Facility: McGuire		Date of Examination: February 2020		
Item	Task Description	Initials a	Initials b*	Initials c**
1. WRITTEN	a. Verify that the outline(s) fit(s) the appropriate model in accordance with ES-401 or ES-401N.	[illegible]	N/A	[illegible]
	b. Assess whether the outline was systematically and randomly prepared in accordance with Section D.1 of ES-401 or ES-401N and whether all K/A categories are appropriately sampled.	[illegible]		[illegible]
	c. Assess whether the outline overemphasizes any systems, evolutions, or generic topics.	[illegible]		[illegible]
	d. Assess whether the justifications for deselected or rejected K/A statements are appropriate.	[illegible]		[illegible]
2. SIMULATOR	a. Using Form ES-301-5, verify that the proposed scenario sets cover the required number of normal evolutions, instrument and component failures, technical specifications, and major transients.	N/A		N/A
	b. Assess whether there are enough scenario sets (and spares) to test the projected number and mix of applicants in accordance with the expected crew composition and rotation schedule without compromising exam integrity, and ensure that each applicant can be tested using at least one new or significantly modified scenario, that no scenarios are duplicated from the applicants' audit test(s), and that scenarios will not be repeated on subsequent days.			
	c. To the extent possible, assess whether the outline(s) conforms with the qualitative and quantitative criteria specified on Form ES-301-4 and described in Appendix D and in Section D.5, "Specific Instructions for the 'Simulator Operating Test,'" of ES-301 (including overlap).			
3. WALKTHROUGH	a. Verify that the systems walkthrough outline meets the criteria specified on Form ES-301-2: (1) The outline(s) contains the required number of control room and in-plant tasks distributed among the safety functions as specified on the form. (2) Task repetition from the last two NRC examinations is within the limits specified on the form. (3) No tasks are duplicated from the applicant's audit test(s). (4) The number of new or modified tasks meets or exceeds the minimums specified on the form. (5) The number of alternate-path, low-power, emergency, and radiologically controlled area tasks meets the criteria on the form.			
	b. Verify that the administrative outline meets the criteria specified on Form ES-301-1: (1) The tasks are distributed among the topics as specified on the form. (2) At least one task is new or significantly modified. (3) No more than one task is repeated from the last two NRC licensing examinations.			
	c. Determine whether there are enough different outlines to test the projected number and mix of applicants and ensure that no items are duplicated on subsequent days.			
4. GENERAL	a. Assess whether plant-specific priorities (including probabilistic risk assessment and individual plant examination insights) are covered in the appropriate exam sections.	[illegible]		[illegible]
	b. Assess whether the 10 CFR 55.41, 55.43, and 55.45 sampling is appropriate.	[illegible]		[illegible]
	c. Ensure that K/A importance ratings (except for plant-specific priorities) are at least 2.5.	[illegible]		[illegible]
	d. Check for duplication and overlap among exam sections and the last two NRC exams.	[illegible]		[illegible]
	e. Check the entire exam for balance of coverage.	[illegible]		[illegible]
	f. Assess whether the exam fits the appropriate job level (RO or SRO).	[illegible]		[illegible]

	Printed Name/Signature	Date
a. Author	Phillip G. Capehart / [illegible]	10/15/18
b. Facility Reviewer (*)	N/A	N/A
c. NRC's Chief Examiner (#)	David R. Lang. / [illegible]	10/15/18
d. NRC Supervisor	Gerald J. McCoy / [illegible]	10/15/2018

* Not applicable for NRC-prepared examination outlines.
\# The independent NRC reviewer initials items in column "c"; the chief examiner's concurrence is required.

Facility: McGuire 1&2 Date of Exam: February 2020

Tier	Group	RO K/A Category Points: K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	SRO-Only Points: A2	G*	Total
1. Emergency and Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	18	3	3	6
	2	1	1	2				2	2			1	9	2	2	4
	Tier Totals	4	4	5				5	5			4	27	5	5	10
2. Plant Systems	1	3	2	2	2	3	3	3	2	2	3	3	28	3	2	5
	2	1	1	1	1	1	1	1	0	1	1	1	10	0 2	1	3
	Tier Totals	4	3	3	3	4	4	4	2	3	4	4	38	5	3	8

3. Generic Knowledge and Abilities Categories	RO: 1	2	3	4	Total	SRO: 1	2	3	4	Total
	3	2	2	3	10	2	2	1	2	7

Note: 1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outline sections (i.e., except for one category in Tier 3 of the SRO-only section, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 radiation control K/A is allowed if it is replaced by a K/A from another Tier 3 category.)

2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points, and the SRO-only exam must total 25 points.

3. Systems/evolutions within each group are identified on the outline. Systems or evolutions that do not apply at the facility should be deleted with justification. Operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.

4. Select topics from as many systems and evolutions as possible. Sample every system or evolution in the group before selecting a second topic for any system or evolution.

5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.

6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.

7. The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.

8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' IRs for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above. If fuel-handling equipment is sampled in a category other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2. (Note 1 does not apply). Use duplicate pages for RO and SRO-only exams.

9. For Tier 3, select topics from Section 2 of the K/A catalog and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

G* Generic K/As

* These systems/evolutions must be included as part of the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan. They are not required to be included when using earlier revisions of the K/A catalog.

** These systems/evolutions may be eliminated from the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan.

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)						Form ES-401-2		
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery / 1	X						007EK1.05; Knowledge of the operational implications of the following concepts as they apply to the reactor trip: Decay power as a function of time.	3.3	
000008 (APE 8) Pressurizer Vapor Space Accident / 3						X	008AG2.2.42; Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	3.9	
000009 (EPE 9) Small Break LOCA / 3				X			009EA1.10; Ability to operate and monitor the following as they apply to a small break LOCA: Safety parameter display system.	3.8	
000011 (EPE 11) Large Break LOCA / 3			X				011EK3.15; Knowledge of the reasons for the following responses as the apply to the Large Break LOCA: Criteria for shifting to recirculation mode.	4.3	
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4			X				015AK3.02; Knowledge of the reasons for the following responses as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): CCW lineup and flow paths to RCP oil coolers.	3.0	
000022 (APE 22) Loss of Reactor Coolant Makeup / 2					X		022AA2.03; Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup: Failures of flow control valve or controller.	3.1	
000025 (APE 25) Loss of Residual Heat Removal System / 4						X	025AG2.4.20; Knowledge of the operational implications of EOP warnings, cautions, and notes.	3.8	
000026 (APE 26) Loss of Component Cooling Water / 8					X		026AA2.02; Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: The cause of possible CCW loss.	2.9	
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3		X					027AK2.03; Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and positioners.	2.6	
000029 (EPE 29) Anticipated Transient Without Scram / 1					X		029EA2.02; Ability to determine or interpret the following as they apply to an ATWS: Reactor trip alarm.	4.4	
000038 (EPE 38) Steam Generator Tube Rupture / 3						X	038EG2.2.4; (multi-unit license) Ability to explain the variations in control board/control room layouts, systems, instrumentation, and procedural actions between units at a facility.	3.6	
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4	X						WE12EK1.1; Knowledge of the operational implications of the following concepts as they apply to the (Uncontrolled Depressurization of all Steam Generators): Components: capacity, and function of emergency systems.	3.4	
000054 (APE 54; CE E06) Loss of Main Feedwater /4				X			054AA1.04; Ability to operate and / or monitor the following as they apply to the Loss of Main Feedwater (MFW): HPI, under total feedwater loss conditions.	4.4	
						X	054AG2.4.35; Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.	4.0	
000055 (EPE 55) Station Blackout / 6					X		055EA2.06; Ability to determine or interpret the following as they apply to a Station Blackout: Faults and lockouts that must be cleared prior to re-energizing buses.	4.1	
000056 (APE 56) Loss of Offsite Power / 6			X				056AK3.01; Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power: Order and time to initiation of power for the load sequencer.	3.5	

000057 (APE 57) Loss of Vital AC Instrument Bus / 6					X		057AA2.18; Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: The indicator, valve, breaker, or damper position which will occur on a loss of power.	3.1	
000058 (APE 58) Loss of DC Power / 6						X	058AG2.2.37; Ability to determine operability and/or availability of safety related equipment.	4.6	
000062 (APE 62) Loss of Nuclear Service Water / 4				X			062AA1.07; Ability to operate and / or monitor the following as they apply to the Loss of Nuclear Service Water (SWS): Flow rates to the components and systems that are serviced by the SWS: interactions among the components.	2.9	
000065 (APE 65) Loss of Instrument Air / 8						X	065AG2.2.36; Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	3.1	
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6					X		077AA2.02; Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: Voltage outside the generator capability curve.	3.6	
(W E04) LOCA Outside Containment / 3	X						WE04EK1.1; Knowledge of the operational implications of the following concepts as they apply to the (LOCA Outside Containment): Components, capacity, and function of emergency systems.	3.5	
(W E11) Loss of Emergency Coolant Recirculation / 4		X					WE11EK2.2; Knowledge of the interrelations between the (Loss of Emergency Coolant Recirculation) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	3.9	
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4		X					WE05EK2.2; Knowledge of the interrelations between the (Loss of Secondary Heat Sink) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	3.9	
K/A Category Totals:	3	3	3	3	3/3	3/3	Group Point Total:		18/6

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)						Form ES-401-2		
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000001 (APE 1) Continuous Rod Withdrawal / 1									
000003 (APE 3) Dropped Control Rod / 1									
000005 (APE 5) Inoperable/Stuck Control Rod / 1									
000024 (APE 24) Emergency Boration / 1									
000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2									
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7									
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7									
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8				X			036AA1.03; Ability to operate and / or monitor the following as they apply to the Fuel Handling Incidents: Reactor building containment evacuation alarm enable switch.	3.5	
000037 (APE 37) Steam Generator Tube Leak / 3					X		037AA2.12; Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: Flow rate of leak.	3.3	
000051 (APE 51) Loss of Condenser Vacuum / 4					X		051AA2.01; Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: Cause for low vacuum condition.	2.7	
000059 (APE 59) Accidental Liquid Radwaste Release / 9	X						059AK1.05; Knowledge of the operational implications of the following concepts as they apply to Accidental Liquid Radwaste Release: The calculation of offsite doses due to a release from the power plant.	2.6	
000060 (APE 60) Accidental Gaseous Radwaste Release / 9									
000061 (APE 61) Area Radiation Monitoring System Alarms / 7						X	061AG2.1.25; Ability to interpret reference materials, such as graphs, curves, tables, etc.	4.2	
000067 (APE 67) Plant Fire On Site / 8									
000068 (APE 68; BW A06) Control Room Evacuation / 8									
000069 (APE 69; W E14) Loss of Containment Integrity / 5		X					069AK2.03; Knowledge of the interrelations between the Loss of Containment Integrity and the following: Personnel access hatch and emergency access hatch.	2.8	
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4						X	074EG2.4.11; Knowledge of abnormal condition procedures.	4.0	
000076 (APE 76) High Reactor Coolant Activity / 9									
000078 (APE 78*) RCS Leak / 3									
(W E01 & E02) Rediagnosis & SI Termination / 3					X		WE02EA2.1; Ability to determine and interpret the following as they apply to the (SI Termination): Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	3.3	

(W E13) Steam Generator Overpressure / 4					X		WE13EA2.2; Knowledge of the interrelations between the (Steam Generator Overpressure) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	3.4	
(W E15) Containment Flooding / 5									
(W E16) High Containment Radiation /9			X				WE16EK3.4; Knowledge of the reasons for the following responses as they apply to the (High Containment Radiation): RO or SRO function within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated.	3.0	
(BW E08; W E03) LOCA Cooldown—Depressurization / 4			X				WE03EK3.1; Knowledge of the reasons for the following responses as they apply to the (LOCA Cooldown and Depressurization): Facility operating characteristics during transient conditions, including coolant chemistry and the effects of temperature, pressure, and reactivity changes and operating limitations and reasons for these operating characteristics.	3.1	
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4				X			WE09EA1.3; Ability to operate and / or monitor the following as they apply to the (Natural Circulation Operations): Desired operating results during abnormal and emergency situations.	3.8	
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4						X	WE08EG2.2.37; Ability to determine operability and/or availability of safety related equipment.	4.6	
K/A Category Point Totals:	1	1	2	2	2/2	1/2	Group Point Total:		9/4

ES-401 PWR Examination Outline Form ES-401-2
Plant Systems—Tier 2/Group 1 (RO/SRO)

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump					X							003K5.02; Knowledge of the operational implications of the following concepts as they apply to the RCPS: Effects of RCP coastdown on RCS parameters.	2.8	
						X						003K6.14; Knowledge of the effect of a loss or malfunction on the following will have on the RCPS: Starting requirements.	2.6	
004 (SF1; SF2 CVCS) Chemical and Volume Control					X							004K5.31; Knowledge of the operational implications of the following concepts as they apply to the CVCS: Purpose of flow path around boric acid storage tank.	3.0	
											X	004G2.4.30; Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator.	2.7	
005 (SF4P RHR) Residual Heat Removal		X										005K2.03; Knowledge of bus power supplies to the following: RCS pressure boundary motor-operated valves.	2.7	
006 (SF2; SF3 ECCS) Emergency Core Cooling									X			006A3.03; Ability to monitor automatic operation of the ECCS, including: ESFAS-operated valves.	4.1	
007 (SF5 PRTS) Pressurizer Relief/Quench Tank				X								007K4.01; Knowledge of PRTS design feature(s) and/or interlock(s) which provide for the following: Quench tank cooling.	2.6	
008 (SF8 CCW) Component Cooling Water							X					008A1.01; Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCWS controls including: CCW flow rate.	2.8	
								X				008A2.03; Ability to (a) predict the impacts of the following malfunctions or operations on the CCWS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: High/low CCW temperature.	3.2	
010 (SF3 PZR PCS) Pressurizer Pressure Control		X										010K2.04; Knowledge of bus power supplies to the following: Indicator for code safety position.	2.7	
012 (SF7 RPS) Reactor Protection	X											012K1.05; Knowledge of the physical connections and/or cause effect relationships between the RPS and the following systems: ESFAS.	3.8	
								X				012A2.05; Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Faulty or erratic operation of detectors and function generators.	3.2	
013 (SF2 ESFAS) Engineered Safety Features Actuation										X		013A4.01; Ability to manually operate and/or monitor in the control room: ESFAS-initiated equipment which fails to actuate.	4.5	
						X						013K6.01; Knowledge of the effect of a loss or malfunction on the following will have on the ESFAS: Sensors and detectors.	2.7	

022 (SF5 CCS) Containment Cooling							X					022A1.02; Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCS controls including: Containment pressure.	3.6	
025 (SF5 ICE) Ice Condenser											X	025G2.4.4; Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.	4.5	
							X					025A1.01; Ability to predict and/or monitor changes in parameters associated with operating the ice condenser system controls including: Temperature chart recorders.	3.0	
026 (SF5 CSS) Containment Spray										X		026A4.01; Ability to manually operate and/or monitor in the control room: CSS controls.	4.5	
039 (SF4S MSS) Main and Reheat Steam								X				039A2.01; Ability to (a) predict the impacts of the following malfunctions or operations on the MRSS; and (b) based on predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Flow paths of steam during a LOCA.	3.1	
					X							039K5.01; Knowledge of the operational implications of the following concepts as the apply to the MRSS: Definition and causes of steam/water hammer.	2.9	
059 (SF4S MFW) Main Feedwater											X	059G2.4.35; Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.	3.8	
061 (SF4S AFW) Auxiliary/Emergency Feedwater						X						061K6.01; Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: Controllers and positioners.	2.5	
062 (SF6 ED AC) AC Electrical Distribution									X			062A3.05; Ability to monitor automatic operation of the ac distribution system, including: Safety-related indicators and controls.	3.5	
	X											062K1.02; Knowledge of the physical connections and/or cause-effect relationships between the ac distribution system and the following systems: ED/G.	4.1	
063 (SF6 ED DC) DC Electrical Distribution	X											063K1.03; Knowledge of the physical connections and/or cause-effect relationships between the DC electrical system and the following systems: Battery charger and battery.	2.9	
064 (SF6 EDG) Emergency Diesel Generator										X		064A4.04; Ability to manually operate and/or monitor in the control room: Remote operation of the air compressor switch (different modes).	3.2	
073 (SF7 PRM) Process Radiation Monitoring								X				073A2.01; Ability to (a) predict the impacts of the following malfunctions or operations on the PRM system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Erratic or failed power supply.	2.5	
076 (SF4S SW) Service Water			X									076K3.01; Knowledge of the effect that a loss or malfunction of the SWS will have on the following: Closed cooling water.	3.4	
											X	076G2.4.47; Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	4.2	

078 (SF8 IAS) Instrument Air				X								078K4.02; Knowledge of IAS design feature(s) and/or interlock(s) which provide for the following: Cross-over to other air systems.	3.2	
								X				078A2.01; Ability to (a) predict the impacts of the following malfunctions or operations on the IAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Air dryer and filter malfunctions.	2.9	
103 (SF5 CNT) Containment			X									103K3.03; Knowledge of the effect that a loss or malfunction of the containment system will have on the following: Loss of containment integrity under refueling operations.	3.7	
											X	103G2.4.21; Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.	4.6	
K/A Category Point Totals:	3	2	2	2	3	3	3	2/3	2	3	3/2	Group Point Total:		28/5

ES-401												PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)		Form ES-401-2
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
001 (SF1 CRDS) Control Rod Drive				X								001K4.05: Knowledge of CVCS design feature(s) and/or interlock(s) which provide for the following: Interrelationships and design basis, including fluid flow splits in branching networks (e.g., charging and seal injection flow).	3.3	
002 (SF2; SF4P RCS) Reactor Coolant			X									002K3.02; Knowledge of the effect that a loss or malfunction of the RCS will have on the following: Fuel.	4.2	
011 (SF2 PZR LCS) Pressurizer Level Control		X										011K2.02; Knowledge of bus power supplies to the following: PZR heaters.	3.1	
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation											X	015G2.4.1; Knowledge of EOP entry conditions and immediate action steps.	4.5	
016 (SF7 NNI) Nonnuclear Instrumentation	X											016K1.08; Knowledge of the physical connections and/or cause-effect relationships between the NNIS and the following systems: PZR PCS.	3.4	
017 (SF7 ITM) In-Core Temperature Monitor														
027 (SF5 CIRS) Containment Iodine Removal														
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control								X				028A2.02; Malfunctions or operations on the HRPS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: LOCA condition and related concern over hydrogen.	3.9	
029 (SF8 CPS) Containment Purge											X	029G2.1.23; Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.4	
033 (SF8 SFPCS) Spent Fuel Pool Cooling									X			033A3.01; Ability to monitor automatic operation of the Spent Fuel Pool Cooling System including: Temperature control valves.	2.5	
034 (SF8 FHS) Fuel-Handling Equipment						X						034K6.02; Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System: Radiation monitoring systems.	2.6	
035 (SF 4P SG) Steam Generator														
041 (SF4S SDS) Steam Dump/Turbine Bypass Control														
045 (SF 4S MTG) Main Turbine Generator														
055 (SF4S CARS) Condenser Air Removal														
056 (SF4S CDS) Condensate														
068 (SF9 LRS) Liquid Radwaste								X				068A2.04; Ability to (a) predict the impacts of the following malfunctions or operations on the Liquid Radwaste System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Failure of automatic isolation.	3.3	

071 (SF9 WGS) Waste Gas Disposal							X					071A1.06; Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with Waste Gas Disposal System operating the controls including: Ventilation system.	2.5	
072 (SF7 ARM) Area Radiation Monitoring					X							072K5.01; Knowledge of the operational implications of the following concepts as they apply to the ARM system: Radiation theory, including sources, types, units, and effects.	2.7	
075 (SF8 CW) Circulating Water														
079 (SF8 SAS**) Station Air														
086 Fire Protection										X		086A4.03; Ability to manually operate and/or monitor in the control room: Fire alarm switch.	3.5	
050 (SF 9 CRV*) Control Room Ventilation														
K/A Category Point Totals:	1	1	1	1	1	1	1	0/2	1	1	1/1	Group Point Total:		10/3

Facility: McGuire	Date of Exam: February 2020					
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.15	Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.	2.7			
	2.1.26	Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen).	3.4			
	2.1.44	Knowledge of RO duties in the control room during fuel handling, such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.	3.9			
	2.1.4	Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.			3.8	
	2.1.41	Knowledge of the refueling process.			3.7	
	Subtotal		3		2	
	2.2.6	Knowledge of the process for making changes to procedures.	3.0			
	2.2.42	Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	3.9			
	2.2.7	Knowledge of the process for conducting special or infrequent tests.			3.6	
	2.2.13	Knowledge of tagging and clearance procedures.			4.3	
	Subtotal		2		2	
3. Radiation Control	2.3.11	Ability to control radiation releases.	3.8			
	2.3.12	Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.	3.2			
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.			3.8	
	Subtotal		2		1	
4. Emergency Procedures/Plan	2.4.9	Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.	3.8			
	2.4.32	Knowledge of operator response to loss of all annunciators.	3.6			
	2.4.37	Knowledge of the lines of authority during implementation of the emergency plan.	3.0			
	2.4.28	Knowledge of procedures relating to a security event (non-safeguards information).			4.1	
	2.4.30	Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator.			4.1	
	Subtotal		3		2	
Tier 3 Point Total			10	10	7	7

Tier / Group	Randomly Selected K/A	Reason for Rejection

Facility: **McGuire**		Date of Examination:	**2/2020**
Examination Level:	**RO**	Operating Test Number:	**N20-1**

Administrative Topic (see Note)	Type Code*	Describe activity to be performed	
Conduct of Operations	D, P, R	2.1.20 (4.6)	Ability to interpret and execute procedure steps.
		JPM:	Complete a Surveillance for Mode Change
Conduct of Operations	M, R	2.1.37 (4.3)	Knowledge of procedures, guidelines or limitations associated with reactivity management.
		JPM:	Verification of Keff <0.99 with Shutdown Banks Withdrawn
Equipment Control	M, R	2.2.43 (3.0)	Knowledge of process used to track inoperable alarms.
		JPM:	Partial Loss of Annunciators
Radiation Control	M, R	2.3.7 (3.5)	Ability to comply with radiation work permit requirements during normal or abnormal conditions.
		JPM:	Evaluate Stay Time with Lowered SFP Level

NOTE: All items (5 total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).

*Type Codes & Criteria:
(C)ontrol room, **(0)** (S)imulator, **(0)** or Class(R)oom **(4)**
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) **(1)**
(N)ew or (M)odified from bank (≥ 1) **(3)**
(P)revious 2 exams (≤ 1; randomly selected) **(1)**

RO Admin JPM Summary

A1a This is a Bank JPM. The operator will be told that Unit 1 is in Mode 4 during a plant startup, that the current EFPD is 348, that NC System pressure has stabilized at 1600 psig, and that it has become necessary to perform Enclosure 13.4, NC Boron Concentration Checklist, of PT/1/A/4600/003D, Monthly Surveillance Items, in order to continue with the plant startup. The operator will be provided with the most recent chemistry sample results for the Cold Leg Accumulator Boron Concentrations, and directed to complete Enclosure 13.4, NC Boron Concentration Checklist, of PT/1/A/4600/003D, Monthly Surveillance Items. Additionally, the operator will be directed to identify any Flex Strategy Administrative Limits and any Technical Specification LCO that are not being complied with. The operator will be expected to complete Enclosure 13.4 of PT/1/A/4600/003D in accordance with the attached KEY, determine that all Flex Strategy Administrative Limits are met, and determine that LCO 3.5.1 is not currently met. This JPM appeared on the 2016 Initial License Exam and was randomly selected for the 2020 Exam.

A1b This is a modified Bank JPM. The operator will be told that a Unit 1 startup in progress per OP/1/A/6100/001 (Controlling Procedure for Unit Startup) and PT/0/A/4150/047 (1/M Monitoring During Startup), that all control banks have just been reinserted because the extrapolated critical rod position indicated that criticality would occur below the lower ECP band, that the OAC and REACT Program are unavailable, and that it is expected that Tavg will be maintained at its current value of 557°F. The operator will be provided with an initial set of plant /reactor conditions; and directed to perform Enclosure 4.7 (Verification of Keff <0.99 with Shutdown Banks Withdrawn) of OP/0/A/6100/006 (Reactivity Balance Calculation) to ensure that an inadvertent Mode change has not occurred. The operator will be expected to determine that an inadvertent mode change has not occurred (See attached KEY).

A2 This is a modified JPM. The operator will be told that while Unit 1 was operating at 100% power, a lightning strike caused several of the Unit 1 Control Room Annunciators to fail requiring entry into PT/1/A4600/033 (Loss of Control Room Annunciators) and has completed Attachment 2 (Partial Loss of Annunciator Panels) through Step 3.8. The operator will be told that several operators are reviewing the Annunciator Response Procedures for each failed annunciator. The operator will be provided with a list of failed annunciators on 1AD-13; and directed to perform step 9 of Attachment 2 to determine (1) IF any AP or EP that has a Time Critical Task has been affected, (2) IF any Technical Specification or Selected Licensee Commitment surveillance has been affected and (3) IF any proceduralized Alternate Action must be taken. The operator will be expected to determine that there are Alternative Methods procedurally identified for Surveillance associated with three of these annunciators, that one failure impacts the Semi-Daily Surveillance associated with TS SR 3.6.4.1, that one failure impacts the Daily Surveillance associated with SLC 16.7.3, and that one failure impacts an AP/EP Time Critical Task per the attached KEY.

A3 This is a modified Bank JPM. The operator will be told that a station wide accident has occurred due to an Earthquake, that Unit 1 is Mode 6 with a full core off-load, that the Unit 1 Spent Fuel Pool level has lowered to 10 feet above the top of the fuel, and has stabilized at this level, and that the crew is implementing AP/1/A/5500/41 (Loss of Spent Fuel Cooling or Level) and EP/1/A/5000/G-1 Generic Enclosures), Enclosure 32 (Monitoring Unit 1 SFP Level and Temperature). They will also be told that there are no installed radiation monitors that are operable in the Spent Fuel Building, that an RWP limit of 500 mrem has been placed on all personnel performing emergency tasks within the building, and that the operator has been assigned a repetitive task within Generic Enclosure 32 which will require them to enter the Fuel Building and proceed to the area around the Spent Fuel Pool, and remain there for 8 minutes, before exiting the building. The operator will be directed to use Enclosure 13 (Spent Fuel Pool Radiation Level Vs. Water Level Above Fuel) of AP/1/A/5500/41 (Loss of Spent Fuel Cooling or Level), and determine the number of times they will be able to perform this repetitive task before they must be replaced by another operator. The operator will be expected to use Enclosure 13 of AP/1/A/5500/41 to determine that the dose rate around the Spent Fuel Pool area is 649 mrem/hour and based on this the operator will determine that the repetitive task can be performed 5 times before another operator will need to perform the task.

Facility: **McGuire**		Date of Examination:	**2/2020**
Examination Level:	**SRO**	Operating Test Number:	**N20-1**

Administrative Topic (see Note)	Type Code*	Describe activity to be performed	
Conduct of Operations	M, R	2.1.18 (3.8)	Ability to make accurate, clear, concise logs, records, status boards, and reports.
		JPM:	Determine Reportability Requirements
Conduct of Operations	M, R	2.1.1 (4.2)	Knowledge of conduct of operations requirements
		JPM:	Perform Daily Surveillance Items Checklist
Equipment Control	M, R	2.2.18 (3.9)	Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.
		JPM:	Perform a Thermal Margin Determination
Radiation Control	D, P, R	2.3.6 (3.8)	Ability to approve release permits.
		JPM:	Approve a Liquid Release Permit
Emergency Procedures/Plan	D, R	2.4.41 (4.6)	Knowledge of emergency action level thresholds and classifications.
		JPM:	Classify an Emergency Event

NOTE: All items (5 total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).

*Type Codes & Criteria:

(C)ontrol room, **(0)** (S)imulator, **(0)** or Class(R)oom **(5)**
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) **(2)**
(N)ew or (M)odified from bank (≥ 1) **(3)**
(P)revious 2 exams (≤ 1; randomly selected) **(1)**

SRO Admin JPM Summary

A1a This is a modified Bank JPM. The operator will be provided with a set of plant conditions that ultimately led to an automatic reactor trip from 100% power. The operator will be directed to determine reportability requirements, including completion of any necessary paperwork. The operator will be expected to identify that this condition requires a 4-hour notification to the NRC in accordance with RP/0/A/5700/010 (NRC Immediate Notification Requirements), and to complete Attachment 2 (NRC Event Notification Worksheet) in accordance with the attached Key.

A1b This is a modified Bank JPM. The operator will be told that Unit 1 is in Mode 1 at 100% power, given several initial plant conditions and told that Enclosure 13.1, Daily Surveillance Items Checklist, of PT/1/A/4600/003B, "Daily Surveillance Items," has been completed. The operator will be directed to evaluate the completed Enclosure 13.1 of PT/1/A/4600/003B (Daily Surveillance Items Checklist) per Step 12, identify all Technical Specification/SLC required ACTION, as well as all other actions that must be taken. The operator will be expected to review the completed Enclosure 13.1, Daily Surveillance Items Checklist and associated Equipment Problem Identification Form and verify that the applicable surveillance items meet specified acceptance criteria. For surveillance items NOT meeting Acceptance Criteria, all required action will be identified per the attached KEY.

A2 This is a modified Bank JPM. The operator will be told that Unit 1 was shutdown 16 days ago for a mid-cycle outage after 200 days of operation, that Unit 1 is currently in Mode 5 with the NC system is 125˚F and "A" Train ND in service; and that preparations are being made to lower NC system level to 67 inches above Hot Leg Centerline per Enclosure 4.1 (Draining the NC System) of OP/1/A/6100/SD-20 (Draining the NC System). The operator will be directed to complete Attachment 12.6 of OMP 5-8 (Shift Supervision Turnovers) to determine the new thermal margin with NC system level at 67 inches above Hot Leg Centerline and make the appropriate notifications (Complete all paperwork). The operator will be expected to determine the Thermal Margin and complete Attachment 12.6 (Thermal Margin Determination) and Attachment 12.7 (Shutdown Assessment Status) of OMP 5-8 (Shift Supervision Turnovers) in accordance with the provided KEY.

A3 This is a Bank JPM. The operator will be provided with a list of equipment that is Out-of-Service (OOS) which will include some Liquid Radwaste monitoring equipment. The operator will be told that Unit 1 and Unit 2 are in Mode 1 at 100% power, that there are no on-going liquid radiation releases, that Attachment 1 ('B' WMT Release Using 'B' WMT Pump) of OP/0/B/6200/607 (Liquid Waste Release – WMT 'B' with WMT Pump 'B') is in progress in preparation for release of the B Waste Monitor Tank, that Attachment 10 ('B' WMT Release Authorization) has been initiated, that RP has just delivered the LWR package # 2020067 to the Control Room, and that all available RC Pumps are running. The operator will be directed to review and approve LWR Package # 2020067 by performing Steps 9-12 of Attachment 10 ('B' WMT Release Authorization) of OP/0/B/6200/607; and if LWR Package # 2020067 cannot be approved, identify why not. The operator will be expected to determine that LWR Package # 2020067 cannot be approved because the recommended Release Rate is GREATER THAN the Allowable Release Rate and 0EMF49 has NOT been source checked. This JPM appeared on the 2018 Initial License Exam and was randomly selected for the 2020 Exam.

A4 This is a Bank JPM. The operator will be told that Unit 1 was operating at 100% power and Unit 2 was in No Mode when a Loss of Offsite Power occurred to the site. The operator will be directed to classify the event in accordance with RP/0/A/5700/000 (Classification of Emergency), identify the EAL resulting in the Highest Emergency Classification, then prepare a Nuclear Power Plant Emergency Notification Form for the event, and present to the Emergency Coordinator for approval. The operator will be expected to declare a SITE AREA EMERGENCY (SAE) based on SS1.1, "Loss of all offsite and all onsite AC power capability to essential 4160V buses 1(2)ETA and 1(2)ETB for ≥15 min;" and complete the Emergency Notification Form in accordance with the provided KEY within the following 15 minutes.

Facility: **McGuire**		Date of Examination:	**2/2020**
Exam Level (circle one): *RO (only)* / SRO(I) **/ SRO (U)**		Operating Test No.:	**N20-1**

Control Room Systems@ (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)

	System / JPM Title	Type Code*	Safety Function
A.	**APE 022 Loss of Reactor Coolant Makeup [022 AA1.04 (3.3/3.2)]** **Restoring Charging Flow with Hot NC Pump Seals**	**S, N, A, L**	**2**
B.	APE 065 Loss of Instrument Air [065 AA2.07 (2.8/3.2)] Auxiliary Feedwater Flow Control with a Loss of Instrument Air	S, N, A, L	8
C.	**061 Auxiliary/Emergency Feedwater (AFW) System [061 A2.07 (3.4/3.5)]** **CA Suction Source Realignment**	**S, P, D, A, EN**	**4S**
D.	**010 Pressurizer Pressure Control System [010 A4.03 (4.0/3.8)]** **Place LTOP in Service and Respond to a Failed PORV**	**S, D, A, L**	**3**
E.	APE 056 Loss of Off-Site Power [056 AA1.02 (4.0/3.9)] Restore Normal Power to 1ETB and Unload the 1B EDG/Respond to 1ETB Lockout	S, D, A	6
F.	APE 061 ARM System Alarms [061 AA2.01 (3.5/3.7)] Control Room Air Intake High Radiation Alarms	S, P, D	7
G.	007 Pressurizer Relief Tank/Quench Tank System [007 A1.03 (2.6/2.7)] Control Pressurizer Relief Tank Parameters	S, D	5
H.	*003 Reactor Coolant Pump System [003 A4.01 (3.3/3.2)]* *Start and Stop the 1B NCP for NCS Venting*	*S, D, L*	*4P*

In-Plant Systems@* 3 for RO; 3 for SRO-I; 3 or 2 for **SRO-U**

	System / JPM Title	Type Code*	Safety Function
I.	APE 024 Emergency Boration [024 AA1.04 (3.6/3.7)] Emergency Borate the NCS Locally Using 2NV-269	P, D, R, E	1
J.	**APE 069 Loss of Containment Integrity [069 AA1.03 (2.8/3.0)]** **Start the Hydrogen Analyzers**	**D, R, E**	**5**
K.	**EPE 055 Station Blackout [055 EK3.02 (4.3/4.6)]** **Establish NC Pump Seal Injection From the SSF**	**D, E**	**6**

*	All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions, all five SRO-U systems must serve different safety functions, and in-plant systems and functions may overlap those tested in the control room.
* Type Codes	Criteria for R / SRO-I / SRO-U
(A)lternate path	4-6 (5) /4-6 (5) / 2-3 (3)
(C)ontrol room	
(D)irect from bank	≤ 9 (9) /≤ 8 (8) / ≤ 4 (4)
(E)mergency or abnormal in-plant	≥ 1 (3) /≥ 1 (3) / ≥ 1 (2)
(EN)gineered Safety Feature	≥ 1 (1) /≥ 1 (1)/ ≥ 1 (1) (Control Room System)
(L)ow-Power / Shutdown	≥ 1 (4) /≥ 1 (3) / ≥ 1 (2)
(N)ew or (M)odified from bank including 1(A)	≥ 2 (2) / ≥ 2 (2) / ≥ 1 (1)
(P)revious 2 exams	≤ 3 (3) / ≤ 3 (3)/ ≤ 2 (1) (Randomly Selected)
(R)CA	≥ 1 (2)/≥ 1 (2) / ≥ 1 (1)
(S)imulator	

JPM Summary

JPM A This is a New JPM. The operator will be told that a loss of Charging at 100% power has resulted in a plant trip and hot lower bearing temperatures on all four NC Pumps and that charging flow is now ready to be restored. The operator will be directed to perform Enclosure 4 (Restoring Charging Flow With Hot NC Pump Seals) of AP/1/A/5500/12, "Loss of Letdown, Charging or Seal Injection." The operator will be expected to isolate the NC Pumps seals, attempt to start the 1B NV Pump to re-establish Charging Flow, then start the PD Pump when the 1B NV Pump fails to start **(Alternate Path)** and complete the restoration of 50 gpm charging flow per Enclosure 4 of AP/1/A/5500/12.

JPM B This is a New JPM. The operator will be told that with Unit 1 at 100% power, a seismic event resulted in a loss of VI and a reactor trip, that the crew is in EP/1/A/5000/ES-0.1, "Reactor Trip Response," and continuing with AP/1/A/5500/22, "Loss of VI," as able; and that crew has just determined that VI Header pressure is less than 85 psig at Step 2 of ES-0.1. The operator will be directed to perform the ES-0.1 Step 2 RNO to control NC System Cooldown. The operator will be expected to initiate the Step 2 RNO of ES-0.1, determine that all S/G levels are greater than 11% and rising in an uncontrolled manner, then implement Generic Enclosure 16 (CA Flow Control with a Loss of VI) to minimize cooldown and stabilize all Steam Generator levels prior to Steam Generator Narrow Range level in any Steam Generator rising to greater than 92%. When attempting to control CA flow from the MDCA Pump to the 1D S/G the operator will determine that the CA flow cannot be controlled from the Control Room and direct local action to isolate CA flow (**Alternate Path**).

JPM C This is a Bank JPM. The operator will be told that Unit 1 has just tripped from 100% power, due to seismic activity, that the crew is now implementing EP/1/A/5000/ES-0.1 (Reactor Trip Response), and that the CA Storage Tank has developed a leak, and level has lowered to 1.5 feet. The operator will be directed to perform EP/1/A/5000/G-1, Generic Enclosure 20 (CA Suction Source Realignment), while the crew continues with ES-0.1. The operator will realign the suction of the CA Pumps from the non-safety related to the safety-related source (RN). During this action, the operator will recognize that RN Supply to the 1B MDCA Pump cannot be established **(Alternate Path)** and stop the pump. This

JPM appeared on the 2016 Initial License Exam and was randomly selected for the 2020 Exam.

JPM D This is a Bank JPM. The operator will be told that Unit 1 is in a cooldown and depressurization in accordance with OP/1/A/6100/SD-4, (Cooldown to 240 Degrees F), that the 1A and 1B NCPs are operating, and that conditions have been established for placing LTOPs in service. The operator will be directed to place the LTOP System in operation beginning with Step 3.13.2b - of Attachment 1 of OP/1/A/6100/SO-10 (Controlling Procedure for LTOP Operation) and monitor for proper operation. The operator will be expected to place LTOP in service by first placing 1NC-32B in service per procedure; and then respond to a failed open Pzr PORV (1NC-34A) by closing the failed open Pzr PORV Block Valve **(Alternate Path)**.

JPM E This is a Bank JPM. The operator will be told that Unit 1 was operating at 100% power when the normal power breaker to 1ETB was inadvertently opened, the 1B EDG started and re-energized the bus and sequenced loads onto 1ETB as expected, the crew entered AP/1/A/5500/07, Loss of Electrical Power, Case II, Loss of Normal Power to Either 1ETA or 1ETB; and they are currently at Step 86. The operator will also be told that an investigation has revealed that the breaker was inadvertently opened, that the breaker is ready to be re-closed, and that the crew is attempting to return 1ETB to normal power and shutdown the 1B D/G. The operator will be directed to restore 1ETB to normal power and separate the 1B D/G from the Grid from the Control Room per OP/1/A/6350/002 (Diesel Generator), Enclosure 4.4 (1B D/G Shutdown). The operator will be expected to parallel 1ETB, with 1ATD, and then unload the 1B D/G. When the operator transfers the 1ETB load to the normal power supply and opens the 1ETB Emergency Breaker, an overcurrent lockout will occur on Bus 1ETA causing the running NV and KC Pumps to stop **(Alternate Path)**. Then, after Bus 1ETA has experienced an overcurrent lockout, the operator will be expected to carry out the immediate actions of AP/1/A/5500/07 by starting the 1B NV Pump and the 1B KC Pumps manually.

JPM F This is a Bank JPM. The operator will be told that Units 1 and 2 are operating at 100% power, that Annunciator 1RAD-2 B2, EMF 43B CR AIR INTAKE B HI RAD, alarmed 45 seconds ago; and that Annunciator 1RAD-1 B2, EMF 43A CR AIR INTAKE A HI RAD, alarmed 15 seconds ago. The operator will be directed to perform the Annunciator Response Procedures for both alarms. The operator will be expected to determine that the Unit 2 intake presents a greater threat than Unit 1 and align the VC inlet to take suction on Unit 1 only; and then pressurize the Control Room from the B Train Outside Air Pressure Fan. This JPM appeared on the 2018 Initial License Exam and was randomly selected for the 2020 Exam.

JPM G This is a Bank JPM. The operator will be told that Unit 1 is operating at power, that a transient has resulted in a discharge to the Pressurizer Relief Tank (PRT) from the Pressurizer PORVs, that the plant has stabilized and all Pressurizer PORVs are closed, and then provided with a set of PRT parameters. The operator will also be told that Steps 3.1 through 3.5 of Enclosure 4.3 (PRT Cooling) of OP/1/A/6150/004 (Pressurizer Relief Tank), have been completed. The operator will be directed to perform Enclosure 4.3 (PRT Cooling) of OP/1/A/6150/004 (Pressurizer Relief Tank), starting with Step 3.6, to lower PRT Temperature to clear 1AD-6, C9, PRT HI TEMP. The operator will be expected to complete Enclosure 4.3 (PRT Cooling) of OP/1/A/6150/004 (Pressurizer Relief Tank) such that PRT Temperature is less than 110°F, and 1AD-6, C9, PRT HI TEMP is EXTINGUISHED.

JPM H This is a Bank JPM. The operator will be told that a plant startup is in progress per OP/1/A/6100/001 (Controlling Procedure For Unit Startup), that the crew is implementing Enclosure 4.2 (Venting the NC System (Control Room Activities)) of OP/1/A/6100/SU-6 (Venting the NC System), that the NC System is water solid, and that NC System pressure is being maintained between 320-350 psig. The operator will also be told that the crew is ready to conduct a 60 second run of the 1B NC Pump, and that Attachment 1 (Startup and Operation) of OP/1/A/6150/002 A (Reactor Coolant Pump Operation) has been marked up for place-keeping through step 3.1.3 to support NC Pump operation. The operator will be directed to start the 1B NCP per Section 3.3 of Attachment 1 (Startup and Operation) of OP/1/A/6150/002 A (Reactor Coolant Pump Operation); and then stop the 1B NCP after 60 seconds of operation, or if a low temperature condition develops. The operator will be expected to conduct a 60 second run of the 1B NC Pump in accordance with Attachment 1 of OP/1/A/6150/002 A.

JPM I This is a Bank JPM. The operator will be told that Unit 2 was at 100% power when a Boron dilution event occurred, that AP/2/A/5500/38 (Emergency Boration and Response to Inadvertent Dilution) was entered, and that while attempting to open 2NV-265B (Boric Acid To NV Pumps), the BOP discovered that 2NV-265B was de-energized. The operator will be directed to emergency borate the NC System by performing Step 12.d RNO of AP/2/A/5500/38. The operator will be expected to attempt to open 2NV-265B, and when this fails open 2NV-269 within ten (10) minutes of dispatch. This is a Time Critical JPM. This JPM appeared on the 2016 Initial License Exam and was randomly selected for the 2020 Exam.

JPM J This is Bank JPM. The operator will be told that Unit 1 has tripped from 100% power due to an accident, that the crew is in EP/1/A/5000/FR-Z.1 (Response to High Containment Pressure), and that the crew is checking Containment Hydrogen Concentration. The operator will be directed to place the Hydrogen Analyzers in service in accordance with Enclosure 5 (Placing H_2 Analyzers In Service) of EP/1/A/5000/G-1 (Generic Enclosures). The operator will be expected to place the 1A Hydrogen Analyzer in service.

JPM K This is a Bank JPM. The operator will be placed in a situation in which a Loss of All AC has occurred on Unit 1. The operator will be told that EP/1/A/5000/ECA-0.0, (Loss of All AC Power) has been implemented, and that an operator to complete Enclosure 3 (Unit 1 ETA And ETB Rooms - ECA-0.0 Actions). The operator will be directed to obtain the Brown Folder at SSF and complete Enclosure 2, (Unit 1 SSF-ECA-0.0 Actions), which will require the re-establishment of NCP Seal Water flow. The operator will be expected to place the SSF Diesel in operation and supply power to 1SLXG, start the Standby Makeup Pump and ensure that it is supplying NCP seal injection within seven (7) minutes of dispatch, ensure that 1SLXG is supplying power to SMXG and SMXG-1, and that Battery Chargers SDSP-1 and SDSP-2 supply breakers are closed. This is a Time Critical JPM.

SYS003 K5.02 - Reactor Coolant Pump System (RCPS)

Knowledge of the operational implications of the following concepts as they apply to the RCPS: (CFR: 41.5 / 45.7)

Effects of RCP coastdown on RCS parameters ....

Given the following on Unit 1:

- Unit is at 40% RTP
- Power ascension in progress
- Turbine Controls in MW-IN

Subsequently:

- 1C NC pump trips

Based on the conditions above and assuming no operator action,

1) **Tcold** in the unaffected NC loops ________ stabilize at a lower value.

2) NC Loop 1C **delta T** will stabilize at a value ________ than the other NC loops delta Ts.

Which ONE (1) of the following completes the statements above?

A. 1. will NOT
   2. lower

B. 1. will NOT
   2. higher

C. 1. will
   2. lower

D. 1. will
   2. higher

General Discussion

Per PS-NCP lesson plan:
Reverse flow in the affected loop will cause Thot to decrease to a value equal to or slightly less than Tcold, thereby decreasing the affected loop delta T.
Steam flow from the Steam Generators and heat removal from the NC system in unaffected loops will increase and Tcold in the unaffected loops will decrease.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that the increase in heat removal from the unaffected loops will casue an increase in Tavg and thus Tcold.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that the increase in heat removal from the unaffected loops will casue an increase in Tavg and thus Tcold.

Part 2 is plausible because the overall core delta T would increase due to only 3 NC pumps running, but the affected loop delta T would decrease due to reverse flow in that loop.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the overall core delta T would increase due to only 3 NC pumps running, but the affected loop delta T would decrease due to reverse flow in that loop.

Basis for meeting the KA

The K/A is matched because applicants are required to have knowledge of the operational implications of NC pump coastdown on NC system parameters (Tcold and delta T).

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.
The applicant will be required to analyze the conditions in the stem and determine the affect those conditions will have on unaffected loops Tcold and affected loop delta T.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2016 CNS NRC (Bank 6332)

Development References	Student References Provided
OP-MC-PS-NCP (Rev 32) page 26 OP-MC-CF-IFC (Rev 07) page 8	

SYS003 K5.02 - Reactor Coolant Pump System (RCPS)
Knowledge of the operational implications of the following concepts as they apply to the RCPS: (CFR: 41.5 / 45.7)
Effects of RCP coastdown on RCS parameters ....

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Remarks/Status

SYS003 K6.14 - Reactor Coolant Pump System (RCPS)
Knowledge of the effect of a loss or malfunction on the following will have on the RCPS: (CFR: 41.7 / 45/5)
Starting requirements ....

Given the following on Unit 1:

- NCS Tavg is 215°F
- NCS pressure is 250 PSIG
- VCT pressure is 28 PSIG
- The 1A NC pump is to be started for a unit heatup

Subsequently:

- The 1A2 Oil Lift pump is started
- Oil Lift pressure is 580 PSIG

1) In accordance with OP/1/A/6150/002A (REACTOR COOLANT PUMP OPERATION) Attachment 1 (Startup and Operation), the MINIMUM required #1 Seal differential pressure for starting the NC pump ________ met.

2) Based on the conditions above, if the 1A NC PUMP SAFETY BKR "**START**" pushbutton is depressed, the pump ________ start.

Which ONE (1) of the following completes the statements above?

A. 1. is NOT
2. will

B. 1. is NOT
2. will NOT

C. 1. is
2. will

D. 1. is
2. will NOT

General Discussion

The minimum #1 Seal D/P for starting an NC pump is 200 PSID as stated in OP/1/A/6150/002 A (NCP Operation).

The NC Pump will not start (safety breaker will not close) unless oil lift pressure is greater than 600 psig.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant does not recall 200 PSID is the minimum required #1 seal differential pressure required by OP/1/A/6150/002 A. It is also typical for #1 seal differential pressure to be greater than 300 PSID during an NC pump start.

Part 2 is plausible since the 1A NCP can be started with low #1 seal differential pressure. However, the bearing oil lift interlock pressure for starting an NCP is not met.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant does not recall 200 PSID is the minimum required #1 seal differential pressure required by OP/1/A/6150/002 A. It is also typical for #1 seal differential pressure to be greater than 300 PSID during an NC pump start.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant does not recall there is a bearing oil lift pressure interlock for starting an NCP.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of the starting requirements for an NC pump to be able to identify when a malfunction has occurred that would effect whether or not an NC pump could be started.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to perform more than one mental step. First the applicant must analyze the parameters given in the stem and then calculate NCP Seal D/P.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2015 MNS NRC Q2 (Bank 5914)

Development References

Lesson Plan OP-MC-PS-NCP Section 2.1 & Section 2.3.2

LEARNING OBJECTIVES:
OP-MC-PS-NCP Objectives 6 & 12

OP/1/A/6150/002A (REACTOR COOLANT OPERATION) Attachment 1(Startup and Operation).

Student References Provided

SYS003 K6.14 - Reactor Coolant Pump System (RCPS)
Knowledge of the effect of a loss or malfunction on the following will have on the RCPS: (CFR: 41.7 / 45/5)
Starting requirements ....

Remarks/Status
Rearranged answers from original bank question, correct answer is now "D". - SLG 10/25/2018

SYS004 K5.31 - Chemical and Volume Control System

Knowledge of the operational implications of the following concepts as they apply to the CVCS: (CFR: 41.5/45.7)

Purpose of flow path around boric acid storage tank ....

Given the following on Unit 1:

- Unit is at 75% RTP
- The U1 Boric Acid Tank (BAT) has been placed in Normal Recirculation per OP/1/A/6150/009 (BORON CONCENTRATION CONTROL)

Based on the conditions above,

1) the U1 BAT ________ available as a boration flowpath to the NC system.

2) SLC 16.9.9 (BORATION SYSTEMS FLOW PATH - OPERATING) requires that ________ of 3 boron injection flow paths be OPERABLE.

Which ONE (1) of the following completes the statements above?

A. 1. is
2. one

B. 1. is NOT
2. two

C. 1. is
2. two

D. 1. is NOT
2. one

General Discussion

Placing the BAT in Normal recirculation requires one boric acid transfer pump to be started and the stby boric acid transfer pump to be placed in auto if the NV system is aligned for auto makeup. This alignment does not affect the ability of the BAT to be used as a boration flowpath to the NC system. Placing the BAT in Rapid recirculation makes the boration flowpath from BAT to NC System via NV Pumps inoperable and unavailable.

SLC 16.9.9 requires two of three possible boron injection flow paths to be operable.

Answer A Discussion

INCORRECT: See explanantion above.

Plausible:
Part 1 is correct.

Part 2 is plausible because SLC 16.9.12 (Boration Systems Flow Path Shutdown) requires one functional flow path.

Answer B Discussion

INCORRECT: See explanantion above.

Plausible:
Part 1 is plausible because the BAT is NOT available as a boration flowpath in a rapid recirculation lineup.

Part 2 is correct.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanantion above.

Plausible:
Part 1 is plausible because the BAT is NOT available as a boration flowpath in a rapid recirculation lineup.

Part 2 is plausible because SLC 16.9.12 (Boration Systems Flow Path Shutdown) requires one functional flow path.

Basis for meeting the KA

K/A is matched because item asks the operational implications of having the BAT in recirculation. (MNS does have a path around the BAT that contains one manual valve. Exam team is unable to write a discriminating question about this one manual valve and opted to write a question concerning operational implications with the BAT being in recirc).

Basis for Hi Cog

This question is higher cognitive because more than one mental step is required. First, the applicant isrequired to evaluate the affect a change in system alignment will have on boration flowpath and then recall from memory SLC commitment requirements.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

Student References Provided

SYS004 K5.31 - Chemical and Volume Control System

Knowledge of the operational implications of the following concepts as they apply to the CVCS: (CFR: 41.5/45.7)

Purpose of flow path around boric acid storage tank ....

Remarks/Status

401-9 Comments: SAT

S004 K5.31

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Although the purpose of the bypass is explicitly stated in the question, the question does meet the operational implication portion adequately.

Facility Response: NONE

SYS004 2.4.30 - Chemical and Volume Control System

SYS004 GENERIC

Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator. (CFR: 41.10 / 43.5 / 45.11)

Given the following on Unit 2:

- Operations is shifting from the 2A NV pump to the 2B NV pump per OP/2/A/6200/001B, (CHEMICAL AND VOLUME CONTROL CHARGING)

In accordance with OP/2/A/6200/001B,

1) the DP between Seal Balance Line Pressure AND suction pressure must be less than or equal to a MAXIMUM of ________ PSID.

2) if DP is too high, ________ is required to be notified to evaluate pump performance.

Which ONE (1) of the following completes the statements above?

A. 1. 40
2. Maintenance

B. 1. 50
2. Maintenance

C. 1. 40
2. Engineering

D. 1. 50
2. Engineering

General Discussion

OP/2/A/6200/001B requires the DP between seal balance line pressure and suction pressure to be no greater than 50 psid when starting a pump.

If DP is greater than 50 psid then engineering will be contacted to evaluate pump performance.

Answer A Discussion

INCORRECT: See explanation above.

Plausible:
Part 1 is plausible because 40 psid is the seal injection filter high DP setpoint.

Part 2 is plausible because maintenance is usually the point of contact for mechanical issues.

Answer B Discussion

INCORRECT: See explanation above.

Plausible:
Part 1 is correct.

Part 2 is plausible because maintenance is usually the point of contact for mechanical issues.

Answer C Discussion

INCORRECT: See explanation above.

Plausible:
Part 1 is plausible because 40 psid the is seal injection filter high DP setpoint.

Part 2 is correct.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicants will have to recall the DP setpoint for seal balance pressure and suction pressure and determine which internal organization will be contacted to evaluate the DP when not in spec.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References	Student References Provided
OP/2A/6200/01 B (Chemical and Voume Control - Charging, Rev 76 PS-NV lesson plan, Rev 14A	

SYS004 2.4.30 - Chemical and Volume Control System
SYS004 GENERIC
Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator. (CFR: 41.10 / 43.5 / 45.11)

Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS005 K2.03 - Residual Heat Removal System (RHRS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
RCS pressure boundary motor-operated valves ....

Given the following on Unit 1:

- Plant shutdown and cooldown to 100°F is in progress.
- NC System temperature 180°F.
- Both trains of ND are in service in accordance with station procedures.

The power supply to 1ND-1B (C NC Loop to ND Pumps) is ___(1)___ and the current status of its motor breaker is ___(2)___.

Which ONE (1) of the following completes the statement above?

A. 1. 1EMXA4
   2. OPEN

B. 1. 1EMXD
   2. OPEN

C. 1. 1EMXA4
   2. CLOSED

D. 1. 1EMXD
   2. CLOSED

General Discussion

OP/1/A/6100/SD-12 Enclosure 4.1, Cooldown to 100 Degrees F, lists the power supplies for 1ND-1B (1EMXD-8D) and 1ND-2A (1EMXA4-3C). This enclosure also has a step to Open the breakers.

OP-MC-PS-ND states: The normal system configuration is to remove power from ND-1B and ND-2AC after the Unit has reached Mode 5 during shutdown (while performing OP/1or 2/A/6100/SD-12, Cooldown to 100°F).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1ND-2AC (C NC Loop to ND Pumps) is powered from 1EMXA4.

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1ND-2AC (C NC Loop to ND Pumps) is powered from 1EMXA4.

Part 2 is plausible because during shutdown power is restored and maintained in Mode 4 to allow the valves to be operated from the control room before power is removed again while in Mode 5.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because during shutdown power is restored and maintained in Mode 4 to allow the valves to be operated from the control room before power is removed again while in Mode 5.

Basis for meeting the KA

K/A is matched because item directly evaluates power source for MOVs, and further discriminates by asking breaker position.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.
The applicant will be required to analyze the conditions in the stem and determine the affect those conditions will have on breaker position during shutdown.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2008 MNS NRC Q3 (Bank 3221)

Development References

OP/1/A/6100/SD-12 Rev. 67
OP-MC-PS-ND Rev. 53

Student References Provided

SYS005 K2.03 - Residual Heat Removal System (RHRS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
RCS pressure boundary motor-operated valves ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "B".
- SLG 10/29/2018

SYS006 A3.03 - Emergency Core Cooling System (ECCS)
Ability to monitor automatic operation of the ECCS, including: (CFR: 41.7 / 45.5)
ESFAS-operated valves ....

Given the following on Unit 1:

- A Reactor Trip and Safety Injection have occurred due to a LOCA
- LOCA SEQ ACTUATED TRAIN B status light on 1SI-14 is DARK
- The Phase A "RESET" lights for Trains "A" and "B" are LIT

1) Based on the conditions above, the "S LATCHED" light for 1NI-185A (RB SUMP TO TRAIN A ND & NS) ________ LIT.

2) When the "S LATCHED" lights are LIT for 1NI-185A and 1NI-184B, depressing the "SS RESET" pushbuttons ________ disable the Auto OPEN signal.

Which ONE (1) of the following completes the statements above?

A. 1. is
2. will

B. 1. is
2. will NOT

C. 1. is NOT
2. will

D. 1. is NOT
2. will NOT

General Discussion

Per PS-ND lesson Plan:
NI-184B and NI-185A have open/close pushbuttons on the ND section of MC11. These valves are designed to automatically open on FWST low level (95"), following a safety injection signal, to swap the ND pump suction from the FWST to the containment sump.

When the SS signal is actuated, the S LATCHED indication will illuminate and remain lit until the SS RESET pushbutton is depressed. The S LATCH seals in the SS SIGNAL, therefore the automatic swap will be enabled even if the SS signal is reset. The S-latch allows the automatic opening of NI-184B and/or NI-185A on 2 of 3 FWST LO level bistables provided the FWST level instruments are not in test.

The 1NI-185A/184B SS Reset pushbutton will restore the NI-184B(185A) open interlock and disables the 2/3 FWST LO level auto open signal. When depressed, the S latch light will go out

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the applicant may believe it requires resetting the train related Safety Injection Signal as well as depressing the SS Reset in order to regain control of the valves.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the Phase A reset lights are lit for both trains indicating they did not receive a safety injection signal to actuate.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the Phase A reset lights are lit for both trains indicating they did not receive a safety injection signal to actuate.

Part 2 is plausible because the applicant may believe it requires resetting the train related Safety Injection Signal as well as depressing the SS Reset in order to regain control of the valves.

Basis for meeting the KA

The K/A is matched because the applicant demonstates the ability to monitor and anticipate automatic operation of containment sump suction valves.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to analyze the conditions in the stem and determine how the failures provided will affect the ability of the containment sump valves to operate automatically.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

Lesson Plan OP-MC-PS-ND Section 2.3.10

Learning Objectives:
OP-MC-PS-ND Objective 7

Student References Provided

SYS006 A3.03 - Emergency Core Cooling System (ECCS)

ILT 20-1 MNS SRO NRC Examination **QUESTION 6** 6 **A**

Ability to monitor automatic operation of the ECCS, including: (CFR: 41.7 / 45.5)
ESFAS-operated valves ....

Remarks/Status

SYS007 K4.01 - Pressurizer Relief Tank/Quench Tank System (PRTS)
Knowledge of PRTS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Quench tank cooling ....

Given the following on Unit 1:

- Unit is at 100% RTP
- Leak-by on ONE PZR PORV has caused PRT temperature to rise
- NO PRT level adjustments are in progress

1) Annunciator 1AD-6 C/9 (PRT HI TEMP) will alarm if PRT temperature rises to a MINIMUM of ________ degrees F.

2) In accordance with OP/1/A/6150/004 (PZR RELIEF TANK), Enclosure 4.3 (PRT Cooling), the PRT will be cooled by ________.

Which ONE (1) of the following completes the statements above?

A. 1. 120
2. initiating PRT spray flow from the RMWST

B. 1. 114
2. initiating PRT spray flow from the RMWST

C. 1. 120
2. recircing PRT contents with the NCDT pump and heat exchanger

D. 1. 114
2. recircing PRT contents with the NCDT pump and heat exchanger

---

General Discussion

Per PS-NC lesson plan:
The PRT is equipped with internal spray and drain system to cool the tank. The PRT is cooled by recirculating its contents with the Reactor Coolant Drain Tank (NCDT) Pump through the NCDT heat exchanger. If the NCDT pumps are unavailable, the PRT can be cooled by increasing PRT N2 pressure, initiating PRT spray flow from the RMWST while cycling NC107 to maintain level. The PRT has a temperature indication on 1(2)MC10 and an alarm on 1(2)AD6 "PRT Hi Temp" to inform the operator that the tank needs cooling.

Per Annunciator response for 1AD-6 C/9:
PRT HI temp setpoint is 114 degrees F.

Per OP/1/A/6150/004 (Pzr Relief Tank)
IF 1NC-109 (PRT #1 Sample) being used to lower/stabilize level in PRT, go to Enclosure 4.2 (Adjusting PRT Level), Section 3.4, Raising PRT Level Using Reactor Makeup Water Pump and use PRT Spray as primary means to cool PRT.
Otherwise, the NCDT pump and Hx will be used to cool the PRT.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 120 degrees F is the OAC alarm HI-HI setpoint.

Part 2 is plausible because initiating PRT spray flow from the RMWST is a method available to cool the PRT. However, unless PRT level is being lowered using a different enclosure, recircing the PRT contents with the NCDT pump and Hx will be used iaw OP/1/A/6150/004 (Pzr Relief Tank).

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because initiating PRT spray flow from the RMWST is a method available to cool the PRT. However, unless PRT level is being lowered using a different enclosure, recircing the PRT contents with the NCDT pump and Hx will be used iaw OP/1/A/6150/004 (Pzr Relief Tank).

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 120 degrees F is the OAC alarm HI-HI setpoint.

Part 2 is correct.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant is required to have knowledge of the design features that allow for cooling the PRT.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
Lesson Plan OP-MC-PS-NC, Rev 41

Student References Provided

OP/1/A/6100/010 G (Annunciator Response for 1AD-6), Rev 74

OP/1/A/6150/004 (PRT Operation), Rev58

Learning Objectives:
PS-NC Objective #19

SYS007 K4.01 - Pressurizer Relief Tank/Quench Tank System (PRTS)
Knowledge of PRTS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Quench tank cooling ....

Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS008 A1.01 - Component Cooling Water System (CCWS)

Ability to predict and/or monitor changes in parameters to prevent exceeding design limits) associated with operating the CCWS controls including : (CFR: 41.5 / 45.5)

CCW flow rate ....

Given the following on Unit 1:

- The unit is in HOT SHUTDOWN on ND Cooling (Both Train A and B)
- B Train KC is aligned to supply Reactor and Aux Bldg Non-Essential Headers with both 1B1 and 1B2 pumps in operation
- A Train KC is aligned to supply the A ND HX Header with both 1A1 and 1A2 pumps in operation
- The 1A1 KC pump has just tripped

In accordance with the Limits and Precautions of OP/1/A/6400/005 (Component Cooling Water System), KC flow through the 1A ND Heat Exchanger shall be throttled to less than a MAXIMUM of ________.

Which ONE (1) of the following completes the statement above?

A. 6000 GPM

B. 5000 GPM

C. 4000 GPM

D. 3500 GPM

General Discussion

In accordance with the KC System Limits and Precautions:

Maximum Discharge Header Flow for one KC pump is 4000 gpm or 8000 gpm for both pumps.

Basis: To prevent KC pump runout

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because 6000 GPM is the limit on total KC flow through the ND HXs with both trains of KC in service.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because AP-21 (Loss of KC or KC System Leakage)
Enclosure 4 specifies a flow range of 2000 to 5000 GPM flow when starting a KC Train.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because 3500 GPM is the minimum KC flow to the operating ND train with NC system temperature greater than 200°F.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of the CCW flow rate limit through the ND Hx with only one KC pump in service.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2015 MNS NRC Q9 (Bank 5920)

Development References

OP/1/A/6400/005 Rev. 107
AP/1/A/5500/21 Rev. 10
OP/1/A/6100/022, Unit 1 Data Book Enclosure 4.3, Section 2.10.10

Student References Provided

SYS008 A1.01 - Component Cooling Water System (CCWS)

Ability to predict and/or monitor changes in parameters to prevent exceeding design limits) associated with operating the CCWS controls including : (CFR: 41.5 / 45.5)

CCW flow rate ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "C". SLG 10/29/2018

SYS010 K2.04 - Pressurizer Pressure Control System (PZR PCS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
Indicator for code safety position ....

Given the following on Unit 1:

- The Unit is at 100% RTP
- Pressurizer pressure is 2235 psig and stable
- Due to a failure on the 1EVID output breaker, power was lost to 1EKVD and 1AD-6 F/5 NC1, 2, OR 3 FLO DETECTED annunciator is lit

Based on the conditions above:

1) 1EKVD ________ automatically swap to 1KRP.

2) While 1EKVD is de-energized, alternate indication for lifting of a pressurizer safety valve ________ still available.

Which ONE (1) of the following completes the statements above?

A. 1. will
2. is

B. 1. will
2. is NOT

C. 1. will NOT
2. is

D. 1. will NOT
2. is NOT

General Discussion

A regulated power supply (1KRP for Unit 1 and 2 KRP for Unit 2) is provided, as an alternate power source, to allow uninterruptible manual power transfer to panelboards 1(2) EKVA, 1(2) EKVB, 1(2) EKVC, and 1(2) EKVD when an inverter is intentionally taken out-of-service.

1EKVD Bkr 15 is the power supply for the acoustic leak detection monitor for the pressurizer safety valves. With no power 1AD-6 F5 will be lit and alternate indications will be needed. The safety valves also have temperature elements that will alarm on 1AD6 for PZR Safety Discharge Hi Temp.

Answer A Discussion

INCORRECT: See Explanation Above

Plausibility:
Part 1 is plausible because the shared load center power to 1KRP will auto swap on a loss of power. The initial transfer to 1KRP for 1EKVD is manual.

Part 2 is correct.

Answer B Discussion

INCORRECT: See Explanation Above

Plausibility:
Part 1 is plausible because the shared load center power to 1KRP will auto swap on a loss of power. The initial transfer to 1KRP for 1EKVD is manual.

Part 2 is plausible because the Pressurizer relief valves only have temperature elements for detecting operation on their discharge lines. The safety valves have temperature and acoustics.

Answer C Discussion

CORRECT: See Explanation Above

Answer D Discussion

INCORRECT: See Explanation Above

Plausibility:
Part 1 is correct.

Part 2 is plausible because the Pressurizer relief valves only have temperature elements for detecting operation on their discharge lines. The safety valves have temperature and acoustics

Basis for meeting the KA

The K/A is matched because the applicant has to have knowledge of 1EKVD and 1KRP power supplies. 1EKVD is the power suppy to the acoustic leak detection system which is an indicator for pressurizer safety valve position.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

Lesson Plan OP-MC-EL-EPL, 125VDC (EPL) and 120 VAC (EPG) Vital I&C Power
Lesson Plan OP-MC-PS-NC, Reactor Coolant System
OP/1/A/16100/010 G, 1AD-6 F5

Student References Provided

SYS010 K2.04 - Pressurizer Pressure Control System (PZR PCS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
Indicator for code safety position ....

Remarks/Status

SYS012 K1.05 - Reactor Protection System (RPS)

Knowledge of the physical connections and/or cause effect relationships between the RPS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

ESFAS ....

Given the following on Unit 2:

- A Reactor Trip and Safety Injection from 100% RTP has occurred

Based on the conditions above:

1) The **S/G CF Control Bypass Valves** ________ receive a CLOSE signal.

2) Closing the Reactor Trip breakers ________ required to regain control of the **S/G CF Control Valves.**

Which ONE (1) of the following completes the statements above?

A. 1. will
   2. is

B. 1. will
   2. is NOT

C. 1. will NOT
   2. is

D. 1. will NOT
   2. is NOT

General Discussion

Per ECC-ISE lesson:
SS (Safety Injection) will cause the following:
1) FWI (Feedwater Isolation)
2) Turbine trip
3) Both FWPT's trip

Valves that close on FWI (Feedwater Isolation) signal
S/G CF Control Valves (CF-32, 23, 20, 17)
S/G CF Control Valve Bypasses (CF-104, 105, 106, 107)
S/G CF Containment Isolations (CF-35, 30, 28, 26)
CF to CA Nozzle Isolations (CF-126, 127, 128, 129)

If the Feedwater Isolation was due to a Safety Injection; control of Feedwater Isolation components is regained by resetting Safety Injection and then closing the reactor trip breakers. (The Feedwater Isolation "Reset" Pushbutton does not need to be depressed.)

Answer A Discussion

CORRECT: See explanation above:

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because there are other FWI signals that do not require the reactor trip breakers to be closed to regain control of equipment (P4 with Low Tave).

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicants may conclude that the CF Control Bypass Valves are not part of the group of valves that receive a closed signal on a FWI.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicants may conclude that the CF Control Bypass Valves are not part of the group of valves that receive a closed signal on a FWI.

Part 2 is plausible because there are other FWI signals that do not require the reactor trip breakers to be closed to regain control of equipment (P4 with Low Tave).

Basis for meeting the KA

The K/A is matched because the operator must demonstrate Knowledge of the physical connections and/or cause effect relationships between the RPS and the Feedwater Isolation Signal (ESFAS).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2015 RNP NRC Exam (Bank 6835)

FOR REVIEW ONLY - DO NOT DISTRIBUTE

Development References
Lesson Plan: ECC-ISE Rev 39 Learning Objectives: ECC-ISE Obj #6

Student References Provided

SYS012 K1.05 - Reactor Protection System (RPS)

Knowledge of the physical connections and/or cause effect relationships between the RPS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

ESFAS ....

Remarks/Status

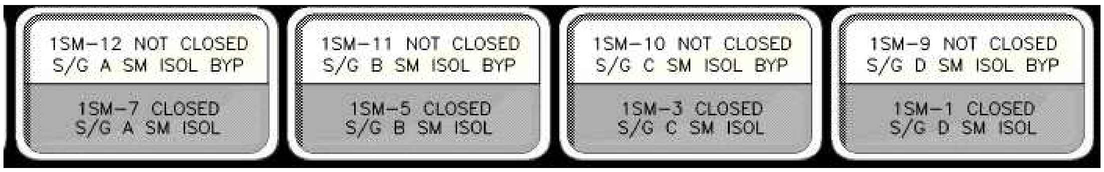
FOR REVIEW ONLY - DO NOT DISTRIBUTE

C

SYS013 A4.01 - Engineered Safety Features Actuation System (ESFAS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
ESFAS-initiated equipment which fails to actuate ....

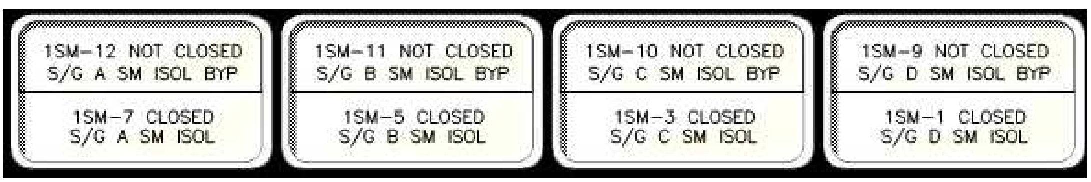
Given the following on Unit 1:

- Unit is at 10% RTP
- Main Turbine is rolling at 1800 RPM in preparation for a unit startup
- Status lights on **1SI-3** indicate the following:



Subsequently,

- A steam line break occurs upstream of the 1D S/G MSIV
- 1D S/G pressure is 700 PSIG
- The status lights on **1SI-3** currently indicate the following:



Based on the indications above:

1) the Main Steam Isolation Bypass valves ________ operated as designed.

2) the Main Steam Isolation valves ________ operated as designed.

Which ONE (1) of the following completes the statements above?

(ASSUME NO OPERATOR ACTIONS HAVE BEEN TAKEN)

A. 1. have
   2. have

B. 1. have
   2. have NOT

C. 1. have NOT
   2. have

D. 1. have NOT
   2. have NOT

General Discussion

Individual status lights for the MSIVs will be illuminated upon MSIV closure and individual status lights for MSIV Bypass valves will be dark upon closure.

A Main Steam Isolation should close all MSIVs, MSIV bypass valves and PORVs. In this case the isolation is actuated by pressure on the 1D S/G being less than 775 psig.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that the MSIV Bypass valves were already in their required position prior to the event.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that the MSIV Bypass valves were already in their required position prior to the event.

Part 2 is plausible if the applicant concludes the following: based on the conditions given, the status light indications should have swapped (i.e. MSIV status lights should be lit and the MSIV Bypass valve status lights should be dark). If the applicant understands that they should have swapped but confuses the two sets of valves, they could conclude that the MSIVs should be dark. If so, they would choose this answer as being correct.

Answer C Discussion

Correct: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant concludes that the MSIVs were already in their safety-related position prior to the event. If so, the applicant would conclude that the MSIVs changing positions has resulted in them no longer being in their safety-related positions.

Basis for meeting the KA

The KA is matched because the applicant must demonstrate the ability to monitor steam line isolation valve indications upon receipt of an MSI signal as a result of a steam line rupture and determine that the isolation failed to complete.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.
The applicant will be required to analyze the conditions to determine that a main steam isolation should have occurred and relate the status lights to correct valve position.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2016 MNS NRC Q47 (Bank 7546)

Development References

Lesson Plan OP-MC-ECC-ISE (Engineered Safeguards Actuation System) Rev. 39
MNS Main Control Board Indications (Simulator) for specific event

LEARNING OBJECTIVES:
NONE

Student References Provided

SYS013 A4.01 - Engineered Safety Features Actuation System (ESFAS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
ESFAS-initiated equipment which fails to actuate ....

Remarks/Status
Changed the order of 1) and 2) in the stem to align with the order of the status lights. The correct answere is now "C". 10/30/18 SLG

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS013 K6.01 - Engineered Safety Features Actuation System (ESFAS)
Knowledge of the effect of a loss or malfunction on the following will have on the ESFAS: (CFR: 41.7 / 45.5 to 45.8)
Sensors and detectors ....

Given the following on Unit 2:

- Containment Pressure Channel III has failed high

Following this malfunction, a High Containment Pressure Safety Injection signal will be generated if a MINIMUM of ___(1)___ of the remaining channels exceed the setpoint of ___(2)___.

Which ONE (1) of the following completes the statement above?

A. 1. two
2. 1.0 PSIG

B. 1. two
2. 3.0 PSIG

C. 1. one
2. 1.0 PSIG

D. 1. one
2. 3.0 PSIG

General Discussion

The normal logic for High Containment Pressure SI is 2/3 (referencing Channels 2-4). With one channel failed high, the logic for actuation becomes 1 of 2. These same channels feed the Hi-Hi Containment Pressure logic along with Channel 1. The Hi-Hi Containment Pressure signal would be placed in bypass (per TS) following this malfunction, but High Containment Pressure SI is placed in Trip.

The High Containment Pressure Safety Injection sepoint is 1.0 psig. The High-High Containment Pressure Phase B isolation sepoint is 3.0 psig.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the High-High Containment Pressure Phase B isolation signal would be placed in bypass (per TS) for this malfunction and thus require two channels for activation.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the High-High Containment Pressure Phase B isolation signal would be placed in bypass (per TS) for this malfunction and thus require two channels for activation.

Part 2 is plausible because this is the High-High Containment Pressure Phase B isolation setpoint.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because this is the High-High Containment Pressure Phase B isolation setpoint.

Basis for meeting the KA

The K/A is matched because the applicant is required to demonstrate knowledge of the effect of a detector malfunction upon an ESFAS actuation signal.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to recall from memory the number of Containment pressure channels which input to SI and Phase "B" and which specific channels input to Si and Phase "B" in order to determine the coincidence required for actuation.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2017 CNS NRC (Bank 7136)

Development References	Student References Provided
ECCS-ISE, Rev. 39, Pgs 11,14 TS 3.3.2	

SYS013 K6.01 - Engineered Safety Features Actuation System (ESFAS)

Knowledge of the effect of a loss or malfunction on the following will have on the ESFAS: (CFR: 41.7 / 45.5 to 45.8)

Sensors and detectors ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "C". SLM 10/30/2018

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS022 A1.02 - Containment Cooling System (CCS)
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCS controls including: (CFR: 41.5 / 45.5)
Containment pressure ....

Given the following on Unit 2:

- Unit is currently in Mode 2
- Four VL AHUs are running in low speed

Subsequently,

- A small NC system leak occurs
- Containment Pressure is slowly rising

Based on the condition above,

1) The VL AHUs will FIRST shift to HIGH speed at a MINIMUM containment pressure of ________ PSIG.

2) If VL AHUs are successful in lowering containment pressure, the fans will ________ to LOW speed.

Which ONE (1) of the following completes the statements above?

A. 1. 0.5
2. automatically shift

B. 1. 0.5
2. be manually shifted

C. 1. 1.0
2. automatically shift

D. 1. 1.0
2. be manually shifted

General Discussion

VL units, along with the pipe tunnel booster fans, will all start and run in high speed or if already running will shift to high speed if containment pressure exceeds 0.5 psig, as sensed by 1NSPT5550. If this causes containment pressure to drop back to 0.49 psig after the VL fans shift to high speed, they will all go back to their control switch selected mode of operations (off/hi/lo). There is no seal-in to keep fans on or in high speed and there is almost no dead band for operation.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the pipe tunnel booster fans also receive a start signal at 0.5 psig but require manual operation to down-shift speeds or remove from service after auto start.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the VL AHUs will start in high speed at 1.0 psig due to a safety injection signal, but this will occur first at 0.5 psig.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the VL AHUs will start in high speed at 1.0 psig due to a safety injection signal, but this will occur first at 0.5 psig.

Part 2 is plausible because the pipe tunnel booster fans also receive a start signal at 0.5 psig but require manual operation to down-shift speeds or remove from service after auto start.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the ability to predict changes associated with the containment cooling (VL) system due to changes in containment pressure.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2018 MNS NRC Q3 (Bank 7401)

Development References

CNT-VUL (Upper and Lower Containment Ventilation System) lesson plan, Rev 33

Student References Provided

SYS022 A1.02 - Containment Cooling System (CCS)

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCS controls including: (CFR: 41.5 / 45.5)

Containment pressure ....

Remarks/Status

SYS025 2.4.4 - Ice Condenser System

SYS025 GENERIC

Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures. (CFR: 41.10 / 43.2 / 45.6)

Given the following on Unit 2:

- Unit is in Mode 3 performing a plant cooldown to Cold Shutdown
- NC Tave is 400 °F
- NC system Pressure is 800 PSIG

Subsequently,

- The OATC reports containment pressure is 0.5 PSIG and rising slowly
- Annunciator 2AD-9 A/5 (ICE COND LOWER INLET DOORS OPEN) alarms

1) Entry into AP-34 (SHUTDOWN LOCA) is allowed in MODE 3 if ________.

2) Based on the conditions above, symptoms for entry into AP-34 ________ been met.

Which ONE (1) of the following completes the statements above?

A. 1. Cold Leg Accumulators are isolated
   2. have

B. 1. Pzr pressure is less than P-11
   2. have

C. 1. Cold Leg Accumulators are isolated
   2. have NOT

D. 1. Pzr pressure is less than P-11
   2. have NOT

General Discussion

Symptoms for entry into AP-34 (Shutdown LOCA)
Any of the following while in Mode 3 with Cold Leg Accumulators isolated, or in
Mode 4:

- "ICE COND LOWER INLET DOORS OPEN" alarm
- Pzr level - GOING DOWN IN AN UNCONTROLLED MANNER
- NC subcooling - GOING DOWN IN AN UNCONTROLLED MANNER
- Containment floor and equipment sump level(s) - GOING UP.

Based on the conditions in the stem, CLAs will be isolated. (Isolated per procedure at 400 degrees F and 1000 PSIG.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because it is a requirement to be below P-11 (1955#) for entry into AP-35 (ECCS Actuation During Plant Shutdown). The plant conditions in the stem are below P-11 setpoint.

Part 2 correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the applicants may confuse the entry requirements for AP-34 and AP-35. Containment pressure in the stem is at 0.5 psig and rising. If Containment pressure rose to greater than 1.0 psig entry into AP-35 would be required.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because it is a requirement to be below P-11 (1955#) for entry into AP-35 (ECCS Actuation During Plant Shutdown). The plant conditions in the stem are below P-11 setpoint.

Part 2 is plausible because the applicants may confuse the entry requirements for AP-34 and AP-35. Containment pressure in the stem is at 0.5 psig and rising. If Containment pressure rose to greater than 1.0 psig entry into AP-35 would be required.

Basis for meeting the KA

The K/A is matched because the applicants are required to recognize abnormal parameters associated with the ice condenser system that are entry conditions to abnormal procedures.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
AP-34 (Shutdown LOCA), Rev24

Student References Provided

SYS025 2.4.4 - Ice Condenser System

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SYS025 GENERIC

Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures. (CFR: 41.10 / 43.2 / 45.6)

Remarks/Status

SYS025 A1.01 - Ice Condenser System

Ability to predict and/or monitor changes in parameters associated with operating the ice condenser system controls including: (CFR: 41.5 / 45.5)

Temperature chart recorders ....

Given the following on Unit 1:

- NCS temperature is 185°F
- A plant heat-up is in progress
- The BOP reports that Ice Condenser Chart Recorder (1NPRC-5000) indicates temperatures on multiple ice bed RTDs are 21°F and rising at a rate of 0.5°F/minute.

Based on the conditions above,

1) the Technical Specification 3.6.12 (Ice Bed) maximum allowed ice bed temperature will be reached in a MINIMUM of ________ minutes.

2) Technical Specification 3.6.12 (Ice Bed) ________ applicable.

Which ONE (1) of the following completes the statements above?

A. 1. 8
2. is

B. 1. 8
2. is NOT

C. 1. 12
2. is

D. 1. 12
2. is NOT

General Discussion

Per TS 3.6.12 (Ice Bed):
The maximum ice bed temperature is 27 degrees F.

The ice bed shall be OPERABLE in MODES 1, 2, 3, and 4.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible because annunciator 1AD-9 B/5 (ICEBED RTD ABNORMAL TEMP) will alarm if any ice bed RTD in points 1-48 reaches 25 degrees. (25-21=4) and (4/0.5=8)

The second part is plausible if the applicant concludes from given conditions that the plant is in Mode 4.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible because annunciator 1AD-9 B/5 (ICEBED RTD ABNORMAL TEMP) will alarm if any ice bed RTD in points 1-48 reaches 25 degrees. (25-21=4) and (4/0.5=8)

The second part is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct.

The second part is plausible if the applicant concludes from given conditions that the plant is in Mode 4.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant is required to predict the change in ice bed temperature, by monitoring the ice bed temperature chart recorder, that would result in meeting the maximum allowed ice bed temperature .

Basis for Hi Cog

This question is higher cognitive because the applicant is required to recall from memory the maximum allowed ice bed temperature and then perform a calculation to determine when that temperature will be met. Applicant is also required to analyze conditions in the stem and determine the current mode of operation.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

TS 3.6.12, Ice Bed

Learning Objectives:
CNT-NF Objective 16

Student References Provided

SYS025 A1.01 - Ice Condenser System
Ability to predict and/or monitor changes in parameters associated with operating the ice condenser system controls including: (CFR: 41.5 / 45.5)
Temperature chart recorders ....

Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS026 A4.01 - Containment Spray System (CSS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
CSS controls ....

Given the following on Unit 2:

- A Large Break LOCA has occurred
- "A" train of NS has been aligned per ES-1.3 (TRANSFER TO COLD LEG RECIRC)

1) The 2A NS Pump will automatically stop when containment pressure lowers to less than a MAXIMUM of ________.

2) Subsequently, if Containment pressure increases to greater than 1 PSIG, the 2A NS Pump ________.

Which ONE (1) of the following completes the statements above?

A. 1. 1 PSIG
   2. will start automatically

B. 1. 1 PSIG
   2. can be started manually

C. 1. 0.35 PSIG
   2. will start automatically

D. 1. 0.35 PSIG
   2. can be started manually

General Discussion

The Containment Spray System will be started manually from the Control Room from ES-1.3 once Containment Pressue is greater than 3 psig. For the manual start, CPCS must be at least 0.35 psig for the discharge valves to be manually opened or for the pumps to be manually started. If the containment pressure decreases to < .35 psig (after the initial pump start) containment spray pumps are automatically turned off and the discharge valves are automatically closed. Per ES 1.3 the pumps are manually restarted if pressure increases above 1 psig.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1 psig is used in ES 1.3 to start available NS pumps if NS pump flow has been lost.

Part 2 is plausible if applicant concludes that NS pump operation is all automatic after the initial start. Also plausible because NS pumps do have an automatic stop after initial start.

Answer B Discussion

NCORRECT: See explanation above

PLAUSIBLE:
Part 1 is plausible because 1 psig is used in ES 1.3 to start available NS pumps if NS pump flow has been lost.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if applicant concludes that NS pump operation is all automatic after the initial start. Also plausible because NS pumps do have an automatic stop after initial start.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant must demonstrate the ability to monitor when NS pumps will automatically stop and the ability to manually open the NS pump discharge valves and start the NS pumps when required.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2014 MNS NRC Q14 (Bank 5849)

Development References

OP-MC-ECC-ISE Rev. 39
EP/2/A/5000/ES-1.3 Rev. 29

Student References Provided

SYS026 A4.01 - Containment Spray System (CSS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
CSS controls ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "D". SLG 10/31/2018

SYS039 A2.01 - Main and Reheat Steam System (MRSS)

Ability to (a) predict the impacts of the following malfunctions or operations on the MRSS; and (b) based on predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Flow paths of steam during a LOCA ....

Given the following on Unit 1:

- A LOCA has occurred
- A Loss of Off-site power has occurred
- Containment pressure is 3.1 PSIG and STABLE
- ES-1.2 (POST LOCA COOLDOWN AND DEPRESSURIZATION) has been implemented

Based on the conditions above and in accordance with ES-1.2,

1) the NC system cooldown will be performed using the ________.

2) the crew will cooldown at ________.

Which ONE (1) of the following completes the statements above?

A. 1. SM PORVs
   2. a rate NOT to exceed 100°F/hour

B. 1. SM PORVs
   2. maximum rate

C. 1. Condenser Dumps
   2. a rate NOT to exceed 100°F/hour

D. 1. Condenser Dumps
   2. maximum rate

General Discussion

ES-1.2 specifies a cooldown rate based on NC T-colds as close as possible without exceeding 100°F in an hour.

ES-1.2 directs the operators to first attempt to establish a cooldown using Steam Dumps. With the conditions in the stem the dumps cannot be used for two reasons. (1) containment pressure had caused a MSI that isolated the dumps. MSI can be reset anytime due to containment pressure and the dumps would be available to use. However, with the loss of offsite power, C-9 is not met and the PORVs must be used to cooldown.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
The first part is correct.

The second part is plausible because cooling down at the maximum rate is a strategy that is used in other situations in the EOP network when an NC system cooldown is required.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
The first part is plausible if the applicant concludes that steam flow using the Condenser Dumps can be established. Containment pressure is greater than 3 PSIG, a Main Steam Isolation would has occurred and the operator could reset the MSI and open the MSIVs to establish a cooldown. However, due to the loss of offsite power, C-9 is not met and the PORVs must be used to cooldown.

The second part is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
The first part is plausible if the applicant concludes that steam flow using the Condenser Dumps can be established. Containment pressure is greater than 3 PSIG, a Main Steam Isolation would has occurred and the operator could reset the MSI and open the MSIVs to establish a cooldown. However, due to the loss of offsite power, C-9 is not met and the PORVs must be used to cooldown.

The second part is plausible because cooling down at the maximum rate is a strategy that is used in other situations in the EOP network when an NC system cooldown is required.

Basis for meeting the KA

The K/A is matched because the applicant is required to predict the impact of, and use procedures to mitigate the consequences of, high containment pressure and loss of offsite power on the available steam flowpaths to conduct a coodown and depressurization in ES-1.2.

Basis for Hi Cog

This question is higher cognitive because the applicants are required to analyze the conditions in the stem, determine their affect on the ability to dump steam and then determine the correct mitigating strategies due to those conditions.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2018 MNS Audit Q64 (Bank 7563)

Development References

ES-1.2, (Post LOCA Cooldown and Depressurization) Rev 18

Student References Provided

SYS039 A2.01 - Main and Reheat Steam System (MRSS)

Ability to (a) predict the impacts of the following malfunctions or operations on the MRSS; and (b) based on predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Flow paths of steam during a LOCA ....

Remarks/Status

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SYS039 K5.01 - Main and Reheat Steam System (MRSS)

Knowledge of the operational implications of the following concepts as the apply to the MRSS: (CFR: 441.5 / 45.7)

Definition and causes of steam/water hammer ....

Given the following on Unit 1:

- A reactor trip has occurred due to a secondary system malfunction
- E-0 (REACTOR TRIP OR SAFETY INJECTION) has been performed and the crew has transitioned to ES-0.1 (REACTOR TRIP RESPONSE)

Subsequently,

- The crew enters FR-H.2 (RESPONSE TO STEAM GENERATOR OVERPRESSURE)
- The crew is preparing to dump steam from the affected S/G

1) FR-H.2 will only allow steam release from the affected S/G if NR level is less than a MAXIMUM of ________.

2) If the maximum level has been exceeded, an evaluation must be performed prior to release due to the potential effects of ________.

Which ONE (1) of the following completes the statements above?

A. 1. 83%
   2. steamline water hammer

B. 1. 83%
   2. condenser tube damage

C. 1. 92%
   2. steamline water hammer

D. 1. 92%
   2. condenser tube damage

General Discussion

The procedure for S/G high pressure directs operators to enter the procedure for S/G high level if level is ≥ 92% in order to prevent a water hammer event if steam is released above this setpoint.

Following reduction of S/G level, an evaluation must be performed due to the potential for water intrusion into the steamline.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the setpoint identified in FR-H.3 " Throughout this procedure, "affected" refers to any S/G in which N/R level is greater than 83%" and this is also the setpoint for P-14 (Hi-Hi S/G Level Interlock).

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the setpoint identified in FR-H.3 " Throughout this procedure, "affected" refers to any S/G in which N/R level is greater than 83%" and this is also the setpoint for P-14 (Hi-Hi S/G Level Interlock).

Part 2 is plausible because it could be reasoned that water entry into the condenser via steam dumps may cause tube damage.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because it could be reasoned that water entry into the condenser via steam dumps may cause tube damage.

Basis for meeting the KA

The K/A is matched because the applicant is required to determine the implication of high S/G water level as related to the potential for water hammer.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2015 CNS NRC (Bank 6642)

Development References

FR-H.2 (Response to Steam Generator Overpressure), Rev. 03
FR-H.3 (Response to Steam Generator High Level), Rev. 05
Lesson Plan EP-FRH, rev 16

Student References Provided

SYS039 K5.01 - Main and Reheat Steam System (MRSS)
Knowledge of the operational implications of the following concepts as the apply to the MRSS: (CFR: 441.5 / 45.7)
Definition and causes of steam/water hammer ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "C". SLM 11/01/2018

SYS059 2.4.35 - Main Feedwater (MFW) System

SYS059 GENERIC

Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. (CFR: 41.10 / 43.5 / 45.13)

Given the following on Unit 2:

- E-0 (Reactor Trip or Safety Injection) was entered following a Small Break LOCA
- Both trains of Safety Injection automatically actuated
- 2B Reactor Trip Breaker (RTB) failed to open from the Control Room
- All CA pumps failed to start

Subsequently:

- The crew has entered FR-H.1 (Response to Loss of Secondary Heat Sink) and is attempting to align feed flow from 2A CFPT

1) In order to reset 2B Train Safety Injection, 2B RTB ________ required to be locally opened.

2) In accordance with FR-H.1, 2A CFPT will be reset ________.

Which ONE of the following completes the statements above?

A. 1. is
   2. locally

B. 1. is
   2. at 2MC-10

C. 1. is NOT
   2. locally

D. 1. is NOT
   2. at 2MC-10

General Discussion

A Safety Injection signal (either train) will trip both Main Feedwater Pumps. In order to reset either MFP both SI signals must be reset. In order to reset an automatic SI signal, the associated P-4 (Rx Trip & Bypass Breakers open) must be present.

Therefore, the 2B RTB must first be opened locally, both trains of ECCS are then reset, and the 2A CFPT is reset on the Main Control Board (2MC-10) in accordance with FR-H.1 Enclosure 8 (Reestablishing CF Flow).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because an operator will be dispatched to perform local actions to reset the CFPT per FR-H.1 Enclosure 8, if "Reset" from MC-10 is not successful. Also plausible because reset of the CAPT (Auxiliary Feedpump Turbine) is required to be performed locally.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this would be the correct answer if Safety Injection was initiated manually.

Part 2 is plausible because an operator will be dispatched to perform local actions to reset the CFPT per FR-H.1 Enclosure 8, if "Reset" from MC-10 is not successful. Also plausible because reset of the CAPT (Auxiliary Feedpump Turbine) is required to be performed locally.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this would be the correct answer if Safety Injection was initiated manually.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the applicant is required to have knowledge of local Auxiliary Operator Tasks during an emergency related to Main Feedwater (Local trip of Rx Trip Breaker) and the resultant operational effects (Reset of ECCS which allows reset of Main Feedwater Pump).

Basis for Hi Cog

This question is higher cognitive because the applicant must reason through multiple mental processes in order to determine the prerequisite conditions required to reset a Main Feed Pump with conditions provided.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2017 CNS NRC (Bank 7143)

Development References

ECCS-ISE (Engineered Safety Features Actuation System LP), Rev 39
FR-H.1 (Response to Loss of Secondary Heat Sink), Rev 21

Student References Provided

SYS059 2.4.35 - Main Feedwater (MFW) System
SYS059 GENERIC
Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

Rearranged answers from original bank question, correct answer is now "B". SLM 11/05/2018

401-9 Comments: SAT

059G2.4.35
This is OK. Although a loss of AFW is the cause, the question is focusing on restoring feed from the Feed and Condensate system. We need to be careful on the wording for the second part to ensure only one correct answer.

Facility Response:
Added "In accordance with FR-H.1" to Q2 to address CE concern with two correct answers. SLM 9/16/2019

SYS061 K6.01 - Auxiliary / Emergency Feedwater (AFW) System

Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: (CFR: 41.7 / 45.7)

Controllers and positioners ....

Given the following on Unit 1:

- The unit is at 98% RTP
- In preparation for a Unit 1 TDCA pump performance test the following flow control valves are positioned with the manual loaders as follows:

  1CA-64AB (TD CA PUMP TO 1A S/G) -- CLOSED
  1CA-52AB (TD CA PUMP TO 1B S/G) -- CLOSED
  1CA-48AB (TD CA PUMP TO 1C S/G) -- OPEN
  1CA-36AB (TD CA PUMP TO 1D S/G) -- OPEN

Subsequently,

- An inadvertent U1 TDCA pump auto-start signal was generated

After the inadvertent auto-start signal is initiated, ___(1)___ U1 TDCA Flow Control valves will be OPEN and the CA MODULATING VALVES RESET TURB indicating light will be ___(2)___. (**No operator actions have been taken**)

Which ONE (1) of the following completes the statement above?

A. 1. ONLY two
   2. illuminated

B. 1. ONLY two
   2. dark

C. 1. all
   2. illuminated

D. 1. all
   2. dark

General Discussion

The TDCA pump is capable of feeding all four S/G's via the four flow control valves listed, two of which are not in their normal full open alignment. During an auto start, these valves are designed to fail open providing full design flow to all S/G's. In this scenario, an auto start has occurred therefore all of the flow control valves would open.

When an auto-start occurs the "TURB" indicating light for the CA Modulating Valve circuit will be off and the operator will not have control of the valves.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible since this would be true if the TDCA pump start were due to inadvertent opening of steam supply valves SA-48ABC, SA-49AB. This would start the TDCA pump. However, since no "autostart" signal would be generated in that case, the flow control valves would not reposition.

Part 2 is plausible if the candidate believes that the indicating lights will be illuminated when the latching relay for the Modulating Control Valve circuit has picked up.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible since this would be true if the TDCA pump start were due to inadvertent opening of steam supply valves SA-48ABC, SA-49AB. This would start the TDCA pump. However, since no "autostart" signal would be generated in that case, the flow control valves would not reposition.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the candidate believes that the indicating lights will be illuminated when the latching relay for the Modulating Control Valve circuit has picked up.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of the effect of a malfunction/mis-operation of the TDCA pump on the TDCA flow control valves that are positioned in an abnormal alignment.

Basis for Hi Cog

This question is higher cognitive since the applicant must evaluate the initial valve positions in the stem and determine if the inadvertent TDCA start would result in the associated flow control valves failing to their full open position. The applicant is given an abnormal alignment and required to predict an outcome.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2015 MNS NRC Q18 (Bank 5928)

Development References	Student References Provided
Lesson Plan OP-MC-CF-CA	

SYS061 K6.01 - Auxiliary / Emergency Feedwater (AFW) System

Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: (CFR: 41.7 / 45.7)

Controllers and positioners ....

Remarks/Status

SYS062 A3.05 - AC Electrical Distribution System

Ability to monitor automatic operation of the ac distribution system, including: (CFR: 41.7 / 45.5)

Safety-related indicators and controls ....

Given the following on Unit 2:

- A loss of voltage has occurred on 2ETA
- Blackout loading is in progress

Subsequently:

- A Safety Injection signal is received before Blackout loading is completed on 2ETA

Based on the conditions above, the Blackout load sequence ___(1)___ be completed and 2ETA will be cleared of ___(2)___.

Which ONE (1) of the following completes the statement above?

A. 1. will NOT
   2. all loads

B. 1. will NOT
   2. non-SI loads ONLY

C. 1. will
   2. all loads

D. 1. will
   2. non-SI loads ONLY

General Discussion

When a Blackout has occurred and load sequencing is in progress, if an SI signal is received, the Blackout sequence stops, the affected bus is cleared of non-SI loads, and the SI load sequence is actuated.
SI loads which were previously running continue to operate.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible since the applicant may conclude that all loads are cleared from the bus after the SI sequencer actuation. Which does occur after a Blackout sequencer actuation.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant misunderstands the function of the Blackout sequencer and concludes that the Blackout sequence must be complete to ensure full restoration of power to the Emergency Bus.

Part 2 is plausible since the applicant may conclude that all loads are cleared from the bus after the SI sequencer actuation. Which does occur after a Blackout sequencer actuation.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if the applicant misunderstands the function of the Blackout sequencer and concludes that the Blackout sequence must be complete to ensure full restoration of power to the Emergency Bus.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the candidate must possess the ability to monitor the automatic loading of safety-related equipment during all possible load sequence scenarios and determine that the sequencer has operated properly using Main Control Board indications for the various sequencer loads.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2015 MNS NRC Q22 (Bank 5932)

Development References

Lesson Plan DG-EQB (Diesel Generator Load Sequencer), Rev 24A

LEARNING OBJECTIVES:
OP-MC-DG-EQB, Objective 7

Student References Provided

SYS062 A3.05 - AC Electrical Distribution System
Ability to monitor automatic operation of the ac distribution system, including: (CFR: 41.7 / 45.5)
Safety-related indicators and controls ....

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Remarks/Status
Rearranged answers from original bank question, correct answer is now "B". SLM 11/05/2018

SYS062 K1.02 - AC Electrical Distribution System

Knowledge of the physical connections and/or cause-effect relationships between the ac distribution sys- tem and the following systems : (CFR: 41.2 to 41.9)

ED/G ....

Given the following on Unit 1:

- Unit is shutdown in MODE 5
- Auxiliary Transformer 1ATA is tagged out for repairs
- All unit loads are being supplied by Auxiliary Transformer 1ATB

1) A Blackout will occur if ________ open.

2) The DG Committed Sequence ________ require emergency bus minimum voltage and frequency setpoints to be met.

Which ONE (1) of the following completes the statements above?

A. 1. PCBs 8 & 9
   2. does NOT

B. 1. PCBs 11 & 12
   2. does NOT

C. 1. PCBs 8 & 9
   2. does

D. 1. PCBs 11 & 12
   2. does

General Discussion

Since one busline is already out, loss of the other busline which feeds 1ATB will result in a Blackout on both 4160V busses. The busline which feeds 1ATB is fed from the switchyard via PCB 11 & 12.

When bus voltage is greater than or equal to 92.5% and D/G speed is greater than or equal to 97%, the accelerated sequence is enabled. Blackout loads will be sequentially applied at intervals of approximately 2 seconds, as long as bus voltage remains greater than or equal to 92.5% and frequency remains > 58.2 Hz. Complete loading of all blackout loads, via the accelerated sequence, could be done in as little as 25 seconds.

Should the Accelerated Sequence Relay scheme fail to work, the Committed Sequence would be actuated approximately 10 seconds after the diesel receives its blackout start signal if load shed of the bus has been completed. The committed sequence may take up to 12 minutes to load all blackout loads. The committed sequence does not require any minimum voltage or minimum frequency to allow it to progress as does the Accelerated Sequence. The Committed Sequence is required by Technical Specifications.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because PCBs 8 and 9 are the PCBs for busline A that would cause a blackout.

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because PCBs 8 and 9 are the PCBs for busline A that would cause a blackout.

Part 2 is plausible because the applicant may conclude the Committed sequence instead of the Accelerated sequence requires minimum voltage and frequency.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the applicant may conclude the Committed sequence instead of the Accelerated sequence requires minimum voltage and frequency.

Basis for meeting the KA

The K/A is matched because the applicant is required to have knowledge of the cause-effect relationship between the ac distribution system (Switchyard PCBs and Busline 1B) and the D/G (operation following a blackout signal).

Basis for Hi Cog

This question is higher cognitive because the applicant is required to analyze the conditions in the stem to understand and determine the current electrical lineup and then determine what conditions would result in a blackout signal being generated.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2010 MNS NRC Q23 (Bank 2723)

Development References

DG-EQB (D/G Load Sequencer) LP, Rev 24A
EL-EP (Main Power) LP, rev 51A

Learning Objectives:

Student References Provided

DG-EQB, OBJ. #5

SYS062 K1.02 - AC Electrical Distribution System

Knowledge of the physical connections and/or cause-effect relationships between the ac distribution sys- tem and the following systems : (CFR: 41.2 to 41.9)

ED/G ....

Remarks/Status

SYS063 K1.03 - DC Electrical Distribution System

Knowledge of the physical connections and/or cause-effect relationships between the DC electrical system and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

Battery charger and battery ....

Given the following initial conditions:

- Both Units are operating at 100% RTP
- An equalizing charge is being performed on vital battery EVCB

1) When performing a normal equalizing charge, battery EVCB will be charged by battery charger ________.

AND

2) Subsequently, if a loss of offsite power occurs on Unit 1 and 1B DG fails to start, 125 VDC Distribution Center (EVDB) ________ be energized.

Which ONE (1) of the following completes the statements above?

A. 1. EVCS
   2. will

B. 1. EVCS
   2. will not

C. 1. EVCB
   2. will

D. 1. EVCB
   2. will not

General Discussion

During the equalizing charge mode the normal battery charger is disconnected from its distribution center and will be aligned in parallel with its respective battery. The normal battery charger will be placed in Equalize mode of operation.

Battery charger (EVCS) will then supply the distribution center EVDB with the tie breakers closed between EVDB and EVDD (cross-tied with its sister channel). The tie breakers are closed so a battery is available to supply the distribution center on a loss of power since the standby charger (EVCS) does not have its own battery.

Answer A Discussion

INCORRECT: See explanation above

PLAUSIBLE:
Part 1 is plausible because the Aux I&C (240/120 VAC) electrical distribution system does use the standby charger in place of the normal charger to perform an equalize charge on the respective battery.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above

PLAUSIBLE:
Part 1 is plausible because the Aux I&C (240/120 VAC) electrical distribution system does use the standby charger in place of the normal charger to perform an equalize charge on the respective battery.

Part 2 is plausible if the candidate concludes that while cross-tied to EVDD the only power source is from 1ETB through 1EMXB. The normal alignment is to 2EMXB so with a loss of 1B DG the distribution center wouldn't be affected. If the system was aligned to 1EMXB you still have the battery to supply the distribution center after a loss of power.

Answer C Discussion

CORRECT: See explanation above

Answer D Discussion

INCORRECT: See explanation above

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the candidate concludes that while cross-tied to EVDD the only power source is from 1ETB through 1EMXB. The normal alignment is to 2EMXB so with a loss of 1B DG the distribution center wouldn't be affected. If the system was aligned to 1EMXB you still have the battery to supply the distribution center after a loss of power.

Basis for meeting the KA

K/A is matched because applicant must have knowledge of the physical connections in the 125VDC electrical distribution system required for a normal "equalizing" battery charge and alignments made when loss of power to the battery charger occurs.

Basis for Hi Cog

Question is higher cog since the applicant must analyze given plant conditions and determine the status of Bus 1ETB and then determine the effect of the loss of 1ETB on the 125 VDC electrical distribution system battery chargers.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2014 MNS Audit (Bank 5251)

Development References	Student References Provided
Lesson Plan OP-MC-EL-EPL	

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SYS063 K1.03 - DC Electrical Distribution System

Knowledge of the physical connections and/or cause-effect relationships between the DC electrical system and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

Battery charger and battery ....

Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS064 A4.04 - Emergency Diesel Generator (ED/G) System
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
Remote operation of the air compressor switch (different modes) ....

Given the following on Unit 1:

- 1AD-11 A6, D/G A PANEL TROUBLE is in alarm
- An AO has been dispatched to the 1A D/G local panel

Subsequently, the AO reports the following;

- AD-19 (Diesel Generator Panel 1A) C5, STARTING AIR PRESSURE LOW, is in alarm
- 1VGPS-5040, Starting Air Tank 1A1, is 208 PSIG and lowering
- 1VGPS-5050, Starting Air Tank 1A2, is 220 PSIG
- VG compressors have automatically started

1) Based on the conditions above, VG compressors will automatically stop if header pressure rises to a MINIMUM of ________ PSIG.

2) One air receiver with pressure greater than a MINIMUM of ________ PSIG will provide at least one fast start and five total starts.

Which ONE (1) of the following completes the statements above?

A. 1. 225
2. 210

B. 1. 225
2. 220

C. 1. 235
2. 210

D. 1. 235
2. 220

General Discussion

Each air compressor is designed to maintain its associated header pressure at 225-235 psig. As header pressure decreases to 225 psig the compressor will automatically start. Once pressure increases to 235 psig, the compressor will automatically stop.

Each header has a receiver tank designed to store a sufficient volume of air (100 ft3) to start the diesel without assistance. One air receiver at > 210 psig will provide at least one fast start and five total starts.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 225 psig VG header pressure is the pressure at which the VG compressors will start.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 225 psig VG header pressure is the pressure at which the VG compressors will start.

Part 2 is plausible because 220 psig is the Lo-Lo OAC alarm for VG header pressure.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 220 psig is the Lo-Lo OAC alarm for VG header pressure.

Basis for meeting the KA

The K/A is matched because the applicant displays the ability to monitor remote operation of the air compressors in different modes (through the use of annunciators and local indications). MNS does not have an air compressor switch.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
DG-DGA, D/G Auxiliaries, lesson plan, Rev 40

Student References Provided

SYS064 A4.04 - Emergency Diesel Generator (ED/G) System
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
Remote operation of the air compressor switch (different modes) ....

Remarks/Status

401-9 Comments: SAT

064 A4.04
Since MNS does not have a switch for the A/C, this question meets the intent of the K/A

Facility Response: NONE

SYS073 A2.01 - Process Radiation Monitoring (PRM) System

Ability to (a) predict the impacts of the following malfunctions or operations on the PRM system; and (b) based on those predictions, use procedures to cor- rect, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Erratic or failed power supply ....

Given the following on Unit 2:

- Unit is in Mode 6
- VP is in service and refueling is in progress

Subsequently:

- A power supply failure occurs on 2EMF-38(L) (CONTAINMENT PARTICULATE MONITOR)

1) Based on the conditions above, the VP Supply and Exhaust dampers ________ be CLOSED.

2) In accordance with OP/2/A/6100/010 Q (Annunciator Response for 2EMF 38 CONT PART HI RAD), to regain control of VP components, ________ must be reset.

Which ONE (1) of the following completes the statements above?

A. 1. will NOT
2. Containment Ventilation (S_H) ONLY

B. 1. will NOT
2. Containment Ventilation (S_H) AND 2EMF-38

C. 1. will
2. Containment Ventilation (S_H) ONLY

D. 1. will
2. Containment Ventilation (S_H) AND 2EMF-38

General Discussion

These will shutdown on a SH signal from either train:
-VP Supply Fans A & B
-VP Exhaust Fans A & B
-Incore Instrument Room Fans

These close on a SH signal from either train:
-Containment Purge Supply Damper
-Containment Purge Exhaust Damper

To "Reset" Containment Ventilation following an EMF 38, 39, 40 Trip II, the EMF must be reset, then the Containment Ventilation "Reset" Pushbuttons must be depressed.

To "Reset" Containment Ventilation Isolation following a Safety Injection, Manual Phase "A", or Manual Phase "B", the Containment Ventilation (SH) "Reset" Pushbuttons must be depressed (can reset without resetting the initiating signal).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible since other ventilation streams, such as VA (Aux bldg. ventilation), have EMF compensatory actions where only the supply and exhaust fans will trip on a Trip 2 condition.

Part 2 is plausible because To "Reset" Containment Ventilation Isolation following a Safety Injection, Manual Phase "A", or Manual Phase "B", the Containment Ventilation (SH) "Reset" Pushbuttons must be depressed (can reset without resetting the initiating signal).

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible since other ventilation streams, such as VA (Aux bldg. ventilation), have EMF compensatory actions where only the supply and exhaust fans will trip on a Trip 2 condition.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because To "Reset" Containment Ventilation Isolation following a Safety Injection, Manual Phase "A", or Manual Phase "B", the Containment Ventilation (SH) "Reset" Pushbuttons must be depressed (can reset without resetting the initiating signal).

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant must be able to predict/determine the position of containment purge system components following a containment ventilation isolation signal (EMF Trip2) and use procedures to regain control of those components.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2016 MNS Audit Q35 (Bank 6054)

Development References
Lesson Plan CNT-VP (Containment Purge System), Rev 26 OP/2/A/6011/010 Q, Rev 49 LEARNING OBJECTIVES: CNT-VP Objective 4

Student References Provided

SYS073 A2.01 - Process Radiation Monitoring (PRM) System

Ability to (a) predict the impacts of the following malfunctions or operations on the PRM system; and (b) based on those predictions, use procedures to cor- rect, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Erratic or failed power supply ....

Remarks/Status

SYS076 K3.01 - Service Water System (SWS)
Knowledge of the effect that a loss or malfunction of the SWS will have on the following: (CFR: 41.7 / 45.6)
Closed cooling water ....

Given the following on Unit 1:

Initial Conditions:

- The Unit is at 100% power
- Both trains of KC and RN are in service

Subsequently:

- 1A RN pump TRIPS
- A B/O occurs on **2ETA**

Based on the conditions above: (Assuming no operator actions)

1) 1A KC HX will lose RN flow due to the closure of ________.

2) 1B RN suction ________ automatically swap to the SNSWP.

Which ONE (1) of the following completes the statements above?

A. 1. 1RN-43A (Train B to Non-Ess Hdr Isol)
2. will

B. 1. 1RN-43A (Train B to Non-Ess Hdr Isol)
2. will NOT

C. 1. 1RN-40A (Train A to Non-Ess Hdr Isol)
2. will NOT

D. 1. 1RN-40A (Train A to Non-Ess Hdr Isol)
2. will

General Discussion

The blackout on 2ETA causes the following:
The A train cross-connect valves on both units will close (1/2 RN-43A) to give train seperation.

1A KC HX will not have RN cooling water flow because the 1A RN pump trips and the running 1B RN pump cannot provide flow due to the now closed cross-connect.

The A Suction and Discharge valves (shared) on both Units will receive a signal to align to the Low Level Intake from the loss of 2ETA. This is a train related signal for A valves only.

The B Suction and Discharge valves (shared) on both Units will not receive a signal to align to the the SNSWP because the signal was A train only.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant assumes that any B/O signal on either unit/either train will realign suction and discharge flowpaths. This is a valid assumption for other plant systems. However, the signal to realign RN is train related. With a blackout on ETA only A train valves realign.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1RN-40A is an A Train valve and is one of the 3 valves between Train A and B but will not close until a Sp signal (Phase B) is received.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1RN-40A is an A Train valve and is one of the 3 valves between Train A and B but will not close until a Sp signal (Phase B) is received.

Part 2 is plausible if the applicant assumes that any B/O signal on either unit/either train will realign suction and discharge flowpaths. This is a valid assumption for other plant systems. However, the signal to realign RN is train related. With a blackout on ETA only A train valves realign.

Basis for meeting the KA

The K/A is matched because the applicant must demonstrate knowledge of the effect on the 1A KC HX of an infrequent alignment, loss of 1A RN pump and the introduction of a B/O signal on the opposite unit. Which results in a loss of RN cooling to the 1A KC HX.

Basis for Hi Cog

The question is Hi cog because the applicant must analyze the initial conditions, evaluate their effect on the KC and RN systems and predict an outcome.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2014 MNS NRC Exam Q25 (Bank 4981)

Development References
Lesson Plan OP-MC-PSS-RN

Student References Provided

SYS076 K3.01 - Service Water System (SWS)

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Knowledge of the effect that a loss or malfunction of the SWS will have on the following: (CFR: 41.7 / 45.6)
Closed cooling water ....

Remarks/Status

SYS078 K4.02 - Instrument Air System (IAS)

Knowledge of IAS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)

Cross-over to other air systems ....

Given the following on Unit 1

- A Loss of Offsite Power has occurred
- A loss of VI to the Auxiliary Building has occurred
- Safety Injection has NOT actuated
- D/G speed is at 96%

1) Based on the conditions above, the VG to VI Auxiliary Building Air tank isolation valves ________ auto OPEN after the time delay is met.

2) When conditions are met, auto OPENING of the VG to VI Auxiliary Building Air tank isolation valves ONLY ________ complete the VG to VI alignment.

Which ONE (1) of the following completes the statements above?

A. 1. will
   2. does

B. 1. will
   2. does NOT

C. 1. will NOT
   2. does

D. 1. will NOT
   2. does NOT

General Discussion

The VG to VI Auxiliary Building Air Tank isolation valves will automatically open after a 30 second time delay when the three conditions mentioned below are met:
1.Blackout
2.No Safety Injection
3.D/G speed > 95%

The Starting Air System can be used as a backup air supply to the Auxiliary Building Instrument Air System. A solenoid valve (VG-93 or 94) is used to allow air flow from the Starting Air System to the Instrument Air System if, the diesel speed is ・ 95%, a valid Blackout signal is present and a Safety Injection Signal is not present. VG-95 & 96 or VG-97 & 98, which must be manually unlocked and opened to tie to VI, normally isolate the solenoid valves.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1is correct.

Part 2 is plausible because there are VI alignments to other systems (such as VI to VS via VI-820) that do occur due to the automatic re-positioning of a valve (no manual actions required).

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1is plausible because there is a D/G speed setpoint that requires speed to be greater than 97% (Accelerated sequence on a blackout). Therefore, it is plausible that the applicant may conclude that D/G speed is required to be greater than 97% for the VG to VI valves to auto open.

Part 2 is plausible because there are VI alignments to other systems (such as VI to VS via VI-820) that do occur due to the automatic re-positioning of a valve (no manual actions required).

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1is plausible because there is a D/G speed setpoint that requires speed to be greater than 97% (Accelerated sequence on a blackout). Therefore, it is plausible that the applicant may conclude that D/G speed is required to be greater than 97% for the VG to VI valves to auto open.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the applicants are required to have knowledge of design features of the IA system (VI) that allow for cross-tying VG to Aux bldg. VI.

Basis for Hi Cog

This question is higher cognitive because the applicants are required to analyze the conditions in the stem to determine if the requirements are met to auto open VG to VI tank isolation valves and then recall that the system lineup is not complete until locked-manual isolation valves are manipulated.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

DG-DGA (DG Auxiliaries) LP, Rev 40

LEARNING OBJECTIVES:
DG-DGA Objective 7

Student References Provided

SYS078 K4.02 - Instrument Air System (IAS)

Knowledge of IAS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)

Cross-over to other air systems ....

Remarks/Status

SYS103 K3.03 - Containment System

Knowledge of the effect that a loss or malfunction of the containment system will have on the following: (CFR: 41.7 / 45.6)

Loss of containment integrity under refueling operations. ....

Given the following on Unit 2:

- Unit is in Mode 6
- Core offload is in progress
- The PAL DOORS NORM/BYPASS switch on 2MC-7 is in the BYPASS position
- 2AD-10, E-2, LOWER CONT AIRLOCK AUX DOOR OPEN annunciator is DARK

Subsequently:

- Maintenance opens the Lower Cont Airlock Aux Door first and then opens the Lower Cont Airlock RX door simultaneously for equipment removal

Based on the conditions above,

1) 2AD-10,E-2, LOWER CONT AIRLOCK AUX DOOR OPEN annunciator will INITIALLY alarm ________.

2) Suspending movement of RECENTLY irradiated fuel assemblies within containment ________ required in accordance with T.S. 3.9.4 (CONTAINMENT PENETRATIONS).

Which ONE (1) of the following completes the statements above?

A. 1. when the Lower Cont Airlock Aux Door is first opened
2. is

B. 1. when the Lower Cont Airlock Aux Door is first opened
2. is NOT

C. 1. when the Lower Cont Airlock Aux and RX Doors are opened simultaneously
2. is

D. 1. when the Lower Cont Airlock Aux and RX Doors are opened simultaneously
2. is NOT

General Discussion

The PAL mode switch is a two position switch, located on 2MC-7, it selects the alarm mode for both sets of PAL doors. In the Normal Mode, an alarm is received if any PAL door is Opened. The Alarm received will identify which door is actually Open. In the Bypass Mode, the alarm is received if both doors in a particular Air Lock are open simultaneously. The alarms will identify which set of PAL doors are open (upper or lower).

In accordance with T.S. 3.9.4, Containment Penetrations, during movement of recently irradiated fuel assemblies within containment a minimum of one door in each airlock shall be closed. If at least one door is not closed in each airlock then movement of recently irradiated fuel assemblies shall be suspended immediately.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the candidate believes that the the PAL DOOR NORM/BYPASS switch to BYPASS prevents all airlock annunciators since it is an action taken to prevent unecessary nuisance alarms during shutdown.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the candidate does not believe that containment closure is required in Mode 6. In Modes 1-4 T.S. 3.6.2, Containment Air Locks, is applicable. Interlocks will prevent simultaneous opening of both doors in an air lock. During shutdown the door interlock may be disabled and both doors may remain open for extended periods. During movement of recently irradiated fuel the interlocks can be disabled but one airlock door is required to be closed.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the candidate believes that the the PAL DOOR NORM/BYPASS switch to BYPASS prevents all airlock annunciators since it is an action taken to prevent unecessary nuisance alarms during shutdown.

Part 2 is plausible if the candidate does not believe that containment closure is required in Mode 6. In Modes 1-4 T.S. 3.6.2, Containment Air Locks, is applicable. Interlocks will prevent simultaneous opening of both doors in an air lock. During shutdown the door interlock may be disabled and both doors may remain open for extended periods. During movement of recently irradiated fuel the interlocks can be disabled but one airlock door is required to be closed.

Basis for meeting the KA

The K/A is matched because the candidate has to understand the effect of airlock door operation on containment integrity during shutdown and how it could effect refueling operations.

Basis for Hi Cog

This question is higher cognitive because the applicants are required to analyze the conditions in the stem to determine the required state of airlocks during the current mode as well as relate performing core offload to applicablity to T.S. 3.9.4.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

Lesson Plan OP-MC-IC-IAE
Technical Specification 3.9.4, Containment Penetrations

Student References Provided

ILT 20-1 MNS SRO NRC Examination **QUESTION 28** 28 **C**

SYS103 K3.03 - Containment System

Knowledge of the effect that a loss or malfunction of the containment system will have on the following: (CFR: 41.7 / 45.6)

Loss of containment integrity under refueling operations. ....

Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS001 K4.07 - Control Rod Drive System
Knowledge of CRDS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Rod stops ....

Given the following on Unit 1:

- Unit is at 50% RTP
- Control Rod Bank Select Switch is in "Auto"
- Control Bank "D" is at 195 steps withdrawn

Subsequently:

- Selected TIN1 (Turbine Inlet Pressure) output fails to the 100% value

Assuming no operator action, Control Bank "D" will ________ .

Which ONE (1) of the following completes the statement above?

A. remain at 195 steps

B. withdraw 5 steps

C. withdraw 31 steps

D. withdraw until Reactor Power reaches 103%

General Discussion

Turbine Inlet Pressure develops Turbine Power Signal which has the following functions:
oTurbine Power (%) is compared to Reactor Power (%) to yield Power Mismatch.
oTurbine Power (%) is converted (by a Function Generator in DCS) to TREF (ºF). TREF is compared to TAVG to create the Temperature Mismatch Signal used in Rx Control. TREF values range from 557 ºF at 0% Turbine Power linearly to 585.1 ºF at 100% Turbine Power.

With Control Rods in Automatic, the failure of Selected Turbine Inlet Pressure 1 will result in a negative temperature error signal. This signal will cause control rods to withdraw. Once Control Bank "D" reaches 200 steps, all automatic rod motion will be stopped by Rod Stop Relay C-11.

Answer A Discussion

Plausible if the applicant concludes that Selected Turbine Inlet Pressure used to develop turbine power is only used in the power mismatch circuit of the reactor control system.

Answer B Discussion

CORRECT. See explanation above.

Answer C Discussion

Plausible if the applicant does not recall the C-11 Rod Stop Relay for Control Bank D Rods, therefore rods would withdraw until the all rods out position of 226 steps withdrawn.

Answer D Discussion

Plausible if the applicant does not recall the C-11 Rod Stop Relay for Control Bank D Rods. 103% is an Overpower Rod Stop (C-2) but this power would not be reached before 200 steps is reached.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of various rod stop interlocks (such as inputs and control functions).

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved.
First, the applicant must analyze the conditions in the stem and determine the affect an instrument failure has on the rod control system and then recall from memory the appropriate rod stop that will mitigate the event.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2015 CNS NRC (Bank 6655)

Development References

OP-IRX-DCS (Reactor Control System Lesson Plan)

Student References Provided

SYS001 K4.07 - Control Rod Drive System
Knowledge of CRDS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Rod stops ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "B".
SLG 1/31/19

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS002 K3.02 - Reactor Coolant System (RCS)
Knowledge of the effect that a loss or malfunction of the RCS will have on the following: (CFR: 41.7)
Fuel ....

Given the following on Unit 2:

- The Unit is operating at 30% RTP
- Power ascension in progress
- Turbine controls in MW-IN

Subsequently,

- NCP 2A trips on overcurrent

Assuming no operator action,

1) DNBR will ________.

2) Reactor power will ________.

Which ONE (1) of the following completes the statements above?

A. 1. LOWER
   2. lower and stabilize at a new lower power

B. 1. RISE
   2. lower and stabilize at a new lower power

C. 1. LOWER
   2. initially lower and then return to 40% RTP

D. 1. RISE
   2. initially lower and then return to 40% RTP

General Discussion

The decrease in reactor coolant flow with reactor power, temperature (core delta-T), and pressure remaining the same causes a decrease in DNBR. In this case Actual Heat Flux (AHF) remains the same while the Critical Heat Flux (CHF) (amount of heat required to cause a departure from nucleate boiling) will decrease. Therefore DNBR (CHF/AHF) decreases. Since steam demand has not changed core thermal power (Q=mcdelta-T) must remain the same steady-state to steady-state. However, reactor power initially decreases due to the immediate effect of the loss of flow (mass flow rate decreases) while core delta-T initially has not changed. After the initial decrease in RTP, the colder water returning to the reactor causes an increase in reactor power, core delta-T increases, and core thermal power returns to 40% RTP based on steam demand. The increase in core delta-T results in the water at the core exit being closer to vaporization, and therefore CHF decreases causing an additional decrease in DNBR. The conclusion is that DNBR decreases and reactor power initially decrease and then return to 40% RTP.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicants neglect to consider the long-term effect of the NC pump trip. Reactor power initially decreases due to the decrease in flow. However, power does not stabilize at the new lower power, but returns to 40% thermal power since steam demand has remained constant.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible since the likelihood of an actual departure from nucleate boiling has increased.

Part 2 is plausible if the applicants neglect to consider the long-term effect of the NC pump trip. Reactor power initially decreases due to the decrease in flow. However, power does not stabilize at the new lower power, but returns to 40% thermal power since steam demand has remained constant.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible since the likelihood of an actual departure from nucleate boiling has increased.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the applicant is required to have knowledge of the effect that a loss/malfunction of the RCS (loss of a NC pump) will have on the fuel (DNB/DNBR)

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. The applicant is required to determine the effect a loss of an NCP will have on (1) DNBR (CHF/AHF) and (2) how the changes in mass flow rate and core deltaT will affect core thermal power.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2017 CNS Audit (Bank 7327)

Development References
BNT-TH08 (Thermal Hydraulics) lesson plan

Student References Provided

SYS002 K3.02 - Reactor Coolant System (RCS)

Knowledge of the effect that a loss or malfunction of the RCS will have on the following: (CFR: 41.7)

Fuel ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "C". SLM 11/13/2018

401-9 Comments: SAT

002 K3.02
Im ok with this as long as we dont have too many GFES questions

Facility Response: NONE

ILT 20-1 MNS SRO NRC Examination **QUESTION 31** 31 **A**

SYS011 K2.02 - Pressurizer Level Control System (PZR LCS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
PZR heaters ....

Given the following conditions on Unit 1:

- A Loss of Offsite Power has occurred
- 1ETA and 1ETB are energized from their respective DGs

Based on the conditions above, power can be restored to Pressurizer Heater Group(s) ________.

Which ONE (1) of the following completes the statement above?

A. A and B ONLY

B. C and D ONLY

C. C ONLY

D. D ONLY

General Discussion

Due to the Blackout and the 4160V busses being energized from their respective DGs, Pressurizer heater groups A & B are the only groups that have power available. Groups A & B have safety related power supplies (ELXA & ELXB) and are required by Tech Specs.

The supply breakers on 1MC-5 would have been closed by procedure. However, due to the loss of offsite power, Group D heaters would have no power available. Group D has non-safety power supply (6 Banks from LXG, 1 Bank from SMXG at the SSF).

C Heater Group has variable power control. The capacity of the C Heaters totals 484 KW. There are two power sources available for the C Heaters, LXF (normal) and LXC (Alt.). The supply breakers on 1MC-10 would have been closed by procedure.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because Group C heaters are use by the Pressurizer Pressure Master for variable control of Pzr pressure, so the applicant may conclude that C heaters receive emergency power from the D/G's to allow for NCS pressure control. Also, by procedure the heater supply breaker on 1MC-10 is closed which makes it plausible for the applicant to conclude that power is also available to Group C.
Plausible because a portion of group D heaters are powered from the SSF and the applicant could conclude that in a LOOP condition D heaters would be powered by the SSF D/G. Also, by procedure the heater breaker on 1MC-5 is closed which makes it plausible for the applicant to conclude that power is also available to Group D.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because Group C heaters are used by the Pressurizer Pressure Master for variable control of Pzr pressure, so the applicant may conclude that C heaters receive emergency power from the D/G's to allow for NCS pressure control. Also, by procedure the heater supply breaker on 1MC-10 is closed which makes it plausible for the applicant to conclude that power is also available to Group C.

Answer D Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Plausible because a portion of group D heaters are powered from the SSF and the applicant could conclude that in a LOOP condition D heaters would be powered by the SSF D/G. Also, by procedure the heater breaker on 1MC-5 is closed which makes it plausible for the applicant to conclude that power is also available to Group D.

Basis for meeting the KA

The K/A is matched because it requires the applicant to know the power supplies to the pressurizer heaters as well as the conditions under which power may or may not be available.

Basis for Hi Cog

This question is higher cognitive because it requires more than one mental step. The applicant must first recall from memory the power supply to all of the Pressurizer heaters and then analyze the given conditions to determine which heaters have power.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2015 MNS NRC Q31 (Bank 5940)

Development References

REFERENCES:
Lesson Plan OP-MC-PS-IPE-DCS Section 2.4 and 2.5

Student References Provided

SYS011 K2.02 - Pressurizer Level Control System (PZR LCS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
PZR heaters ....

Remarks/Status
Rearranged answers from original bank question, correct answer is now "A". SLG 2/21/19

SYS015 2.4.1 - Nuclear Instrumentation System (NIS)

SYS015 GENERIC

Knowledge of EOP entry conditions and immediate action steps. (CFR: 41.10 / 43.5 / 45.13)

In accordance with E-0 (Reactor Trip or Safety Injection):

1) Below P-10, a reactor trip signal will be generated if 1/2 Intermediate Range NIs increase to a MINIMUM power of ________.

2) One indication that is used in the immediate actions to verify that the reactor is tripped is ________.

Which ONE (1) of the following completes the statements above?

A. 1. 25%
   2. IR Power - GOING DOWN

B. 1. 25%
   2. IR SUR - NEGATIVE

C. 1. 20%
   2. IR Power - GOING DOWN

D. 1. 20%
   2. IR SUR - NEGATIVE

General Discussion

In accordance with E-0, the following are symptoms that require a reactor trip, if one has not occurred:
1/2 I/R channels - 25% Power (below P10)

In accordance with the immediate actions of E-0 (Reactor Trip or Safety Injection), one of the indications used to verify that a Reactor trip has occurred is "IR POWER - GOING DOWN".

Negative IR SUR is used in FR-S.1 to indicate the reactor is tripped, but is not used in E-0. Although IR power going down and IR SUR negative basically indicate the same outcome, the question specifically asks IAW E-0.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because this is an action that is performed later in the EOPs (FR-S.1)to determine if the Reactor is subcritical.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the Intermediate Range NIs do input to Rod Stop (C-1) with a setpoint of 20%. .

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the Intermediate Range Nis do input to Rod Stop (C-1) with a setpoint of 20%. .

Part 2 is plausible because this is an action that is performed later in the EOPs (FR-S.1)to determine if the Reactor is subcritical.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of NI parameters that are entry conditions to E-0 and the sub steps/indications for verifying the immediate actions.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2013 MNS Audit Q39 (Bank 5731)

Development References

E-0 (Reactor Trip or Safety Injection), Rev 29
FR-S.1 (Response to Nuclear Power Generation / ATWS) Rev 13
IC-IPE, Reactor Protection System Lesson Plan, Rev 35

Learning Objectives:
IC-IPE, Objective 10

Student References Provided

SYS015 2.4.1 - Nuclear Instrumentation System (NIS)
SYS015 GENERIC
Knowledge of EOP entry conditions and immediate action steps. (CFR: 41.10 / 43.5 / 45.13)

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Remarks/Status

SYS016 K1.08 - Non-Nuclear Instrumentation System (NNIS)

Knowledge of the physical connections and/or cause-effect relationships between the NNIS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

PZR PCS ....

Given the following on Unit 1:

- Unit is at 100% RTP
- Pzr pressure channels indicate as follows:

Channel I	2239 PSIG
Channel II	2226 PSIG
Channel III	2235 PSIG
Channel IV	2230 PSIG

Subsequently,

- Channel I experiences a loss of power

1) Prior to the Channel I failure, SELECTED Pzr pressure value was ________ PSIG.

2) After the Channel I failure, SELECTED Pzr pressure value is ________ PSIG.

Which ONE (1) of the following completes the statements above?

REFERENCE PROVIDED

A. 1. 2235
   2. 2230.5

B. 1. 2235
   2. 2232.5

C. 1. 2230
   2. 2230.5

D. 1. 2230
   2. 2232.5

General Discussion

Where 4 Inputs are used, a process termed "Median Select 2nd Highest" is used.
Using the 4 inputs, there are four (4) combinations of the input signals, processed using the "MEDIAN SELECT" Algorithms.
The output of each Median Select Algorithm inputs into a "HIGH SELECT" Algorithm, which selects the Highest of the 4 Median select Inputs, in turn providing an output of the 2nd Highest of the original input signals for control.
If one of the three inputs fail, the Median Select algorithm will average the remaining two inputs and use the average as the output value. Each input signal is used in three (3) Median Select algorithms, therefore the output signal from three (3) of the Median Select algorithms will have an average value as the output signal.
With no failure, the second highest transmitter value is used as the master controller input. Of the four values given, 2235 psig is the second highest, with 2239 psig (Channel I) the highest value.
When channel one fails, the median select algorithm becomes an averaging circuit for three of the median select calculations and one will remain as a true median select. The outputs to the high select circuit will then become 2230.5 psig, 2228 psig, 2230 psig and 2232.5 psig , thus the output to the master controller would be 2232.5 psig.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because this is the second highest input into the "High Select" circuit. With no instrument failure the second highest transmitter output is the output of the "High Select" circuit.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant reverses the median selected value as not the second highest of available channel values, but as the second lowest of available channel values. In this case 2230 psig (Channel IV) would be correct.

Part 2 is plausible because this is the second highest input into the "High Select" circuit. With no instrument failure the second highest transmitter output is the output of the "High Select" circuit.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant reverses the median selected value as not the second highest of available channel values, but as the second lowest of available channel values. In this case 2230 psig (Channel IV) would be correct.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the applicant is required to have knowledge of the cause-effect relationship between Pzr pressure channels and the Pzr pressure master input.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. First the applicant is required to recall from memory how to determine the Selected Pzr pressure value with no failures and then calculate the input into the master controller after a Pzr pressure channel failure.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2017 CNS Audit (Bank 7333)

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Development References
IC-DCS, Distributed Control System, lesson plan, Rev. 03

Student References Provided
Pressurizer Pressure Block Diagram

SYS016 K1.08 - Non-Nuclear Instrumentation System (NNIS)

Knowledge of the physical connections and/or cause-effect relationships between the NNIS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

PZR PCS ....

Remarks/Status
Rearranged answers from original bank question, correct answer is now "B". SLM 11/14/2018

SYS033 A3.01 - Spent Fuel Pool Cooling System (SFPCS)
Ability to monitor automatic operation of the Spent Fuel Pool Cooling System including: (CFR: 41.7 / 45.5)
Temperature control valves ....

Given the following on Unit 1:

- Unit is at 100% RTP
- "A" Train KC is in service
- 1A KF Pump is in service

Subsequently:

- 1KC-50A (Aux Bldg Non-Ess Hdr Isol) has spuriously CLOSED

1) In accordance with OP/1/A/6200/005 (SPENT FUEL COOLING SYSTEM) Limits and Precautions, the spent fuel pool must be maintained less than a MAXIMUM of ________.

2) 1KC-149 (A KF Hx Outlet Flow) ________ AUTOMATICALLY reposition in order to attempt to maintain Spent Fuel Pool temperature.

Which ONE of the following completes the statements above?

A. 1. 90°F
2. will

B. 1. 90°F
2. will NOT

C. 1. 140°F
2. will

D. 1. 140°F
2. will NOT

General Discussion

The temperature of the Spent Fuel Pool is maintained by control of CCW flow through the KF heat exchangers. This flow is adjusted via a manual loader located on the Main Control Boards (KC-149A and KC-156B). There is no automatic function of this valve.

Per the KF OP:
Maximum Spent Fuel Pool Temperature is 140F.

There is a note in the OP stating it is desired to maintain Spent Fuel Pool temperature less than 90°F to help minimize unit vent airborne tritium releases due to Spent Fuel Pool evaporation.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 90 degrees is a desired temperature for tritium concerns.

Part 2 is plausible because KC cooling to various other heat exchangers do have a feedback loop and are controlled automatically (i.e.. Letdown Hx).

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 90 degrees is a desired temperature for tritium concerns.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because KC cooling to various other heat exchangers do have a feedback loop and are controlled automatically (i.e.. Letdown Hx).

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

MNS has NO automatic temperature control for the KF system.
The K/A is matched because the applicant is required to demonstrate the ability to monitor operation of SFP cooling through knowledge of the method of operation of the associated controls and knowledge of SFP temperature limits.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2017 CNS NRC (Bank 7157)

Development References

FH-KF (Spent Fuel Pool Cooling System) LP, Rev. 37
OP/1/A/6200/005 (Spent Fuel Cooling System), Rev. 100

Student References Provided

SYS033 A3.01 - Spent Fuel Pool Cooling System (SFPCS)
Ability to monitor automatic operation of the Spent Fuel Pool Cooling System including: (CFR: 41.7 / 45.5)
Temperature control valves ....

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Remarks/Status

401-9 Comments: ENHANCEMENT

033 A3.01
I'm ok with the auto/manual match with the K/A. I do question the wording on the second question. Should it state that the valve will auto reposition in order to attempt to maintain temperature?

Facility Response:
Made changes to Q2 as suggested by CE.
SLM 09/16/19

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SYS034 K6.02 - Fuel Handling Equipment System (FHES)
Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System : (CFR: 41.7 / 45.7)
Radiation monitoring systems ....

Given the following on Unit 2:

- The unit is at 100% RTP
- The VF (Fuel Handling Building Ventilation) system is in its normal alignment for current plant conditions

Subsequently:

- A loss of power to 2EMF-42 (Fuel Building Ventilation Radiation Monitor) occurs

Based on the conditions above,

1) The Exhaust Filter Bypass Damper (D-5) ________ close.

2) The Supply and Exhaust Fans ________ stop.

Which ONE (1) of the following completes the statements above:

A. 1. will NOT
2. will NOT

B. 1. will
2. will

C. 1. will NOT
2. will

D. 1. will
2. will NOT

General Discussion

At MNS, the Radiation Monitoring System does not have a direct effect on any Fuel Handling System Equipment (unlike other plants). The only equipment associated with fuel handling that is effected by the Radiation Monitoring system is the Fuel Handling Building Ventilation system. Since the Fuel Handling Building Ventilation system must be in service during fuel movement in the Spent Fuel Pool (and since fuel movement must be stopped if it is unavailable), MNS has in the past, tested knowledge of the effects of the Radiation Monitoring System on the Fuel Handling Building Ventilation (VF) system to meet this specific KA and several other Kas related to Fuel Handling Equipment.

In accordance with the VF lesson plan, Normal system operation will bypass the Filter Train Unit and direct exhaust flow, via both Fuel Pool Exhaust Fans, to the Unit Vent.

In accordance with the WE-EMF lesson plan, on a loss of power to any RP-86A module (EMF-42 uses an RP-86A module) a Trip 1 and Trip 2 alarm will occur.

On a Trip 2 alarm EMF-42 intiates an automatic closure of the VF system filter bypass damper (D-5) placing the filters in service.

Answer A Discussion

NCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the candidate does not recall that a loss of power will cause the EMF Trip 2 actions to occur (Fail Safe).

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the candidate believes the fans will be secured to stop a release to the environment.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1and 2 are plausible together if the candidate believes that the correct actions for a loss of power to the EMF and subsequent Trip actions are securing fans to ensure no release to the environment.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because a failure of the VF system process monitor has occurred and the applicant must determine the effect this will have on the fuel handling system.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2014 MNS NRC Q33 (Bank 5861)

Development References
Lesson Plan OP-MC-WE-EMF

Student References Provided

SYS034 K6.02 - Fuel Handling Equipment System (FHES)
Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System : (CFR: 41.7 / 45.7)
Radiation monitoring systems ....

FOR REVIEW ONLY - DO NOT DISTRIBUTE

Remarks/Status

SYS071 A1.06 - Waste Gas Disposal System (WGDS)
Ability to predict and/or monitor changes in parameters(to prevent exceeding design limits) associated with Waste Gas Disposal System operating the controls including: (CFR: 41.5 / 45.5)
Ventilation system ....

Given the following on Unit 1:

- Unit is at 100% RTP
- A minimally decayed Waste Gas Decay Tank is being released

Subsequently,

- A significant packing leak starts on isolation valve 1WG-160 (WG DECAY TANK OUTLET TO UNIT VENT CONTROL)
- 1EMF-37 (UNIT VENT IODINE) Trip 2 alarms

Based on the conditions above,

1) Unit(s) ________ Aux Bldg Ventilation unfiltered exhaust fans will be secured.

2) If a Trip 2 occurs on ________, Aux Bldg Ventilation filters will be placed in service.

Which ONE (1) of the following completes the statements above?

LEGEND:

1EMF-35 (UNIT VENT PART HI RAD)
1EMF-41 (AUX BLDG VENT HI RAD)

A. 1. 1 ONLY
2. 1EMF-41

B. 1. 1 AND 2
2. 1EMF-41

C. 1. 1 ONLY
2. 1EMF-35

D. 1. 1 AND 2
2. 1EMF-35

General Discussion

The release of radioactive gas into the Auxiliary Building will be picked up by the Auxiliary Building Ventilation System which discharges to the unit 1 unit vent.

A Trip 2 high radiation alarm on 1EMF 35 (L), 1EMF 37, 2EMF 35 (L), or 2EMF 37 will stop Auxiliary Building Unfiltered Exhaust Fans 1ABUXF-1A, 1ABUXF-1B, 2ABUXF-1A, and 2ABUXF-2B.

The Auxiliary Building Ventilation Monitor (EMF 41) should also alarm which will place the Auxiliary Building Ventilation Filter system in service.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because most compensatory actions for EMF actuations are Unit or train specific (EMFs, 38, 39, 40, 42 etc.).

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because most compensatory actions for EMF actuations are Unit or train specific (EMFs, 38, 39, 40, 42 etc.).

Part 2 is plausible because EMF-35 does have compensatory actions that affect the VA system upon a Trip 2 condition. Also plausible because the annunciator response for EMF-35 requires placing the VA filter to "test" mode which will place the VA filter in service.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because EMF-35 does have compensatory actions that affect the VA system upon a Trip 2 condition. Also plausible because the annunciator response for EMF-35 requires placing the VA filter to "test" mode which will place the VA filter in service.

Basis for meeting the KA

The K/A is matched because the applicant is required to predict changes in the aux building ventilation system, due to a leak from waste gas, that prevent exceeding design limits of 10CFR-20 , 50 and 100.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. First, the applicant is required to evaluate the affect of a trip 2 condition on both units aux bldg. ventilation alignment and then recall from memory which EMF comp action is to place the aux bldg. ventilation filters in service.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2014 MNS NRC Q62 (Bank 3043)

Development References

WE-EMF, Radiation Monitoring lesson plan Rev 41

Learning Objectives:
WE-EMF, Objective 3

Student References Provided

SYS071 A1.06 - Waste Gas Disposal System (WGDS)
Ability to predict and/or monitor changes in parameters(to prevent exceeding design limits) associated with Waste Gas Disposal System

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operating the controls including: (CFR: 41.5 / 45.5)
Ventilation system ....

Remarks/Status

SYS072 K5.01 - Area Radiation Monitoring (ARM) System

Knowledge of the operational implications of the following concepts as they apply to the ARM system: (CFR: 41.5 / 45.7)

Radiation theory, including sources, types, units, and effects ....

Given the following on Unit 1:

- A Unit startup is being performed
- The "HI Flux At Shutdown" switch for N31 ONLY has been placed in "BLOCK"

1) Based on the conditions above, if a Trip 2 is received on 1EMF-16 (Cont Refueling Bridge), the containment evacuation alarm ________ activate.

2) 1EMF-16 uses a ________ detector.

Which ONE (1) of the following completes the statements above:

A. 1. will NOT
   2. Ionization Chamber

B. 1. will NOT
   2. Geiger Mueller

C. 1. will
   2. Ionization Chamber

D. 1. will
   2. Geiger Mueller

General Discussion

From the EMF lesson plan: No control actions are performed by these channels with the exception of 1EMF-16 and 2EMF-3 (Containment Refueling Bridge). On a Trip 2 High Radiation Alarm, the respective EMF (1EMF-16 and 2EMF-3) will actuate the Containment Evacuation alarm. This alarm is blocked when both Source Range high flux trips are blocked.

These channels use a Geiger-Mueller detector.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the candidate recalls that when a single switch is placed in "BLOCK" it will cause 1AD-D2 annunciator for S/R HI FLUX ALM BLOCKED. This annunciator lets the operator know that a switch is out of position but it still requires both switches to be in "BLOCK" for the containment evacuation alarm to no longer activate.

Part 2 is plausible because another Containment EMF (EMF-51) is an Ionization Chamber detector.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the candidate recalls that when a single switch is placed in "BLOCK" it will cause 1AD-D2 annunciator for S/R HI FLUX ALM BLOCKED. This annunciator lets the operator know that a switch is out of position but it still requires both switches to be in "BLOCK" for the containment evacuation alarm to no longer activate.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because another Containment EMF (EMF-51) is an Ionization Chamber detector.

Answer D Discussion

CORRECT: See explanation above

Basis for meeting the KA

The K/A is matched because the applicant is required to recall the type of detector used by 1EMF-16.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. First, the applicant is required to evaluate the affect of having one SR instrument in block has on the containment evacuation alarm and then recall from memory what type of detector is used in EMF-16

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

Lesson Plan WE-EMF
OP/A/6100/010 C Annunciator Response for 1AD-2

Student References Provided

SYS072 K5.01 - Area Radiation Monitoring (ARM) System
Knowledge of the operational implications of the following concepts as they apply to the ARM system: (CFR: 41.5 / 45.7)
Radiation theory, including sources, types, units, and effects ....

Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS086 A4.03 - Fire Protection System (FPS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
Fire alarm switch ....

Given the following:

- A Zone 5 alarm has occurred on the Fire Detection System Processing Control Center (EFAPCC) for the 2A NC Pump

Based on the conditions above,

1) An annunciator for Fire Detection System Alert will be received on ________ AD-13.

2) After the annunciator on AD-13 is acknowledged, depressing the "RESET" pushbutton on the EFAPCC panel ________ required to allow subsequent fire alarms to be annunciated.

Which ONE (1) of the following completes the statements above?

A. 1. Unit 1
2. is

B. 1. Unit 1
2. is NOT

C. 1. Unit 2
2. is

D. 1. Unit 2
2. is NOT

General Discussion

The Fire Detection System Alert annunciator is located ONLY on the Unit #1 side of the Control Room on panel 1AD13, E-3.

There is a reset for this annunciator located on the front of the EFAPCC cabinet. Depressing this pushbutton ensures that subsequent EFA alarms will be received at the control room annunciator panel.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is correct.

Part 2 is plausible because acknowledging the annunciator alarm is the only action required to allow subsequent alarms for most of the annunciators on the boards.

Answer C Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is plausible because the vast majority of annunciators are Unit specific, therefore the applicant may conclude an alarm for 2A NCP would be received on Unit 2.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is plausible because the vast majority of annunciators are Unit specific, therefore the applicant may conclude an alarm for 2A NCP would be received on Unit 2.

Part 2 is plausible because acknowledging the annunciator alarm is the only action required to allow subsequent alarms for most of the annunciators on the boards.

Basis for meeting the KA

MNS does not have a "Fire alarm switch" but we do have annunciators to alert the operators of issues detected by the Fire protection system. Therefore, the K/A is matched because the applicant demonstrates the ability to monitor (recognize the location of the alarm) and operate (clear the signal at the EFAPCC) Fire Protection system components in the control room.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

Student References Provided

SYS086 A4.03 - Fire Protection System (FPS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
Fire alarm switch ....

Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

EPE007 EK1.05 - Reactor Trip
Knowledge of the operational implications of the following concepts as they apply to the reactor trip: (CFR 41.8 / 41.10 / 45.3)
Decay power as a function of time ....

Given the following sequence of events on Unit 1:

- 0210 reactor tripped due to a LOCA
- 0300 crew enters ECA-1.1, (LOSS OF EMERGENCY COOLANT RECIRC)

Current conditions at time 0320:

- The crew is at step 17.b of ECA-1.1
- 1A NI pump is running, indicating 180 GPM
- 1B NI pump is running, indicating 160 GPM
- Both NV pumps are running, indicating 350 GPM (Consider that the NV pumps have equal capacity)
- Subcooling is +35°F

Based on the conditions above, at time 0320:

1) the MINIMUM flow from the ECCS pumps which will match the decay heat removal requirements of ECA-1.1 is ________.

AND

2) to meet the ECCS requirements of ECA-1.1, the crew will ________.

Which ONE (1) of the following completes the statements above?

REFERENCE PROVIDED

A. 1. 350 GPM
2. stop both NI pumps

B. 1. 350 GPM
2. stop the 1B NI pump AND one NV pump

C. 1. 335 GPM
2. stop both NV pumps

D. 1. 335 GPM
2. stop the 1A NI pump AND one NV pump

General Discussion

Time after trip is 70 minutes, which makes the required flow 350 GPM.

Since the minimum flow required is 350 GPM per Enclosure 9 of ECA-1.1 and Step 17.b RNO requires the crew to minimize S/I flow by stopping pumps while maintaining flow greater than or equal to that required by Enclosure 9 for decay heat removal, the correct action is to stop both NI pumps. Which leaves two NV pumps running providing the minimum required 350 GPM.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible in that stopping the 1B NI pump and one NV pump would still meet the flow requirements of Enclosure 9 (350 GPM required, 355 GPM provided) .

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this would be the determined flow if the applicant overlooks the fact that the graph starts at 10 minutes (i.e. uses the 80 minute vs. 70 minute line due to incorrect interpretation).

Part 2 is plausible because stopping both NV pumps would minimize S/I flow (340 GPM) and still meet the 335 GPM minimum flow that they determined in Part 1.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this would be the determined flow if the applicant overlooks the fact that the graph starts at 10 minutes (i.e. uses the 80 minute vs. 70 minute line due to incorrect interpretation).

Part 2 is plausible because stopping the 1A NI pump and one of the NV pumps would meet the 335 GPM and would be correct for the minimum flow that they determined in Part 1.

Basis for meeting the KA

The K/A is matched because the applicant must determine injection flow (operational implication) as it relates to decay power as a function of time following a reactor trip. Additionally, the applicant must demonstrate knowledge of the concept of minimizing flow to only that required (in the condition given).

Basis for Hi Cog

This is an analysis question as the applicant must interpret the graph from Enclosure 9 and then determine the correct combination of pumps based on maintaining the minimum required flow while minimizing S/I flow.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2016 MNS NRC Q39 (Bank 7538)

Development References

ECA-1.1 Rev 17, Step 17 and Encl 9 - PROVIDED

LEARNING OBJECTIVES:
EP-EP2 Objective 29

Student References Provided

ECA-1.1 (Step 17)
ECA-1.1 (Enclosure 9)

EPE007 EK1.05 - Reactor Trip

Knowledge of the operational implications of the following concepts as they apply to the reactor trip: (CFR 41.8 / 41.10 / 45.3)

Decay power as a function of time ....

Remarks/Status

APE008 2.2.42 - Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open)
APE008 GENERIC
Ability to recognize system parameters that are entry-level conditions for Technical Specifications. (CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3)

Given the following on Unit 1

- Unit is at 95% RTP
- A pressure transient has resulted in an NC system pressure increase
- 1NC-34A (PZR PORV) opened but did NOT re-close
- 1NC-34A is manually isolated using 1NC-33A (PZR PORV Isol)
- 1NC-34A is NOT capable of being manually cycled

Based on the conditions above and in accordance with TS 3.4.11 (PZR PORVs),

1) Power to 1NC-33A (PZR PORV Isol) ________ required to be removed.

2) Pzr PORVs are required to be OPERABLE in Modes ________.

Which ONE (1) of the following completes the statements above?

A. 1. is
2. 1, 2 and 3 ONLY

B. 1. is
2. 1, 2 ,3 and 4 with all RCS cold leg temperatures 300°F

C. 1. is NOT
2. 1, 2 and 3 ONLY

D. 1. is NOT
2. 1, 2 ,3 and 4 with all RCS cold leg temperatures 300°F

General Discussion

Per TS 3.4.11, with one or more PORVs inoperable and not capable of being manually cycled, the required action is to close and remove power from the associated block valve.

TS 3.4.11 is applicable in Modes 1,2 and 3

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct

Part 2 is plausible because these are the modes of applicability for the Pzr safety valves (TS 3.4.10)

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because maitaining power on the block valve is the required action if one or two PORVs are inoperable and capable of being manually cycled.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because maitaining power on the block valve is the required action if one or two PORVs are inoperable and capable of being manually cycled.

Part 2 is plausible because these are the modes of applicability for the Pzr safety valves (TS 3.4.10)

Basis for meeting the KA

The K/A is matched because the applicants are required to recognize the TS implications (entry conditions) of a stuck open Pzr PORV.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. First the applicants are required to analyze the conditions in the stem to determine the correct TS required actions and then recall from memory the modes of applicability.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

TS 3.4.11 (PZR PORVs)
TS 3.4.10 (PZR Safeties)

Student References Provided

APE008 2.2.42 - Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open)
APE008 GENERIC
Ability to recognize system parameters that are entry-level conditions for Technical Specifications. (CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3)

Remarks/Status

ILT 20-1 MNS SRO NRC Examination **QUESTION 41** 41 **C**

EPE009 EA1.10 - Small Break LOCA
Ability to operate and monitor the following as they apply to a small break LOCA: (CFR 41.7 / 45.5 / 45.6)
Safety parameter display system ....

Given the following on Unit 2:

- A SBLOCA has occurred

As a result of equipment malfunctions, the following conditions are observed:

- Containment pressure is 1.5 PSIG and lowering
- NC system subcooling is **(-)** 5°F
- All NC pumps have been secured
- CETs indicate 710°F and rising
- Reactor Vessel LR Level is 45% and slowly lowering.

Based on the conditions above, the Core Cooling CSF status tree is currently ___(1)___ , and continuous monitoring of the CSF status trees ___(2)___ required.

Which ONE (1) of the following completes the statement above?

A. 1. YELLOW
2. is

B. 1. YELLOW
2. is NOT

C. 1. ORANGE
2. is

D. 1. ORANGE
2. is NOT

General Discussion

The Core Cooling Status Tree is currently in an Orange Path condition (RVLIS greater than 39% but, Core Exit T/Cs are greater than 700 degrees F).

Once status tree monitoring is initiated, monitor status trees continuously if an orange or red condition is found to exist. IF no condition more serious than yellow is found, monitoring frequency may be reduced to 10-15 minutes.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because Reactor Vessel LR level is greater than 39%, which is the setpoint used for a Yellow path.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because Reactor Vessel LR level is greater than 39%, which is the setpoint used for a Yellow path.

Part 2 is plausible because if a valid yellow path exists when CSF status tree monitoring is initiated, monitoring every 10-15 minutes is required (applicant may conclude a yellow path exists or that continous monitoring is only required for a red path).

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because if a valid yellow path exists when CSF status tree monitoring is initiated, monitoring every 10-15 minutes is required (applicant may conclude a yellow path exists or that continous monitoring is only required for a red path).

Basis for meeting the KA

The K/A is matched because demonstrating the ability to monitor SPDS, during a SBLOCA, is achieved by determining the current status of the core cooling status tree using plant indications.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to evaluate and apply all the conditions in the stem to determine the current status of the Core Cooling CSF status tree.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2017 CNS Audit (BANK 7357)

Development References

EP-F-0, (Critical Safety Function Status Trees), Rev 7
OMP 4-3, Rev 47

Student References Provided

EPE009 EA1.10 - Small Break LOCA
Ability to operate and monitor the following as they apply to a small break LOCA: (CFR 41.7 / 45.5 / 45.6)
Safety parameter display system ....

Remarks/Status

EPE011 EK3.15 - Large Break LOCA

Knowledge of the reasons for the following responses as the apply to the Large Break LOCA: (CFR 41.5 / 41.10 / 45.6 / 45.13)

Criteria for shifting to recirculation mode ....

Regarding ES-1.4 (HOT LEG RECIRCULATION),

Transition to ES-1.4 should be made ___(1)___ hours after event initiation in order to ___(2)___.

Which ONE (1) of the following completes the statement above?

A. 1. 6
   2. terminate core boiling AND prevent boron precipitation

B. 1. 6
   2. terminate core boiling ONLY

C. 1. 4
   2. terminate core boiling AND prevent boron precipitation

D. 1. 4
   2. terminate core boiling ONLY

General Discussion

The primary entry into ES-1.4 is from E-1, when 6 hours after event initiation has elapsed. Additionally, the purpose of Hot Leg Recirculation is to terminate boiling in the core and to prevent boron precipitation in the core.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible terminating core boiling is a reason for transferring to Hot Leg recirc but it is NOT the ONLY reason.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because four hours after event initiation is when E-1 directs to align valve power supplies for HLR.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because four hours after event initiation is when E-1 directs to align valve power supplies for HLR.

Part 2 is plausible because terminating core boiling is a reason for transferring to Hot Leg recirc but it is NOT the ONLY reason.

Basis for meeting the KA

The K/A is matched because the applicant must demonstrate knowledge of the reasons for aligning to Hot Leg recirculation (terminate boil off and boron concentration/plate out in the core), as it applies to the Large Break LOCA.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2009 MNS Audit Q46 (Bank 3164)

Development References

EP-E1 (Loss of Reactor or Secondary Coolant) Lesson Plan (Bckgd Doc), Rev 31

E-1 (Loss of Reactor or Secondary Coolant), Rev 18

Student References Provided

EPE011 EK3.15 - Large Break LOCA

Knowledge of the reasons for the following responses as the apply to the Large Break LOCA: (CFR 41.5 / 41.10 / 45.6 / 45.13)

Criteria for shifting to recirculation mode ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "A". SLM 11/19/2018

APE015/017 AK3.02 - Reactor Coolant Pump (RCP) Malfunctions

Knowledge of the reasons for the following responses as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow) : (CFR 41.5,41.10 / 45.6 / 45.13)

CCW lineup and flow paths to RCP oil coolers ....

Given the following on Unit 1

- 1KC-338B (NC Pump Sup Hdr Cont Outside Isol) has failed CLOSED and will NOT OPEN using pushbutton on 1MC-11

In accordance with annunciator response procedures, entry into ___(1)___ is required due to NC pump ___(2)___ temperatures going up.

Which ONE (1) of the following completes the statement above?

PROCEDURE LEGEND:

AP-08, (MAFUNCTION OF NC PUMP)
AP-21, (LOSS OF KC OR KC SYSTEM LEAKAGE)

A. 1. AP-08
 2. Motor Stator Winding

B. 1. AP-08
 2. Motor Bearing

C. 1. AP-21
 2. Motor Stator Winding

D. 1. AP-21
 2. Motor Bearing

General Discussion

KC-338B is the KC supply for the NC Pumps motor bearing coolers. If this valve closes then motor bearing temperatures on the NC pumps will rise. The annunciator response for the four NC Pump Lower Mtr Brg LO KC Flows has the operator check the position of the KC supply and return valves and enter AP-08 if KC flow cannot be corrected and low flow still exists.
AP-21 would be appropriate for a total loss of KC flow or leak but not just to the NC pumps.
KC cools the motor bearings and RN supplies the air coolers after the stator windings.

Answer A Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is correct.

Part 2 is plausible if the applicant believes that KC helps cool the stator windings and that RN cools the motor bearings.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is plausible if the applicant concludes that this valve constitutes a loss of KC. AP-21 actions help swap KC trains, surge tank level, and leaks. It is time critical in AP-21 to restore KC cooling to the NC pumps.

Part 2 is plausible if the applicant believes that KC helps cool the stator windings and that RN cools the motor bearings.

Answer D Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is plausible if the applicant concludes that this valve constitutes a loss of KC. AP-21 actions help swap KC trains, surge tank level, and leaks. It is time critical in AP-21 to restore KC cooling to the NC pumps.

Part 2 is correct.

Basis for meeting the KA

The component cooling alignment for the NCPs during operation would not change due to a malfunction of the NCP (Loss of NC Flow). Therefore, the K/A is matched by introducing a loss of component cooling to the NCPs and requiring the applicants to have knowledge of the correct response (procedure entry) and the reason that response was required to prevent a loss of the NCP.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. First, the applicant must evaluate the affect a specific valve failure will have on NCP components and then recall from memory which procedure will mitigate this event.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

Lesson Plan OP-MC-PS-NCP
AP-21 Background Document
OP/1/A/6100/010G, Annunciator Response for 1AD-6 B1

Student References Provided

APE015/017 AK3.02 - Reactor Coolant Pump (RCP) Malfunctions

Knowledge of the reasons for the following responses as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow) : (CFR 41.5,41.10 / 45.6 / 45.13)

CCW lineup and flow paths to RCP oil coolers ....

Remarks/Status

APE022 AA2.03 - Loss of Reactor Coolant Makeup

Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup: (CFR 43.5/ 45.13)

Failures of flow control valve or controller . . . .

Given the following on Unit 1:

- Unit is at 100% RTP
- A VCT automatic make-up is in progress

Subsequently the following occurs:

- 1AD-7/D3, (VCT ABNORMAL LVL) is lit
- 1NV-221A and 1NV-222B (Unit 1 NV Pump Suction From FWST Isol) are OPEN
- 1NV-141A and 1NV-142B (Unit 1 VCT Outlet Isol) are CLOSING

Based on the above conditions:

1) VCT level is currently NO GREATER THAN ________.

2) The cause of the VCT low level condition is a failure of ________.

Which ONE (1) of the following completes the statements above?

LEGEND:

- **1NV-137A (NC Filters Otlt 3-Way Cntl)**
- **1NV-171A (BA Blender to VCT Inlet)**

A. 1. 4%
2. 1NV-137A

B. 1. 16%
2. 1NV-171A

C. 1. 4%
2. 1NV-171A

D. 1. 16%
2. 1NV-137A

General Discussion

A preset low level signal (41%) from Selected VCT Level 1 causes the automatic
makeup control process to start a selected Reactor Makeup Water Pump (RMWP) and
start a Boric Acid Transfer Pump (BATP). At the same time as this is occurring, the
makeup stop valve NV-175A, BA Flow Control valve NV-267A, and Rx M/U Water Flow
Control valve NV-252A will start to open. 1NV-171A is not used for auto makeup but is used for dilutions.

1AD7 D3 setpoint is 16%.

At 4% VCT Level :

1NV-221A (Unit 1 NV Pump Suction From FWST Isol) opens
1NV-222B (Unit 1 NV Pump Suction From FWST Isol) opens
1NV-141A (Unit 1 VCT Outlet Isol) closes
1NV-142B (Unit 1 VCT Outlet Isol) closes

Because an auto make-up is being peformed 1NV-137 failing to the RHT position instead of the Normal VCT position is the most likely failure.
1NV-171A is on the inlet to the VCT but would not be in use for this line-up.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is plausible because 16% is the alarm setpoint for VCT abnormal low level.

Part 2 is plausible if the applicant believes that 1NV-171A is used for make-up. 1NV-171A is used for dilutions but not auto make-up. 1NV-175A is used for auto make-up.

Answer C Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is correct.

Part 2 is plausible if the applicant believes that 1NV-171A is used for make-up. 1NV-171A is used for dilutions but not auto make-up. 1NV-175A is used for auto make-up.

Answer D Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is plausible because 16% is the alarm setpoint for VCT abnormal low level.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the applicant has to recognize the failure of Reactor Coolant Makeup valve 1NV-137A and the effect that the loss of make-up will have on the system.

Basis for Hi Cog

The question is higher cog because the applicant has to determine the valves that would be used for auto make-up and relate it to the flow path for analyzing failures that could impact the system.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References	Student References Provided
Lesson Plan OP-MC-PS-NV, Chemical and Volume Control OP/1/A/6100/010 H, ARP 1AD-7 D3, VCT Abnormal Lvl	

APE022 AA2.03 - Loss of Reactor Coolant Makeup

Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup: (CFR 43.5/ 45.13)

Failures of flow control valve or controller . . . .

Remarks/Status

APE025 2.4.20 - Loss of Residual Heat Removal System (RHRS)
APE025 GENERIC
Knowledge of the operational implications of EOP warnings, cautions, and notes. (CFR: 41.10 / 43.5 / 45.13)

Given the following on Unit 1:

- The Unit is in Mode 6
- AP/1/A/5500/019 (LOSS OF RESIDUAL HEAT REMOVAL SYSTEM) has been implemented due to lowering NC system level
- The CRS has decided to makeup to the NC system using gravity feed through 1ND-35 (U1 ND TO FWST ISOL) and 1NI-173A (1A ND TO A & B COLD LEGS ISOL)

In accordance with AP-19,

1) Flow to the NC system will be established by throttling 1ND-35 ________.

2) ND pump operation is not allowed with 1ND-35 OPEN because ________ will occur.

Which ONE (1) of the following completes the statements above?

A. 1. locally
2. a loss of NC system inventory outside containment

B. 1. locally
2. ND pump runout conditions

C. 1. from the Control Room
2. a loss of NC system inventory outside containment

D. 1. from the Control Room
2. ND pump runout conditions

General Discussion

AP-19 Enclosure 8 states, have dispatched operator throttle open ND-35 to the necessary makeup flow. ND-35 cannot be operated from the control room.

This enclosure ensures the ND pumps are off, consistent with the caution in Enclosure 8. If ND pumps were allowed to run with ND-35 open, a loss of NC inventory outside containment (to the FWST) could occur.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because having 1ND-35 and 1NI-173A open would provide multiple discharge flowpaths for the running ND pump.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because all other valves that would align NC system flow via ND to the cold legs are control room operated valves.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because all other valves that would align ND to the cold legs are control room operated valves.

Part 2 is plausible because having 1ND-35 and 1NI-173A open would provide multiple discharge flowpaths for the running ND pump.

Basis for meeting the KA

The K/A is matched because the applicant is required to have knowledge of a caution in AP-19, Enclosure 8, for a task that is performed locally and the resultant operational effects of performing this task. An AP (Loss of ND) was used vice an EP because MNS does not have an EP for Loss of ND.

Basis for Hi Cog

This question is higher cognitive because the applicant must perform more than one mental step to correctly answer it. The applicant must first recall from memory where 1ND-35 can be operated from and then have a thorough understanding of system design and flowpath to be determine what undesired circumstances could arise from operating an ND pump with 1ND-35 open.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2017 CNS Audit Exam (Bank 7244)

Development References

REFERENCES:
AP-19 (Loss of ND or ND System Leakage) Rev 33
AP-19 (Loss of ND or ND System Leakage) Bckgd doc Rev 17

LEARNING OBJECTIVES:
NONE

Student References Provided

APE025 2.4.20 - Loss of Residual Heat Removal System (RHRS)
APE025 GENERIC
Knowledge of the operational implications of EOP warnings, cautions, and notes. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
Rearranged answers from original bank question, correct answer is now "A". SLM 01/08/2019.

APE026 AA2.02 - Loss of Component Cooling Water (CCW)

Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: (CFR: 43.5 / 45.13)

The cause of possible CCW loss ....

Given the following on Unit 2:

- KC Surge Tank level is lowering slowly
- The crew has implemented AP-21 (LOSS OF KC OR KC SYSTEM LEAKAGE)

1) A possible location of the KC system leakage is into the ________ heat exchanger.

2) The assured supply of makeup water to the KC Surge tank is ________.

Which ONE (1) of the following completes the statements above?

A. 1. Letdown
   2. RN

B. 1. Letdown
   2. YM

C. 1. Seal Water Return
   2. RN

D. 1. Seal Water Return
   2. YM

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C

General Discussion

KC system leakage into the seal water return heat exchanger is a possible leak location due to KC system pressure being maintained at 100-110 psig and the seal water return header being maintained at VCT pressure of 25-30 psig.

Normal makeup water supply to the KC Surge Tank is YM. The assured water supply is from RN.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1is plausible since KC cools the letdown Hx and letdown pressure is relatively low, however normal letdown pressure is greater than KC system pressure.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1is plausible since KC cools the letdown Hx and letdown pressure is relatively low, however normal letdown pressure is greater than KC system pressure.

Part 2 is plausible because YM is the source of normal makeup for the KC Surge Tank.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1is correct.

Part 2 is plausible because YM is the source of normal makeup for the KC Surge Tank.

Basis for meeting the KA

The K/A is matched because the applicant is required to determine from the information and choices given the cause of the KC system leakage.

Basis for Hi Cog

This is a high cog question because more than one mental step is involved. The applicant is required to analyze the data given and determine the location of the leak that would cause these indications and then recall from memory whether or not YM is capable of keeping up with the leakage.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2016 MNS NRC Q44 (Bank 7543)

Development References

Lesson Plan OP-MC-PSS-KC (Component Cooling Water System) Rev 33

LEARNING OBJECTIVES:
OP-MC-PSS-KC Objective 12

Student References Provided

APE026 AA2.02 - Loss of Component Cooling Water (CCW)
Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: (CFR: 43.5 / 45.13)
The cause of possible CCW loss ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "C". SLM 11/20/2018

APE027 AK2.03 - Pressurizer Pressure Control System (PZR PCS) Malfunction

Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: (CFR 41.7 / 45.7)

Controllers and positioners ....

Given the following on Unit 1:

- Unit is at 100% RTP
- Pzr Pressure is 2235 PSIG

Subsequently:

- The Pressurizer Pressure Master controller has suffered an internal failure resulting in a Pressurizer Pressure Error of +100 PSIG
- Actual Pressurizer Pressure is 2100 PSIG and lowering

1) Pressurizer Spray valves are currently ________.

2) ________ has received a signal to open.

Which ONE (1) of the following completes the statements above?

A. 1. OPEN
   2. all Pressurizer PORVs

B. 1. OPEN
   2. 1NC-34A ONLY

C. 1. CLOSED
   2. all Pressurizer PORVs

D. 1. CLOSED
   2. 1NC-34A ONLY

General Discussion

With a +100 PSIG error signal, PORV 1NC-34A and the Spray Valves would be open. Pressurizer PORVs 1NC-32B and 1NC-36B receive a signal to open from SPP-2.
Since this channel never saw pressure at +100 PSIG, these valves did not open.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because it would be true if ACTUAL Pressurizer pressure was at +100 PSIG (2335 PSIG).

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that the 2177 PSIG block applies to both the Spray Valves and to 1NC-34A (block closed at 2177 PSIG decreasing).

Part 2 is plausible because it would be true if ACTUAL Pressurizer pressure was at +100 PSIG (2335 PSIG).

Answer D Discussion

INCORRECT: See explanation above

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that the 2177 PSIG block applies to both the Spray Valves and to 1NC-34A (block closed at 2177 PSIG decreasing).

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because a malfunction has occurred on the Pressurizer Pressure Master Controller and the applicant must determine the effect on the Pressurizer Pressure Control System.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. The applicant must first analyze the given conditions and then determine based on system knowledge that 1NC-34A and the Spray Valves have an OPEN signal and that the other PORVs do not have an OPEN signal.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2016 CNS NRC (Bank 6310)

Development References
Lesson Plan PS-IPE (Pzr Pressure Control), Rev 07

Student References Provided

APE027 AK2.03 - Pressurizer Pressure Control System (PZR PCS) Malfunction

Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: (CFR 41.7 / 45.7)

Controllers and positioners ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "B". SLM 11/20/2018

WE12 EK1.1 - Uncontrolled Depressurization of all Steam Generators

Knowledge of the operational implications of the following concepts as they apply to the (Uncontrolled Depressurization of all Steam Generators)

(CFR: 41.8 / 41.10 / 45.3)

Components, capacity, and function of emergency systems.

Given the following on Unit 1:

- Reactor trip from 100% power has occurred
- Crew is implementing EP/1/A/5000/ECA-2.1 (UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS)
- Containment pressure peaked at 3.1 PSIG and is currently 2.7 PSIG
- All S/G N/R levels are 4%
- CA flow to each S/G was throttled to 110 GPM in E-0

Based on the conditions above,

1) A RED path on the Heat Sink Critical Safety Function ________ exist.

2) and in accordance with ECA-2.1, minimum feed flow must be maintained to any S/G with a N/R level less than a MAXIMUM of ________.

Which ONE (1) of the following completes the statements above?

A. 1. does NOT
2. 11%

B. 1. does NOT
2. 32%

C. 1. does
2. 11%

D. 1. does
2. 32%

General Discussion

CA flow to each S/G will be maintained greater than 25 GPM due to the cooldown in the previous hour being less than 100 degrees F/hour. With CA flows at 110 GPM to each S/G (440 GPM total) and with all S/G N/R levels being < 11%, the conditions for a RED path on the Heat Sink CSFST is met. FR-H.1 will be entered, but it will immediately direct the crew to "Return to procedure and step in effect" due to the CA flows being < 450 GPM due to operator action.

ECA-2.1 will require that CA flow be maintained at a minimum of 25 gpm to any S/G with N/R levels < 11% (32%).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because CA flow is still being maintained to all S/Gs at a total of 440 GPM. Applicants may conclude incorrectly the total CA flow necessary to keep the Heat Sink CSF from turning red.

Part 2 is plausible because 11% is the ECA-2.1 required S/G level and the required level for maintaining a heat sink if containment pressure hadn't exceeded the limit for ACC values.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because CA flow is still being maintained to all S/Gs at a total of 440 GPM. Applicants may conclude incorrectly the total CA flow necessary to keep the Heat Sink CSF from turning red.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 11% is the ECA-2.1 required S/G level and the required level for maintaining a heat sink if containment pressure hadn't exceeded the limit for ACC values.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because applicants demonstrate knowledge of the operational implications of having CA flow rate throttled as required by ECA-2.1 (Uncontrolled Depressurization of All S/Gs).

Basis for Hi Cog

This question is higher cognitive because it requires more than one mental step.
The applicants must first analyze conditions in the stem to determine if CA flow requirements are being met to satisfy the Heat Sink CSFST and then recall that containment pressure has exceeded ACC values and are applicable.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2016 CNS NRC (Bank 6322)

Development References

F-0, Rev 6
ECA-2.1 (Uncontrolled Depressurization of All S/Gs), Rev 22

Student References Provided

WE12 EK1.1 - Uncontrolled Depressurization of all Steam Generators

Knowledge of the operational implications of the following concepts as they apply to the (Uncontrolled Depressurization of all Steam Generators)

(CFR: 41.8 / 41.10 / 45.3)

Components, capacity, and function of emergency systems.

Remarks/Status

APE054 AA1.04 - Loss of Main Feedwater (MFW)

Ability to operate and / or monitor the following as they apply to the Loss of Main Feedwater (MFW):(CFR 41.7 / 45.5 / 45.6)

HPI, under total feedwater loss conditions ....

Given the following on Unit 1:

- The crew has entered FR-H.1 (Response to Loss of Secondary Heat Sink)
- Trend of parameters are as follows:

Time	1400	1410	1420	1430
S/G 1A WR [%]	43	37	30	26
S/G 1B WR [%]	41	32	25	20
S/G 1C WR [%]	42	34	29	25
S/G 1D WR [%]	40	33	26	21
Total feed flow [GPM]	0	0	0	0
Cont press [PSIG]	0.75	2.1	3.2	2.8

1) Based on the conditions above, the **EARLIEST** time that the crew would be required to initiate NC system Feed and Bleed is ________.

2) To establish adequate heat removal during feed and bleed, the MINIMUM number of Pzr PORVS that must be OPENED is ________.

Which ONE (1) of the following completes the statements above?

A. 1. 1420
2. one

B. 1. 1420
2. two

C. 1. 1430
2. one

D. 1. 1430
2. two

General Discussion

Per FR-H.1, Feed and Bleed criteria is S/G WR levels in at least three S/Gs less than 24% (36% ACC). At time 1420, S/G WR levels are above those required for Feed and Bleed based on normal conditions in Containment. However, Containment pressure has increased above 3 PSIG requiring the use of adverse numbers (36%). Since all S/Gs are less than 36% WR level, initiation of Feed and Bleed is required.

Per FR-H.1, two PZR PORVs are opened to establish an NC system bleed path for heat removal.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because minimum heat removal requirements can be met with one PORV provided the head vents are also opened.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible (and would be correct) if ACC values are not applied. S/G WR levels meet the criteria for Feed and Bleed without adverse conditions.

Part 2 is plausible because minimum heat removal requirements can be met with one PORV provided the head vents are also opened.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible (and would be correct) if ACC values are not applied. S/G WR levels meet the criteria for Feed and Bleed without adverse conditions.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the applicant is provided with multiple sets of plant conditions (Monitor) and must apply the criteria for feed and bleed initiation (SI under normal and adverse conditions) for a loss of feedwater event. Applicant must also recall the criteria for meeting adequate heat removal (Operation of Pzr PORVs).

Basis for Hi Cog

This is a higher cognitive level question because there is more than one mental step involved, First, the applicant must analyze multiple sets of indications and apply adverse Containment condition numbers to determine when Feed and Bleed is required. Next, the applicant must recall from memory correct operation of the Pzr PORVs.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2009 MNS NRC Q11 (Bank 3050)

Development References
EP-FR-H.1, (Loss of Heat Sink), Rev. 21

Student References Provided

APE054 AA1.04 - Loss of Main Feedwater (MFW)

Ability to operate and / or monitor the following as they apply to the Loss of Main Feedwater (MFW):(CFR 41.7 / 45.5 / 45.6)

HPI, under total feedwater loss conditions ....

Remarks/Status

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APE056 AK3.01 - Loss of Offsite Power

Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power: (CFR 41.5,41.10 / 45.6 / 45.13)

Order and time to initiation of power for the load sequencer ....

Given the following on Unit 1:

- The unit is in Mode 5 with both trains of ND in operation

Subsequently,

- A loss of off-site power occurs

1) Based on the conditions above the ND pumps ________ start automatically after 20 seconds.

2) The reason for this configuration is that the sequencer will enter ________ mode due to the LOOP.

Which ONE (1) of the following completes the statements above?

A. 1. will
2. Priority

B. 1. will
2. Secondary

C. 1. will NOT
2. Priority

D. 1. will NOT
2. Secondary

General Discussion

The ND pumps are not a blackout load and would normally not need to be started. In this case with both pumps in operation in Mode 5 prior to the LOOP the operators will need to restart the pumps for decay heat removal but this would be done manually per AP-7.

The Priority Mode of operation is actuated by a Safety Injection signal from the SSPS. When Safety Injection is actuated, the signal seals in and sequencing begins immediately.

The Secondary Mode of operation is actuated by a 2/3 phase Loss of Voltage (LOV) on the 4160 Volt Essential Bus.

During an SI the ND pumps are restarted after 20 seconds.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBILITY:
Part 1 is plausible if the applicants conclude the sequencer will restart the pumps because they were running prior to the LOOP for decay heat removal.

Part 2 is plausible because safety injection and black out are the two signals that will start the sequencer operation and determine which mode (Priority -SI, Secondary-Black out) the sequencer operates in.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBILITY:
Part 1 is plausible if the applicants conclude the sequencer will restart the pumps because they were running prior to the LOOP for decay heat removal.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBILITY:
Part 1 is correct.

Part 2 is plausible because safety injection and black out are the two signals that will start the sequencer operation and determine which mode (Priority -SI, Secondary-Black out) the sequencer operates in.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the knowledge of "why" a specific load (ND pumps) is/is not being sequenced on due to the mode of operation of the sequencer as a result of plant events.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2011 MNS Audit Q49 (Bank 3163)

Development References
Lesson Plan OP-MC-DG-EQB, Diesel Generator Load Sequencer

Student References Provided

APE056 AK3.01 - Loss of Offsite Power

Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power: (CFR 41.5,41.10 / 45.6 / 45.13)

Order and time to initiation of power for the load sequencer ....

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Remarks/Status

APE057 AA2.18 - Loss of Vital AC Electrical Instrument Bus

Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: (CFR: 43.5 / 45.13)

The indicator, valve, breaker, or damper position which will occur on a loss of power ....

Given the following:

- A loss of 2EKVD has occurred
- The crew has implemented AP-15 (LOSS OF VITAL OR AUX CONTROL POWER)

In accordance with AP-15,

1) when checking Vital AC panelboards ENERGIZED, the crew will check ________.

2) Annunciator 2AD-2/F-1 (SSPS TRN B GENERAL WARNING) ________ be LIT.

Which ONE (1) of the following completes the statements above?

A. 1. bottom row of status lights - NORMAL
   2. will

B. 1. switch indication on any pump powered from 2ETB - DARK
   2. will

C. 1. bottom row of status lights - NORMAL
   2. will NOT

D. 1. switch indication on any pump powered from 2ETB - DARK
   2. will NOT

General Discussion

IAW AP-15, Check all vital AC panelboards energized as follows:
For 2EKVA: Top row of channel status lights -NORMAL
For 2EKVB: Second row of channel status lights -NORMAL
For 2EKVC: Third row of channel status lights -NORMAL
For 2EKVD:Bottom row of channel status lights -NORMAL

Check the following Vital DC panelboards energized as follows:
For 2EVDD:Switch indication on any pump powered from 2ETB - LIT.

IAW AP-15 , Enclosure 16 (2EKVD load list), SSPS Train B Output Slave Relays will lose ability to generate any Train B ESF or RPS actuations (Train B General Warning).
IAW AP-15 , Enclosure 13 (2EKVA load list), SSPS Train A Output Slave Relays will lose ability to generate any Train A ESF or RPS actuations (Train A General Warning).

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the correct action for checking whether 2EVDD is energized.

Part 2 correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the applicant may conclude due to normal convention (2EKVA powers train A and 2EKVB powers Train B). 2EKVD is the power supply to Train B, and therefore would cause the annunciator to be lit.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the correct action for checking whether 2EVDD is energized.

Part 2 is plausible because the applicant may conclude due to normal convention (2EKVA powers train A and 2EKVB powers Train B). 2EKVD is the power supply to Train B, and therefore would cause the annunciator to be lit.

Basis for meeting the KA

The K/A is matched because the applicant must demonstrate the ability to determine the indications (status lights and SI RESET lights) that would result from losing a vital bus.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2018 MNS NRC Q53 (Bank 7451)

Development References
AP-15 (Loss of Vital or Aux Control Power), Rev 22

Student References Provided

APE057 AA2.18 - Loss of Vital AC Electrical Instrument Bus

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Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: (CFR: 43.5 / 45.13)
The indicator, valve, breaker, or damper position which will occur on a loss of power ....

Remarks/Status

APE062 AA1.07 - Loss of Nuclear Service Water

Ability to operate and / or monitor the following as they apply to the Loss of Nuclear Service Water (SWS): (CFR 41.7 / 45.5 / 45.6) Flow rates to the components and systems that are serviced by the SWS; interactions among the components ....

Given the following on Unit 1:

- Unit is at 75% RTP
- A Train in service

Subsequently,

- A loss of 1A RN pump occurs
- The crew implements AP/20 (LOSS OF RN, CASE I, LOSS OF OPERATING RN TRAIN)
- 1B RN Pump has been started

In accordance with AP-20, ___(1)___ will be used to establish the desired flow rate while maintaining 1B RN pump flow less than a MAXIMUM of ___(2)___ GPM.

Which ONE (1) of the following completes the statement above?

LEGEND:

- **1RN-187B (B KC HX INLET ISOLATION)**
- **1RN-190B (RN to B KC HX CONTROL)**

A. 1. 1RN-187B
2. 16,000

B. 1. 1RN-187B
2. 14,000

C. 1. 1RN-190B
2. 16,000

D. 1. 1RN-190B
2. 14,000

General Discussion

IAW AP-20, after 1B RN pump has been started, check that 1B RN pump is running and flow is less than 14,000 gpm. If not, lower RN flow below the limit using 1RN-190B.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1RN-187B (KC Hx Inlet Isol) has been modified to be in a "throttled" position when indicating full open. The valves are "throttled" to maintain flow upon receiving a safety signal.

Part 2 is plausible because 16,000 gpm is the high limit for annunciator alarm 1AD-12/E3 (B RN Pump Abnormal Flow)

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1RN-187B (KC Hx Inlet Isol) has been modified to be in a "throttled" position when indicating full open. The valves are "throttled" to maintain flow upon receiving a safety signal.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 16,000 gpm is the high limit for annunciator alarm 1AD-12/E3 (B RN Pump Abnormal Flow)

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the ability to operate the RN system and control flow to RN cooled components, without exceeding flow limits, following a loss of the operating RN pump (Loss of RN).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2007 MNS NRC Q53 (Bank 3574)

Development References

AP-20 (Loss of RN, Case 1, Loss of Operating RN Train), Rev 38

PSS-RN (Nuclear Service Water) Lesson plan, Rev 56

Student References Provided

APE062 AA1.07 - Loss of Nuclear Service Water
Ability to operate and / or monitor the following as they apply to the Loss of Nuclear Service Water (SWS): (CFR 41.7 / 45.5 / 45.6)
Flow rates to the components and systems that are serviced by the SWS; interactions among the components ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "D". SLM 11/27/2018

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APE065 2.1.25 - Loss of Instrument Air
APE065 GENERIC
Ability to interpret reference materials, such as graphs, curves, tables, etc. (CFR: 41.10 / 43.5 / 45.12)

Given the following:

- A complete loss of Instrument Air has occurred.
- AP-22, Enclosure 18 for Unit 1 and Enclosure 13 for Unit 2, RN Strainer Surveillance During Loss of VI, has been implemented.

The following readings were obtained from the OAC:

TIME	1RN-21A Accumulator Pressure (OAC Point M1A0000)	1RN-25B Accumulator Pressure (OAC Point M1A0006)	2RN-21A Accumulator Pressure (OAC Point M2A0000)	2RN-25B Accumulator Pressure (OAC Point M2A0006)
0100	332.6 PSIG	332.9 PSIG	323.4 PSIG	344.4 PSIG
0700	327.6 PSIG	324.9 PSIG	308.4 PSIG	295.4 PSIG
1300	322.6 PSIG	316.9 PSIG	293.4 PSIG	204.4 PSIG

Based on the above readings,

1) ALL Unit 1 and Unit 2 RN strainers ________ required to be placed in backwash.

2) Strainers must be placed in backwash no later than time ________.

Which ONE (1) of the following completes the statements above?

REFERENCE PROVIDED

A. 1. are
2. 1500

B. 1. are
2. 1700

C. 1. are NOT
2. 1500

D. 1. are NOT
2. 1700

General Discussion

When a Loss of VI occurs both Units will enter AP-22. After 6 hours has elapsed, the RN Surveillance During a Loss of VI enclosures will be implemented on both units. The ROs will monitor accumulator pressures on the OAC. When 1 out of the 2 accumulator pressures is below 294 psig, then the affected unit will have both strainers placed in backwash. A time limit is implemented depending on a range below 294 psig. With 2RN-25B Accumulator Pressure at 204.4 psig the time limit will be 2 hours since pressure is lower than the 4 hour band lower limit of 206 psig.

Answer A Discussion

INCORRECT: See Explanation above

Plausibility:
Part 1 is plausible if the applicant determines that with VI being shared for both units, and any accumulator less than 294 psig, then all strainers must be placed in backwash.

Part 2 is correct.

Answer B Discussion

INCORRECT: See Explanation above

Plausibility:
Part 1 is plausible if the applicant determines that with VI being shared for both units, and any accumulator less than 294 psig, then all strainers must be placed in backwash.

Part 2 is plausible because the pressure for 2RN-21A accumulator is in the range that would require action within 4 hours (1700). The applicant may fail to recognize the 2RN-25B accumulator pressure requires action in 2 hours.

Answer C Discussion

CORRECT: See Explanation above

Answer D Discussion

INCORRECT: See Explanation above

Plausibility:
Part 1 is correct.

Part 2 is plausible because the pressure for 2RN-21A accumulator is in the range that would require action within 4 hours (1700). The applicant may fail to recognize the 2RN-25B accumulator pressure requires action in 2 hours.

Basis for meeting the KA

The K/A is matched because the applicant has to interpret a time limit based on a table in the AP-22 (Loss of VI) procedure.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to evaluate required actions from the procedure and tables given a set of plant conditions.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
AP/1/A/5500/22, LOSS OF VI AP/2/A/5000/22, LOSS OF VI

Student References Provided
Copy of AP-22 Enclosure 18 (Unit 1) and Enclosure 13 (Unit 2)

APE065 2.1.25 - Loss of Instrument Air

APE065 GENERIC

Ability to interpret reference materials, such as graphs, curves, tables, etc. (CFR: 41.10 / 43.5 / 45.12)

Remarks/Status

WE04 EK1.1 - LOCA Outside Containment

Knowledge of the operational implications of the following concepts as they apply to the (LOCA Outside Containment)
(CFR: 41.8 / 41.10, 45.3)

Components, capacity, and function of emergency systems.

Given the following on Unit 2:

- The crew has implemented ECA-1.2 (LOCA OUTSIDE CONTAINMENT)
- U2 FWST level is slowly lowering
- NC system pressure is 1600 PSIG and slowly lowering

In accordance with ECA-1.2,

1) the crew will FIRST stop and isolate the ________ pumps from the FWST.

2) the overall mitigation strategy includes cooldown and depressurization of the NCS to allow the ________.

Which ONE (1) of the following completes the statements above?

A. 1. ND
 2. ND isolation valves (2NI-173A and 2NI-178B) to be closed

B. 1. ND
 2. Cold Leg Accumulators to inject

C. 1. NI
 2. ND isolation valves (2NI-173A and 2NI-178B) to be closed

D. 1. NI
 2. Cold Leg Accumulators to inject

General Discussion

The first Major action in ECA-1.2 is to stop and isolate ND pumps from FWST.
One consideration during a LOCA outside of containment is to maintain FWST inventory (since there is no inventory entering the containment sump). The EP Background Document for ECA-1.2 states that operators need to take actions to isolate any potential leak paths and loss of inventory from the FWST. Stopping the associated ND Pump when closing the suction valve from the FWST is done to preserve the ND Pump from running with no suction.

There are two time critical actions in this EP to ensure core cooling:
1. Isolate ND suction from FWST to stop rapid depletion of FWST.
2. Stop break flow from NC to ND break after NC cooldown and depressurization by fully closing NI-173A and NI-178B.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because if the ND leak cannot be isolated before depleting the FWST, a transition to ECA-1.1 (Loss of ECR) would occur, and then the NCS is depressurized to allow CLA injection.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the high pressure injection lines (NI) will be checked later in ECA-1.2 to attempt to identify and isolate the leak.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the high pressure injection lines (NI) will be checked later in ECA-1.2 to attempt to identify and isolate the leak.

Part 2 is plausible because if the ND leak cannot be isolated before depleting the FWST, a transition to ECA-1.1 (Loss of ECR) would occur, and then the NCS is depressurized to allow CLA injection.

Basis for meeting the KA

The K/A is matched because the applicant must understand how the components of the RHR and Safety Injection system interface with each other (valves, tanks, and pumps), and the implications of these relationships in assessing whether to isolate the ISLOCA or the FWST first. Also the applicant is tested on the function of the FWST by knowing where in the system this tank is located, and how it interfaces with other components of the emergency systems.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2015 MNS NRC Q54 (Bank 7553)

Development References

ECA-1.2 (LOCA Outside Containment)
Rev 6
ECA-1.2 Bckgd doc Rev 31

LEARNING OBJECTIVES:

Student References Provided

OP-MC-EP-E1 Objective 3

WE04 EK1.1 - LOCA Outside Containment

Knowledge of the operational implications of the following concepts as they apply to the (LOCA Outside Containment)
(CFR: 41.8 / 41.10, 45.3)

Components, capacity, and function of emergency systems.

Remarks/Status
Rearranged answers from original bank question, correct answer is now "A". SLM 11/27/2018

WE11 EK2.2 - Loss of Emergency Coolant Recirculation
Knowledge of the interrelations between the (Loss of Emergency Coolant Recirculation) and the following:
(CFR: 41.7 / 45.7)
Facility*s heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.

Given the following on Unit 1:

- A Large Break LOCA has occurred inside Containment
- A and B ND pumps are NOT available
- The Control room crew has implemented ECA-1.1 (LOSS OF EMERGENCY COOLANT RECIRC) but, NO actions have been taken
- Containment pressure is 8 PSIG and slowly rising
- FWST level is 105 inches and lowering

1) When the FWST Level LO setpoint is reached, 1NI-184B (1B ND PUMP SUCTION FROM CONT SUMP ISOL) **AND** 1NI-185A (1A ND PUMP SUCTIONFROM CONT SUMP ISOL) ________ automatically OPEN.

2) Per ECA-1.1 Foldout Page, when FWST level decreases to less than a MAXIMUM of ________ inches ALL ECCS pumps must be secured.

Which ONE (1) of the following completes the statements above?

A. 1. will
   2. 95

B. 1. will NOT
   2. 95

C. 1. will
   2. 20

D. 1. will NOT
   2. 20

General Discussion

There are five levels which are important to proper FWST operation:

- Low-Low 20"
- Low 95"
- Pre-Low Level 135"
- Makeup 475"
- High 483"
- Overflow 484"

The Low and Low-Low levels are used for post accident monitoring. Redundant annunciators alarm at each point. Valves NI-184B and NI-185A automatically open at the Low level setpoint.

Valves NI-184B and NI-185A are part of the ECCS System. They are controlled from the Control Room and are normally closed. These valves automatically open on a 2/3 low level in conjunction with a Safety Injection Signal.

IF FWST level goes below "FWST LEVEL LO-LO" alarm setpoint (20 inches), THEN stop all pumps taking suction from the FWST.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible since 95 inches is the setpoint for FWST Level Low.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible since all other actions to align to the Reactor bldg. sump are not performed until after the FWST reaches the Low-Low setpoint. However, automatic opening of the Reactor bldg. sump valves occurs at the FWST Low level setpoint.

Part 2 is plausible since 95 inches is the setpoint for FWST Level Low.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible since all other actions to align to the Reactor bldg. sump are not performed until after the FWST reaches the Low-Low setpoint. However, automatic opening of the Reactor bldg. sump valves occurs at the FWST Low level setpoint.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the applicant is required to know the interrelations between the Loss of Emergency Coolant Recirculation and the facilities decay heat removal systems.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2016 MNS NRC Q56 (Bank 7555)

Development References
ECA-1.1 (Loss of Emergency Coolant Recirc) Rev. 17 Lesson Plan PS-ND (Residual Heat Removal) Rev. 53

Student References Provided

WE11 EK2.2 - Loss of Emergency Coolant Recirculation

Knowledge of the interrelations between the (Loss of Emergency Coolant Recirculation) and the following:
(CFR: 41.7 / 45.7)

Facility*s heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.

Remarks/Status
Rearranged answers from original bank question, correct answer is now "C". SLM 11/28/2018

WE05 EK2.2 - Loss of Secondary Heat Sink

Knowledge of the interrelations between the (Loss of Secondary Heat Sink) and the following:

(CFR: 41.7 / 45.7)

Facility*s heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.

Given the following on Unit 1:

- A Reactor trip and Safety Injection have occurred
- Containment pressure peaked at 2.7 PSIG and is slowly lowering
- The crew has implemented EP/1/A/5000/FR-H.1 (RESPONSE TO LOSS OF SECONDARY HEAT SINK)
- All attempts to restore CA flow have been unsuccessful

Based on the conditions above and in accordance with FR-H.1:

1) The NEXT source of feed water ATTEMPTED for restoration of flow to the S/Gs is through the CM/CF system using ________ pump(s).

2) All NC pumps ________ required to be stopped.

Which ONE (1) of the following completes the statements above?

A. 1. either Main Feed Water
   2. are

B. 1. either Main Feed Water
   2. are NOT

C. 1. Hotwell and Booster
   2. are

D. 1. Hotwell and Booster
   2. are NOT

General Discussion

If CA flow is not available, FR-H.1 will first attempt to place MFPs in service followed by a depressurization and attempts to feed from the Howell and Booster pumps.

Auxiliary feedwater flow restoration is attempted first and, if unsuccessful, NC pumps are tripped to extend the available time to establish feed flow from the main feedwater and condensate systems.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because FR-H.1 does not require all NCPs to be stopped if CA is available. Also plausible because many other procedures in the emergency network require forced circulation as the preferred method for heat removal.

Answer C Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because the Hotwell and Booster pumps could be used if S/Gs were first depressurized and are an option specified in FR-H.1 (following attempts to place MFPs in service)

Part 2 is correct.

Answer D Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because the Hotwell and Booster pumps could be used if S/Gs were first depressurized and are an option specified in FR-H.1 (following attempts to place MFPs in service)

Part 2 is plausible because FR-H.1 does not require all NCPs to be stopped if CA is available. Also plausible because many other procedures in the emergency network require forced circulation as the preferred method for heat removal.

Basis for meeting the KA

The K/A is matched because the applicant must demonstrate knowledge (i.e. strategy after Bleed and feed initiation) of the interrelations between the (Loss of Secondary Heat Sink) and the Facility's heat removal systems, including primary coolant (NC), emergency coolant (CA), the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility (i.e. CF, CM and the operation of the NCPs for heat removal).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2015 CNS NRC (Bank 6619)

Development References

EP-FRH (FR-H Lesson Plan), Rev. 16

Student References Provided

WE05 EK2.2 - Loss of Secondary Heat Sink

Knowledge of the interrelations between the (Loss of Secondary Heat Sink) and the following:
(CFR: 41.7 / 45.7)

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Facility*s heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.

Remarks/Status

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APE036 AA1.03 - Fuel Handling Incidents

Ability to operate and / or monitor the following as they apply to the Fuel Handling Incidents: (CFR 41.7 / 45.5 / 45.6)

Reactor building containment evacuation alarm enable switch ....

Given the following on Unit 1:

- Unit is currently refueling
- The refueling crew is lowering an irradiated fuel assembly into the core

Subsequently,

- The assembly drops completely into the core
- Gas bubbles are observed originating from the dropped assembly
- 1EMF-39 (CONTAINMENT GAS HI RAD) is in Trip 1 alarm
- NO other annunciators have been received
- The crew has implemented AP/1/A/5500/025 (SPENT FUEL DAMAGE)

1) Based on the conditions above, the Containment Evacuation Alarm ________ require manual actuation.

2) AP-25 ________ direct VP to be manually secured.

Which ONE (1) of the following completes the statements above?

A. 1. will NOT
   2. does

B. 1. will NOT
   2. does NOT

C. 1. will
   2. does

D. 1. will
   2. does NOT

General Discussion

A Trip 2 high radiation alarm on EMF-38(L), EMF-40(L), or EMF-39(L) channels will stop the CFAES pumps and the Incore Sump pump. Also, trip 2 will initiate a Containment Ventilation isolation signal (SH) through the Solid State Protection System. This SH signal will: Secure VQ and Secure VP
A high alarm on the EMF-39(L) (gaseous) channel will also sound the Containment Evacuation Alarm unless both source range high flux trips are blocked.

AP-25 step 5 directs the crew to remove VP from service PER
Enclosure 2 (Securing VP).

Answer A Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because a Trip 2 on EMF 39 would sound the containment evacuation alarm. Also plausible because there are EMFs with comp actions associated with Trip 1 alarms (EMF-36 HH).

Part 2 is correct.

Answer B Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because a Trip 2 on EMF 39 would sound the containment evacuation alarm. Also plausible because there are EMFs with comp actions associated with Trip 1 alarms (EMF-36 HH).

Part 2 is plausible because VP would already be secured by the Sh signal generated if EMF 38, 39 or 40 is in trip 2 (entry conditions for AP-25).

Answer C Discussion

CORRECT. See explanation above.

Answer D Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because VP would already be secured by the Sh signal generated if EMF 38, 39 or 40 is in trip 2 (entry conditions for AP-25).

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the ability to monitor plant rad monitors and then manually actuate (operate) the containment evacuation alarm switch when given a fuel handling incident.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to evaluate plant conditions, recall a setpoint, then determine if an automatic action has occurred.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2017 CNS NRC (Bank 7116)

Development References

AP-25 (Spent Fuel Damage), Rev 8
WE-EMF (Radiation Monitoring) lesson plan Rev 41

Student References Provided

APE036 AA1.03 - Fuel Handling Incidents
Ability to operate and / or monitor the following as they apply to the Fuel Handling Incidents: (CFR 41.7 / 45.5 / 45.6)
Reactor building containment evacuation alarm enable switch ....

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Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

APE037 AA2.12 - Steam Generator (S/G) Tube Leak

Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: (CFR: 43.5 / 45.13)

Flow rate of leak ....

Given the following on Unit 2:

- The unit is at 75% RTP
- 2EMF-33 (CONDENSER AIR EJECTOR EXHAUST) is in Trip 2 alarm
- 2EMF-73 (S/G C LEAKAGE) is in Trip 2 alarm
- The crew has implemented AP-10 (NC SYSTEM LEAKAGE), Case 1 (S/G TUBE LEAKAGE)
- Pressurizer level has been stabilized
- Letdown flow is 75 GPM
- Charging flow is 125 GPM

1) Based on the above conditions, the estimated leak rate is ________ GPM.

2) In accordance with AP-10, the MAXIMUM allowed charging flow to stabilize Pressurizer level is ________ GPM.

Which ONE (1) of the following completes the statements above?

A. 1. 50
   2. 155

B. 1. 50
   2. 200

C. 1. 38
   2. 155

D. 1. 38
   2. 200

General Discussion

The estimated leak rate is 125 gpm (Charging flow) - [75 gpm (Letdown flow) + 12 gpm (Seal return)],which equals 38 gpm.

Charging is increased and letdown is reduced as necessary to maintain Pzr level. A maximum flowrate of 232 GPM charging is allowable. This will ensure there is not excessive Regen HX tube vibration. Note this is assuming 32 GPM going to the seals, which will limit the flow through the Regen HX to 200 GPM during transient/accident operation (PIP M-03-05739). The control board gauge for "Charging Flow" reads from 0 - 200 GPM. In order to maintain charging flow on scale, the step provides guidance to maintain charging flow less than 200 GPM. This is well below the maximum allowable flowrate of 232 GPM. It should be noted here that the maximum flowrate allowed through the Regen HX during Normal/Start Up/Shut Down operation is 155 GPM.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 50 gpm will be calculated as the leak rate if the applicant only subtracts letdown flow from charging flow and fails to include seal return in their calculation.

Part 2 is plausible because the maximum flowrate allowed through the Regen HX during Normal/Start Up/Shut Down operation is 155 GPM.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 50 gpm will be calculated as the leak rate if the applicant only subtracts letdown flow from charging flow and fails to include seal return in their calculation.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the maximum flowrate allowed through the Regen HX during Normal/Start Up/Shut Down operation is 155 GPM.
INCORRECT: See explanation above.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant is required to monitor charging flow and letdown flow during a S/G tube leakage event and use this data to determine leak rate.

Basis for Hi Cog

This is a higher cognitive level question because the applicant must perform a level of analysis concerning the given indications and then perform a calculation (solve a problem) to determine leak rate.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2014 MNS NRC Q59 (Bank 5880)

Development References
AP-10 (NC Leakage within the Capacity of Both NV Pumps) Bckgd Doc, Rev 12 PS-NV (Chemical and Volume Control) Lesson Plan Rev 14A

Student References Provided

APE037 AA2.12 - Steam Generator (S/G) Tube Leak
Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: (CFR: 43.5 / 45.13)
Flow rate of leak ....

Remarks/Status
Rearranged answers from original bank question, correct answer is now "D". SLM 12/03/2018

APE003 AK1.01 - Dropped Control Rod

Knowledge of the operational implications of the following concepts as they apply to Dropped Control Rod: (CFR 41.8 / 41.10 / 45.3)

Reason for turbine following reactor on dropped rod event ....

Given the following Unit 1 initial conditions:

- Unit is at 40% RTP and stable
- Rod Control is in automatic
- The MW feedback loop is OUT of service
- NC T-Avg is 567°F

Subsequently,

- Control Bank "D" Rod M-12 drops fully into the core
- the crew has implemented AP-14 (ROD CONTROL MALFUNCTION)
- NC T-Avg is 563°F

1) Based on the conditions above, Turbine power ________ stabilize at a lower value.

2) Based on the conditions above and in accordance with AP-14, the FIRST action the crew will be required to perform to restore T-Avg to T-Ref is ________.

Which ONE (1) of the following completes the statements above?

A. 1. will
   2. adjust turbine load

B. 1. will
   2. move control rods in manual

C. 1. will NOT
   2. adjust turbine load

D. 1. will NOT
   2. move control rods in manual

General Discussion

The MW IN/MW OUT pushbutton is an alternate action push-button that when depressed places the megawatt feedback loop in or out of service. The MW loop is in service when the pushbutton is lit. Taking the MW feedback loop in and out of service is a bumpless transfer to ensure no control valve movement. The MW feedback signal is derived from the output of the Main Generator and is fed into the EHC. This feedback signal is compared to the desired MW output and is used to fine tune the EHC, which will adjust Governor Valve position to obtain the desired megawatt, output.

Per AP-14 background document,
A dropped rod has the potential to cause a substantial NC cooldown; so a step in the RNO instructs the operator to lower turbine load as necessary to restore NC temperature. It is not desirable to move control rods to adjust temperature until the rod control problem has been properly identified and evaluated.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because after I&E determines cause of dropped rod, rod movement in manual could be allowed and would be the preferred method for temperature control.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because MW control and Speed control are the inputs used for the Load Control function. When the Speed control loops fail or is taken out of service the governor valves will not move and turbine power will remain constant.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because MW control and Speed control are the inputs used for the Load Control function. When the Speed control loops fail or is taken out of service the governor valves will not move and turbine power will remain constant.

Part 2 is plausible because after I&E determines cause of dropped rod, rod movement in manual could be allowed and would be the preferred method for temperature control.

Basis for meeting the KA

The K/A is matched because the applicant must demonstrate knowledge of the operational implications (turbine performance) following a dropped rod with the MW loop out of service.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
GEN-EHC (Digital Electro-Hydraulic Control System) lesson plan, Rev 40 AP-14 (Rod Control Malfunction), Rev 16 AP-14 Bckgd Doc, Rev 14

Student References Provided

APE003 AK1.01 - Dropped Control Rod

Knowledge of the operational implications of the following concepts as they apply to Dropped Control Rod: (CFR 41.8 / 41.10 / 45.3)

Reason for turbine following reactor on dropped rod event ....

Remarks/Status

APE069 AK2.03 - Loss of Containment Integrity

Knowledge of the interrelations between the Loss of Containment Integrity and the following: (CFR 41.7 / 45.7)

Personnel access hatch and emergency access hatch ....

Which ONE (1) of the following statements represents a loss of Containment Integrity?

A. Submarine (Emergency Access) hatch is found open

B. Both lower personnel airlock doors closed with all seals deflated

C. Annulus doors blocked open for maintenance

D. Discovery of major divider barrier seal degradation

General Discussion

One of the four Personal Airlock Door seals (two per door) is required to maintain containment integrity.

Answer A Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Plausible because this would affect divider barrier operability.

Answer B Discussion

CORRECT. See explanation above.

Answer C Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Plausible because this would affect Reactor Building operability.

Answer D Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Plausible because this would affect divider barrier operability.

Basis for meeting the KA

The K/A is matched because the applicant is required to demonstrate knowledge of the interrelation of the Personnel Airlock Doors (personnel access hatch) and the Submarine Hatch (emergency access hatch) as related to a Loss of Containment Integrity.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2017 CNS NRC (Bank 7119)

Development References
OP/0/A/6700/006 (Personnel Airlock Operations, Rev 49

Student References Provided

APE069 AK2.03 - Loss of Containment Integrity
Knowledge of the interrelations between the Loss of Containment Integrity and the following: (CFR 41.7 / 45.7)
Personnel access hatch and emergency access hatch ....

Remarks/Status
Rearranged answers from original bank question, correct answer is now "B". SLM 12/03/2018

EPE074 2.4.11 - Inadequate Core Cooling
EPE074 GENERIC
Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)

Given the following on Unit 1:

- A LOCA has occurred
- The crew entered FR-C.1, RESPONSE TO INADEQUATE CORE COOLING
- S/G depressurization was not effective in restoring adequate core cooling
- Core Exit Thermocouples (CET) are 1200°F and rising

Based on the above conditions and in accordance with FR-C.1,

1) the crew will ________.

2) normal conditions for starting a NC pump ________ required.

Which ONE (1) of the following completes the statements above?

A. 1. start NC pumps one at a time as determined by CET response
2. are

B. 1. start NC pumps one at a time as determined by CET response
2. are NOT

C. 1. start all available NC pumps to maximize forced flow
2. are

D. 1. start all available NC pumps to maximize forced flow
2. are NOT

General Discussion

Based on the conditions presented where depressurization is not effective and CETs are greater than 1200F, the crew will need to start NC pumps. This is done one at a time while monitoring CETs. A note in FR-C.1 states that is desired for normal conditions for starting a pump be present but it is not required.

Answer A Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is correct.

Part 2 is plausible because the note in FR-C.1 states that normal conditions are desired and other procedures in the EP series (ES-1.2) require normal start conditions for re-starting NCPs.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is plausible because the major action is to restart NC pumps to restore forced flow with CETs rising.

Part 2 is plausible because the note in FR-C.1 states that normal conditions are desired and other procedures in the EP series (ES-1.2) require normal start conditions for re-starting NCPs.

Answer D Discussion

INCORRECT: See explanation above.

Plausibility:
Part 1 is plausible because the major action is to restart NC pumps to restore forced flow with CETs rising.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the question requires the applicant to have knowledge of the emergency procedure (FR-C.1). Inadequate core cooling is addressed in the EP series at MNS, not in an AP.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2016 CNS NRC Examination (Bank 6331)

Development References

Lesson Plan OP-MC-EP-FRC
EP/1/A/5000/FR-C.1 Respone to Inadequate Core Cooling.

Student References Provided

EPE074 2.4.11 - Inadequate Core Cooling
EPE074 GENERIC
Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

WE02 EA2.1 - SI Termination
Ability to determine and interpret the following as they apply to the (SI Termination)
(CFR: 43.5 / 45.13)
Facility conditions and selection of appropriate procedures during abnormal and emergency operations.

Given the following on Unit 1:

- A Reactor Trip and Safety Injection have occurred
- The crew has implemented ES-1.1, (SAFETY INJECTION TERMINATION)
- While checking if S/I flow is required, the BOP reports Pzr level is 15% and lowering

If Pzr level can NOT be maintained greater than a MINIMUM of ___(1)___, ES-1.1 Foldout page directs the crew to raise S/I flow, restore Pzr level **AND** transition to procedure ___(2)___.

Which ONE (1) of the following completes the statement above?

PROCEDURE LEGEND:

E-0 (REACTOR TRIP OR SAFETY INJECTION)
E-1 (LOSS OF REACTOR OR SECONDARY COOLANT)

A. 1. 11%
2. E-1

B. 1. 11%
2. E-0

C. 1. 4%
2. E-1

D. 1. 4%
2. E-0

General Discussion

Per ES-1.1(S/I Termination) foldout page,
S/I Re-initiation Criteria (applies after Step 10 in body of procedure):
IF NC subcooling based on core exit T/Cs is less than 0°F OR Pzr level cannot be maintained greater than 11% (29% ACC), THEN perform the following:
a. Raise S/I flow as necessary to restore subcooling and level:
Start one or more S/I pumps.
Realign NV S/I flow path PER EP/2/A/5000/G-1 (Generic Enclosures),
Enclosure 29 (NV Alignment to S/I Mode).

B. GO TO EP/2/A/5000/E-1 (Loss of Reactor or Secondary Coolant).

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because ES-0.1 (Rx Trip Recovery) does require initiating S/I and transitioning to E-0 at 4% Pzr level.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 4% is used in other emergency procedures such as ES-0.1 (Rx Trip Recovery) as the Pzr level that would require S/I initiation.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 4% is used in other emergency procedures such as ES-0.1 (Rx Trip Recovery) as the Pzr level that would require S/I initiation.

Part 2 is plausible because ES-0.1 (Rx Trip Recovery) does require initiating S/I and transitioning to E-0 at 4% Pzr level.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the ability to perform the required actions for specific facility conditions encountered while performing SI Termination and select the appropriate procedure for recovery.

Basis for Hi Cog

This question is higher cognitive because the applicant must analyze the conditions in the stem and based on those conditions, determine the required actions and correct procedure for recovery.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
ES-1.1 (S/I Termination) Rev 29 ES-0.1 (Rx Trip Recovery), Rev 46

Student References Provided

WE02 EA2.1 - SI Termination
Ability to determine and interpret the following as they apply to the (SI Termination)
(CFR: 43.5 / 45.13)

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Facility conditions and selection of appropriate procedures during abnormal and emergency operations.

Remarks/Status

WE16 EK3.4 - High Containment Radiation

Knowledge of the reasons for the following responses as they apply to the (High Containment Radiation)
(CFR: 41.5 / 41.10, 45.6, 45.13)

RO or SRO function within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated.

Given the following on Unit 2:

- A Large Break LOCA has occurred
- The CRS has elected to implement FR-Z.3 (RESPONSE TO HIGH CONTAINMENT RADIATION LEVEL)
- Current Containment conditions:
  - Containment Pressure - 2.5 PSIG and stable
  - Containment Radiation Level - 36 R/HR and slowly rising
  - Containment Sump Level - 5.5 FEET and slowly rising

Based on the conditions above,

1) FR-Z.3 ________ direct the crew to start the Containment Aux Carbon Filter fan.

2) FR-Z.3 ________ require the crew to start the VE fans.

Which ONE (1) of the following completes the statements above?

A. 1. will
2. does NOT

B. 1. will
2. does

C. 1. will NOT
2. does NOT

D. 1. will NOT
2. does

General Discussion

Per FR-Z.3, containment sump level is checked to be less than 0.5 feet prior to starting the aux carbon filter fan. If greater than 0.5 feet, the fan will not be started.

Per FR-Z.3, The VE fans will be started if not already on (Normally auto-start at 3.0 psig in containment).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because placing the aux carbon filter fan in service is designed to reduce the radioactivity in the containment atmosphere. However, the unit is on the floor of containment and operation is dependent on sump level.

Part 2 is plausible because containment pressure has not reached the value where VE fans are automatically started.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because placing the aux carbon filter fan in service is designed to reduce the radioactivity in the containment atmosphere. However, the unit is on the floor of containment and operation is dependent on sump level.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because containment pressure has not reached the value where VE fans are automatically started.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant is required to demonstrate knowledge a major action of the High Containment Radiation procedure (knowledge of the reason is inherent to the action- submersion of the component to be started). Additionally, the applicant is required to demonstrate knowledge of proper procedure adherence related to minimizing exposure to plant personnel when faced with a high radiation condition inside containment.

Basis for Hi Cog

This is a higher cognitive question because the applicant must analyze and apply the conditions in the stem to determine the procedure actions that are applicable.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

Student References Provided

WE16 EK3.4 - High Containment Radiation

Knowledge of the reasons for the following responses as they apply to the (High Containment Radiation)
(CFR: 41.5 / 41.10, 45.6, 45.13)

RO or SRO function within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated.

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Remarks/Status

WE03 EK3.1 - LOCA Cooldown and Depressurization

Knowledge of the reasons for the following responses as they apply to the (LOCA Cooldown and Depressurization)

(CFR: 41.5 / 41.10, 45.6 / 45.13)

Facility operating characteristics during transient conditions, includingcoolant chemistry and the effects of temperature, pressure, and reactivity changes and operating limitations and reasons for these operating characteristics.

Given the following on Unit 1:

- The Crew entered ES-1.2, (POST LOCA COOLDOWN AND DEPRESSURIZATION), after a small break LOCA occurred
- Containment Pressure peaked at 3.2 PSIG and is now stable at 2.5 PSIG

Based on the condition above:

1) The operator will first use ________ to depressurize the NC system.

2) After NC system depressurization has commenced, a rapid rise in pressurizer level would be caused by ________.

Which ONE (1) of the following completes the statements above?

A. 1. NV aux spray
2. voiding in the upper head region

B. 1. one Pzr PORV
2. voiding in the upper head region

C. 1. NV aux spray
2. increased S/I flow

D. 1. one Pzr PORV
2. increased S/I flow

General Discussion

Above 3.0 psig in containment, operators are required to secure NC Pumps. With NC pumps off normal spray is not available.

With normal spray unavailable, ES-1.2 directs the use of one Pzr PORV to commence depressurization.

With NC pumps secured, voiding in the upper head could occur which could lead to a rapidly rising pressurizer level on commencement of the depressurization.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because NV aux spray is a method for depressurization if the NC pumps are not running and Pzr PORVS are not effective.

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because NV aux spray is a method for depressurization if the NC pumps are not running and Pzr PORVS are not effective.

Part 2 is plausible because S/I flow will increase once pressure begins to lower.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because S/I flow will increase once pressure begins to lower.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the knowledge of operating characteristics while performing a depressurization during ES-1.2 and the reasons for those characteristics.

Basis for Hi Cog

This is a higher cognitive question because the applicant must analyze the conditions in the stem and determine the affect these conditions have on the method of depressurization as well as operating characteristics that will be encountered during the depressurization.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2013 MNS NRC Q44 (Bank 5885)

Development References

Student References Provided

WE03 EK3.1 - LOCA Cooldown and Depressurization

Knowledge of the reasons for the following responses as they apply to the (LOCA Cooldown and Depressurization)
(CFR: 41.5 / 41.10, 45.6 / 45.13)

Facility operating characteristics during transient conditions, includingcoolant chemistry and the effects of temperature, pressure, and reactivity changes and operating limitations and reasons for these operating characteristics.

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Remarks/Status

WE09 EA1.3 - Natural Circulation Operations
Ability to operate and / or monitor the following as they apply to the (Natural Circulation Operations)
(CFR: 41.7 / 45.5 / 45.6)
Desired operating results during abnormal and emergency situations

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Given the following on Unit 2:

- Unit tripped from 100% RTP
- A Loss of Off-Site Power (LOOP) has occurred
- One CRDM fan is running
- ES-0.2 (NATURAL CIRCULATION COOLDOWN) has been implemented

Based on the conditions above and in accordance with ES-0.2, an NC system cooldown to cold shutdown will be performed using the ___(1)___ at a rate NOT to exceed ___(2)___ in an hour.

Which ONE (1) of the following completes the statement above?

A. 1. steam dumps
   2. 100°F

B. 1. steam dumps
   2. 70°F

C. 1. S/G PORVs
   2. 100°F

D. 1. S/G PORVs
   2. 70°F

General Discussion

Per ES-0.2, to establish the cooldown of the NC system, steam should be released through the condenser steam dump valves. However, if the main condenser is not available for steam dump, the cooldown should be established by use of the S/G PORVs, releasing steam to the atmosphere.
A controlled NC system cooldown to cold shutdown shall be established at a maximum rate of 100 degrees F per hour with 1 or more CRDM fans running, 70 degrees F per hour with no CRDM fans running, as measured in the cold legs, with guidance given in Enclosure 3 on monitoring cooldown rate.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the steam dumps are the preferred method of performing the NC system cooldown in ES-0.2. In our case, the condenser is not available, therefore the dumps cant be used.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the steam dumps are the preferred method of performing the NC system cooldown in ES-0.2. In our case, the condenser is not available, therefore the dumps cant be used.

Part 2 is plausible because the cooldown rate would be established at 70 degrees F per hour if none of the CRDM fans had been operating.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the cooldown rate would be established at 70 degrees F per hour if none of the CRDM fans had been operating.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the ability to operate the systems required to perform a natural circulation cooldown to obtain the desired operating results .

Basis for Hi Cog

This is a higher cognitive question because the applicant must analyze the conditions in the stem and determine the affect these conditions have on the ability to perform the cooldown, and the max allowed cooldown rate.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
EP-ES-0.2 (Natural Circulation Cooldown), Rev 16 EP-E0 series Background Document, Rev 25

Student References Provided

WE09 EA1.3 - Natural Circulation Operations
Ability to operate and / or monitor the following as they apply to the (Natural Circulation Operations)
(CFR: 41.7 / 45.5 / 45.6)
Desired operating results during abnormal and emergency situations

Remarks/Status

GEN2.1 2.1.15 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.

In accordance with OMP 5-12 (COMMUNICATION OF DAY-TO-DAY PLANT ISSUES),

1) Communications of detailed instructions or major guidance to the Control Room will be communicated using ________.

2) The Operations Target Contact for this type of communication is the ________.

Which ONE (1) of the following completes the statements above?

A. 1. the Ops Work List
   2. CRS

B. 1. the Ops Work List
   2. SM

C. 1. Engineering Group Guidance Sheets
   2. CRS

D. 1. Engineering Group Guidance Sheets
   2. SM

General Discussion

In accordance with OMP 5-12, attachment 11.4,
detailed instructions or major guidance to the control room is communicated using engineering group guidance sheets and the CRS is the Ops target contact.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because special requests or minor guidance to Ops that will extend past a day/weekend shift is communicated using the Ops Work List.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because special requests or minor guidance to Ops that will extend past a day/weekend shift is communicated using the Ops Work List.

Part 2 is plausible because the SM is the contact for current plant operating issues, plant concerns, operability issues and adverse condition monitoring and contingency planning.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the SM is the contact for current plant operating issues, plant concerns, operability issues and adverse condition monitoring and contingency planning.

Basis for meeting the KA

The K/A is matched because the applicant is required to have knowledge of temporary management orders (Engineering guidance).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
OMP 5-12 (Communication of Day-to-Day Plant Issues), Rev 32

Student References Provided

GEN2.1 2.1.15 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.

Remarks/Status

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GEN2.1 2.1.26 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen). (CFR: 41.10 / 45.12)

In accordance with AD-HS-ALL-0103 (FALL PROTECTION),

1) Continuous Fall Protection (100% tie-off) is required when there is a free-fall risk of greater than or equal to a MINIMUM of ________ feet above a working or walking surface.

2) A body belt ________ be used to meet Personal Fall Arrest System (PFAS) requirements.

Which ONE (1) of the following completes the statements above?

A. 1. 4
2. can NOT

B. 1. 4
2. can

C. 1. 10
2. can NOT

D. 1. 10
2. can

General Discussion

In accordance withAD-HS-ALL-0103,
The uninterrupted use of full body harness, lanyards, and appropriate anchorage systems where there is a free-fall risk of greater than or equal to 4 feet above a working or walking surface, equipment, or component requires continuous fall protection. Also known as 100% tie-off.
Body belts or positioning belts shall not be used as part of a PFAS.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because a body belt/positioning device is allowed in certain circumstances but is always used in conjunction with a PFAS (full body harness).

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because a PFAS (full body harness) is required when erecting or disassembling scaffolding 10 feet or more from a lower ground level.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because a PFAS (full body harness) is required when erecting or disassembling scaffolding 10 feet or more from a lower ground level.

Part 2 is plausible because a body belt/positioning device is allowed in certain circumstances but is always used in conjunction with a PFAS (full body harness).

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of the industrial safety requirements (specifically Fall Protection) contained in the AD-HS-ALL-0103.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
AD-HS-ALL-0103, Fall Protection, Rev 4

Student References Provided

GEN2.1 2.1.26 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen). (CFR: 41.10 / 45.12)

Remarks/Status

GEN2.1 2.1.44 - GENERIC - Conduct of Operations

Conduct of Operations

Knowledge of RO duties in the control room during fuel handling, such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation. (CFR: 41.10 / 43.7 / 45.12)

Given the following on Unit 1:

- Refueling is in progress
- The VF system is in operation

Subsequently,

- HVAC Annunciator OAD-12, E/3 (1 VF FILTER FIRE) is received
- Filter temperature is 335°F and rising

Based on the conditions above,

1) Unit 1 VF Supply Fan ________ tripped.

2) an operator will be dispatched to ________.

Which ONE (1) of the following completes the statements above?

A. 1. has NOT
   2. manually OPEN the Mulsifyre RF isolation valve

B. 1. has NOT
   2. verify automatic actuation of the Mulsifyre RF deluge system

C. 1. has
   2. manually OPEN the Mulsifyre RF isolation valve

D. 1. has
   2. verify automatic actuation of the Mulsifyre RF deluge system

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General Discussion

0AD-12, E/3 (1 VF FILTER FIRE) alarms at 325 F. The automatic action for this annunciator is for both 1A and 1B VF Exhaust fans to trip. The supply fan for Unit 1 will trip based on a loss of flow sensed by a loss (tripped due to high temperature) of both exhaust fans.
The immediate actions require an operator to be dispatched to open the Aux Building Fire Protection Deluge valves as well as unlocking/opening the Unit 1 Fuel Pool Bldg Exhaust Filter Mulsifyre RF Isolations.

Answer A Discussion

NCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the automatic action directly from filter fire condition is to trip the exhaust fans only. The supply fans will trip only after a low flow conditon is sensed and is not a direct signal from the temperature sensor.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the automatic action directly from filter fire condition is to trip the exhaust fans only. The supply fans will trip only after a low flow conditon is sensed and is not a direct signal from the temperature sensor.

Part 2 is plausible because numerous components in the plant that are protected by mulsifyres are actuated automatically.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because numerous components in the plant that are protected by mulsifyres are actuated automatically.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of RO duties in the control room during fuel handling such as responding to alarms from the fuel handling area.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

OP/0/6100/010P, Annunciator Response for HVAC Panel 0AD-12
OP-MC-FH-VF, Fuel Handling Building Ventilation System
OP-MC-SS-RFY, Fire Protection System

Student References Provided

GEN2.1 2.1.44 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of RO duties in the control room during fuel handling, such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation. (CFR: 41.10 / 43.7 / 45.12)

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Remarks/Status

ILT 20-1 MNS SRO NRC Examination **QUESTION 69** 69 **C**

GEN2.2 2.2.6 - GENERIC - Equipment Control
Equipment Control
Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13)

In accordance with AD-HU-ALL-004 (PROCEDURE AND WORK INSTRUCTION USE AND ADHERENCE),

1) if it is determined that an in progress surveillance PT can NOT be performed as written, out of sequence step performance _______ allowed with supervisor approval, if taking credit for surveillance.

2) when there is a problem with the procedure or work instruction for the type of procedure being performed (PT), a Procedure Revision Request (PRR) _______ required.

Which ONE (1) of the following completes the statements above?

A. 1. is
2. is

B. 1. is
2. is NOT

C. 1. is NOT
2. is

D. 1. is NOT
2. is NOT

General Discussion

Per AD-HU-ALL-0004 Step 5.13.1,
Ensure all of the following criteria are met for the proposed out of sequence performance:
The technical procedure is not a required periodic test, surveillance, special test or an infrequently performed test or evolution.
The technical procedure or work instruction performance does not satisfy a technical specification requirement, is not being used as a special test, or an infrequently performed test or evolution
The intent (method of performance, or the results) of the steps or sections does not change.
Personnel and equipment safety is not affected.

As soon as time permits, initiate a procedure revision request (PRR) or model work instruction change request.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because operations (Ops) can be performed out of sequence with appropriate documentation and supervisor approval. Surveillance PTs can be completed out of sequence to return configuration control back to normal but credit cant be taken for the surveillance.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because operations (Ops) can be performed out of sequence with appropriate documentation and supervisor approval. Surveillance PTs can be completed out of sequence to return configuration control back to normal but credit cant be taken for the surveillance.

Part 2 is plausible if the applicant confuses a Temporary Test (TT) procedure with a PT. Temporary Test procedures do NOT require a PRR.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant confuses a Temporary Test (TT) procedure with a PT. Temporary Test procedures do NOT require a PRR.

Basis for meeting the KA

K/A is matched because the operator must demonstrate knowledge of the process for making changes to procedures, specifically field changes to an in-progress procedure.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2018 MNS NRC Q70 (Bank 7468)

Development References

AD-HU-ALL-0004 (Procedure and Work Instruction Use and Adherence) Rev 10, Step 5.13.1

Student References Provided

GEN2.2 2.2.6 - GENERIC - Equipment Control
Equipment Control
Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13)

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Remarks/Status

GEN2.2 2.2.42 - GENERIC - Equipment Control

Equipment Control

Ability to recognize system parameters that are entry-level conditions for Technical Specifications. (CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3)

Given the following on Unit 2:

- Unit is in Mode 3 with startup in progress

Subsequently:

- A loss of offsite power (LOOP) occurs
- The plant stabilizes with Pressurizer level stable at 90%
- Only 2ETA is powered from its Diesel Generator

LCO 3.4.9 (PRESSURIZER), ________.

Which ONE (1) of the following completes the statement above?

A. is met

B. is NOT met, because of insufficient Pzr Heater Capacity ONLY

C. is NOT met, because Pzr level is too high ONLY

D. is NOT met, because of insufficient Pzr Heater Capacity AND
Pzr level is too high

General Discussion

According to LCO 3.4.9, in Modes 1-3, the Pzr must be OPERABLE with water level < 92% and two groups of Pzr heaters each with a capacity of 150 KW must be OPERABLE. While Pzr level meets the LCO criteria, the Pzr Heater capacity does not. Only two groups receive power from safety related power supplies; Group A and Group B, which is de-energized. Based on this, there is only one group of Pzr Heaters that is OPERABLE, and LCO 3.4.9 is NOT met.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because the applicant may conclude that only one bank of heaters is required along with Pzr level for TS 3.4.9 to be met.

Answer B Discussion

CORRECT : See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because the applicant may conclude that LCO 3.4.9 requires Pzr level to remain lower than 70%, (the alarm setpoint for 2AD-6, B/9 "Pzr Hi Level" alarm. This ARP refers the operators to refer to LCO 3.4.9.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because Pzr heater capacity does not meet the LCO and the applicant may conclude that the LCO requires Pzr level to remain lower than 70%, (the alarm setpoint for 2AD-6, B/9 "Pzr Hi Level" alarm. This ARP refers the operators to refer to LCO 3.4.9.

Basis for meeting the KA

The K/A is matched because it requires the applicant to demonstrate a knowledge of the Tech Spec 3.4.9 (Pressurizer) entry requirements.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant must analyze the conditions given to determine the status of the Pressurizer heaters.

Next, the applicant must recall from memory the LCO requirements for PZR heater operability from Tech Spec 3.4.9 (Pressurizer).

Finally, the applicant must associate the two pieces of information that were recalled from memory and determine by analysis the correct response.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2016 CNS NRC (Bank 6373)

Development References

Tech Spec 3.4.9 (Pressurizer)

Student References Provided

GEN2.2 2.2.42 - GENERIC - Equipment Control
Equipment Control
Ability to recognize system parameters that are entry-level conditions for Technical Specifications. (CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3)

Remarks/Status

Rearranged answers from original bank question, correct answer is now "B". SLM 12/05/2018

GEN2.3 2.3.11 - GENERIC - Radiation Control
Radiation Control
Ability to control radiation releases. (CFR: 41.11 / 43.4 / 45.10)

Given the following on Unit 1:

- A liquid waste release from the Ventilation Unit Condensate Drain Tank (VUCDT), through the NORMAL discharge path, has been initiated

1) If 1EMF-44 (CONT VENT DRN TK OUTLET) reaches Trip 2 status, ________ will automatically CLOSE to terminate the release.

2) Following a Trip 2 signal, the VUCDT release ________ be re-started without additional sampling.

Which ONE (1) of the following completes the statements above?

LEGEND:

- **1WP-35 (WMT & VUCDT TO RC CNTRL)**
- **1WM-46 (0EMF-49 OUTLET HI RAD SHUTOFF ISOL)**

A. 1. 1WM-46
2. can

B. 1. 1WP-35
2. can

C. 1. 1WP-35
2. can NOT

D. 1. 1WM-46
2. can NOT

General Discussion

The WMT and the VUCDT are normally released to the RC discharge through 1WP-35 and 1WP-37. 1WP-35 (normal) and 1WM-46 (alternate) will get a close signal if a trip 2 condition occurs on 0EMF-49 or 1/2 EMF-44. 1WM-46 is normally closed.

VUCDT and WMT releases may be reinitiated following Trip 2 signal from 0EMF49 or 1(2) EMF44 up to two times.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part1 is plausible because WM-46 is a selectable discharge path for liquid waste releases and WM -46 does receive a signal to close from EMFs 44 and 49. WM-46 is not the normal alignment and the valve is a normally closed valve.

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because liquid waste releases from other sources, such as the turbine building sumps that reach trip 2 condition will require new sampling and new LWR paperwork prior to restart.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because WM-46 is a selectable discharge path for liquid waste releases and WM -46 does receive a signal to close from EMFs 44 and 49. WM-46 is not the normal alignment and the valve is a normally closed valve.

Part 2 is plausible because liquid waste releases from other sources, such as the turbine building sumps that reach trip 2 condition will require new sampling and new LWR paperwork prior to restart.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the ability to control radiation releases by knowing the effects a trip 2 has on the release and the requirements to re-start the release.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.
First, the applicant must analyze the conditions given to determine the status of the release line-up.
Next, the applicant must recall from memory requirements to allow re-start of release from various sources.
Finally, the applicant must associate the two pieces of information that were recalled from memory and determine by analysis the correct response.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2003 MNS Audit Q27 (Bank 3754)

Development References	Student References Provided
WE-RLR (Radiological Liquid Waste Releases), Rev 23	

GEN2.3 2.3.11 - GENERIC - Radiation Control
Radiation Control
Ability to control radiation releases. (CFR: 41.11 / 43.4 / 45.10)

Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

GEN2.3 2.3.12 - GENERIC - Radiation Control

Radiation Control

Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 45.9 / 45.10)

Given the following:

- The NV system is being aligned for startup
- The procedure in use requires independent verification of a single valve located in a room with a general dose rate of 130 mREM/hr
- Estimated time to independently verify the valve's position is 10 minutes
- There are no known hot spots in the area
- There is no airborne activity in this room
- The room has no surface contamination areas

In accordance with AD-HU-ALL-0005 (HUMAN PERFORMANCE TOOLS), independent verification of the valve above ___(1)___ be waived because the ___(2)___ .

Which ONE (1) of the following completes the statement above?

A. 1. can
   2. general area dose rate is greater than 100 mREM/hr

B. 1. can
   2. radiation exposure for a single verification would exceed the allowable limit

C. 1. can NOT
   2. general area dose rate is less than 1 REM/hr

D. 1. can NOT
   2. radiation exposure for a single verification is within the allowable limit

---

General Discussion

Total dose for this IV would equal 21.7 mREM which exceeds the guideline in AD-HU-ALL-0005 of 10 mREM for a single verification.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because IV may be waived if dose rates are greater than 1000 mR/hr.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because the second part is true. However, the IV may be waived for a reason other than dose rate.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible if the applicant miscalculates the potential exposure.

Basis for meeting the KA

The K/A is matched because the applicant is required to demonstrate knowledge of radiological safety principles related to the exception to independent verification requirements based on personnel exposure.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to analyze information and perform a calculation in order to obtain the correct answer.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2014 CNS NRC (Bank 6968)

Development References

AD-HU-ALL-0005 (Human Perfomance Tools), Rev 1

Student References Provided

GEN2.3 2.3.12 - GENERIC - Radiation Control

Radiation Control

Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 45.9 / 45.10)

Remarks/Status

Rearranged answers from original bank question, correct answer is now "B". SLM 12/05/2018

GEN2.4 2.4.9 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)

Given the following on Unit 2:

- Unit is in MODE 5 and drained to Mid-loop
- ND Train 2A is in service
- ND system flow rate is 3300 GPM
- NC System level is (+)12 inches

Subsequently,

- ND Low Discharge Pressure alarms on the OAC
- The crew has entered AP-19 (LOSS OF ND OR ND SYSTEM LEAKAGE)

In accordance with AP-19,

1) the crew will be required to ________ in order to mitigate this event.

2) the first MAJOR action category is to ________.

Which ONE (1) of the following completes the statements above?

A. 1. stop 2A ND pump
   2. protect the ND pumps

B. 1. stop 2A ND pump
   2. check if adequate heat sink is available

C. 1. reduce ND flow to $\leq$ 3000 GPM
   2. protect the ND pumps

D. 1. reduce ND flow to $\leq$ 3000 GPM
   2. check if adequate heat sink is available

General Discussion

AP-19 will direct the crew to maintain ND flow less than 3000 gpm any time NC level is less than 15 inches.
AP-19 will also direct the crew to secure ND pumps anytime NC level is less than or equal to 4 inches, NC subcooling is less than or equal to zero degrees or if ND-1 or ND-2 closes.

The Major Action Categories in AP-19 are:
1) Protect the ND pumps (Steps 1-4)
2) Address containment related concerns (Step 5)
3) Check if adequate heat sink or quick restart of ND available (Steps 6-14)
4) Establish alternate means of decay heat removal (Steps 15-20, 32)
5) Establish support conditions and restore ND. (Steps 21-46)

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because stopping the ND pumps would be required by AP-19 if NC level is less than or equal to 4 inches. Also plausible because level is less than 15 inches which is the level setpoint used for the ND flow restriction in AP-19.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because stopping the ND pumps would be required by AP-19 if NC level is less than or equal to 4 inches. Also plausible because level is less than 15 inches which is the level setpoint used for the ND flow restriction in AP-19.

Part 2 is plausible because checking if adequate heat sink or quick restart of ND available is a major action category of AP-19 but not the first major action category.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because checking if adequate heat sink or quick restart of ND available is a major action category of AP-19 but not the first major action category.

Basis for meeting the KA

The K/A is matched because the applicant is required to demonstrate knowledge of the operational implications of pump runout conditions and the actions required to mitigate a loss of RHR while at mid-loop.

Basis for Hi Cog

This question is a hi cognitive question because more than one mental step is involved. First, the applicant is required to analyze the conditions given in the stem to determine the correct course of action to mitigate the event and then recall from memory the first major action category of AP-19.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2018 MNS NRC Q44 (Bank 7442)

Development References

AP-19 (Loss of ND or ND System Leakage) Rev. 32
AP-19 Background Doc, Rev 17

Student References Provided

GEN2.4 2.4.9 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.
(CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
Rearranged answers from original bank question, correct answer is now "C". SLM 12/13/2018

GEN2.4 2.4.25 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of fire protection procedures. (CFR: 41.10 / 43.5 / 45.13)

Given the following:

- A Fire alarm has actuated in the Unit 1 CA Pump Room
- An Operator dispatched to the area reports that there is smoke and some cables with glowing embers but, **NO** visible flames

1) In accordance with AP/0/A/5500/045 (PLANT FIRE), this ________ classified as an ACTIVE fire.

2) In accordance with RP/0/A/5700/025 (FIRE BRIGADE RESPONSE), in addition to making an announcement on the Fire Brigade Radio and activating the Fire Brigade Pagers, a Plant PA announcement ________ required when dispatching the Fire Brigade.

Which ONE (1) of the following completes the statements above?

A. 1. is NOT
2. is

B. 1. is NOT
2. is NOT

C. 1. is
2. is

D. 1. is
2. is NOT

ILT 20-1 MNS SRO NRC Examination **QUESTION 74** 74 **A**

General Discussion

In accordance with AP-45 (Plant Fire) visible flames are required to classify a fire as ACTIVE.

In accordance with RP-25, the fire brigade is dispatched via a Plant PA announcement, activating the Fire Brigade pagers, and making an announcement on the Fire Brigade radio system.

Answer A Discussion

CORRECT. See explanation above.

Answer B Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the announcement on the Fire Brigade Radio and activating the Fire Brigade Pagers is more than adequate to dispatch the Fire Brigade. Making an announcement on the PA does not necessarily provide any additional assurance that all Fire Brigade members will respond. However, it does ensure that personnel not on the Fire Brigade stay clear of the area and it is required by RP-25.

Answer C Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because the presence of smoke and glowing embers means that the fire may have been active at one time.

Part 2 is correct.

Answer D Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because the presence of smoke and glowing embers means that the fire may have been active at one time.

Part 2 is plausible because the announcement on the Fire Brigade Radio and activating the Fire Brigade Pagers is more than adequate to dispatch the Fire Brigade. Making an announcement on the PA does not necessarily provide any additional assurance that all Fire Brigade members will respond. However, it does ensure that personnel not on the Fire Brigade stay clear of the area and it is required by RP-25.

Basis for meeting the KA

The K/A is matched because the applicant is required to demonstrate knowledge of the fire response emergency procedure and plant fire abnormal procedure.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2015 CNS NRC (Bank 6672)

Development References

RP/0/A/5700/025 (Fire Brigade Response), Attch 2, Rev. 22

AP/0/A/5500/045 (Plant Fire), Rev. 19

Student References Provided

GEN2.4 2.4.25 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of fire protection procedures. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

Rearranged answers from original bank question, correct answer is now "A". SLM 10/07/2019

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401-9 Comment: ENHANCEMENT/UNSAT
G2.4 2.4.32
This one be too specific. The K/A is really looking at generically what do operators do with a loss of annunciators. Let's talk about what your loss of annunciator procedure says.

Facility Response:
Cannot write a discerning question at the RO level and topic is being used in an admin JPM.
CE provided a new K/A (GEN 2.4, 2.2.25). Replaced question due to new K/A.
SLM 10/07/2019

GEN2.4 2.4.37 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of the lines of authority during implementation of the emergency plan. (CFR: 41.10 / 45.13)

Regarding AD-OP-ALL-1001 (CONDUCT OF ABNORMAL OPERATIONS),

1) When Reactor Operators (ROs) identify that a fold-out page condition is met, SRO concurrence ________ required PRIOR to performing any required actions.

2) The dispatch of Auxiliary Operators (AOs) to perform tasks outside the control room ________ performed by the Reactor Operators (ROs).

Which ONE (1) of the following completes the statements above?

A. 1. is NOT
   2. is NOT

B. 1. is
   2. is NOT

C. 1. is NOT
   2. is

D. 1. is
   2. is

General Discussion

In accordance with AD-OP-ALL-1001 (Conduct of Abnormal Operations),
When any condition is met that requires performance of a fold-out page item, then immediately notify the CRS. The CRS shall verify conditions are met before giving concurrence for the RO to perform any required actions.

In accordance with AD-OP-ALL-1001 (Conduct of Abnormal Operations), it is the responsibility of the Reactor operators to dispatch Auxiliary operators to perform tasks outside the control room.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because "prudent operator actions" contain similar actions as those carried out by the fold-out page and do NOT require SRO concurrence prior to performing.

Part 2 is plausible because the CRS is responsible for making crew direction decisions based on manpower availability.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the CRS is responsible for making crew direction decisions based on manpower availability.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because "prudent operator actions" contain similar actions as those carried out by the fold-out page and do NOT require SRO concurrence prior to performing.

Part 2 is correct.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because, the applicant must demonstrate knowledge of the lines of authority, once emergency procedures are entered, as defined by AD-OP-ALL-1001(Conduct of Abnormal Operations). Specifically, which actions are performed by the operators/CRS and actions allowed to be performed with/without CRS approval.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
AD-OP-ALL-1001, Conduct of Abnormal Operations, Rev 2

Student References Provided

GEN2.4 2.4.37 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of the lines of authority during implementation of the emergency plan. (CFR: 41.10 / 45.13)

Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS059 A2.04 - Main Feedwater (MFW) System

Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Feeding a dry S/G ....

Given the following on Unit 1:

- The crew tripped the reactor 65 minutes ago due to a main steam line break
- The crew has transitioned to ECA-2.1 (UNCONTROLLED DEPRESSURIZATION OF ALL S/Gs) due to a failure of all MSIVs
- The following indications are observed:
    - Feed flow to each S/G = 125 GPM
    - All S/G NR Levels = 0%
    - All S/G WR Levels = 20%
    - NC T-Colds = 410°F and lowering

1) Based on the conditions above, and in accordance with ECA-2.1, the crew will throttle feed flow to a MAXIMUM flowrate of ________ GPM to each S/G.

2) The basis for the action taken by the crew ________ because a thermal shock concern would exist if the S/G's were allowed to dry out.

Which ONE (1) of the following completes the statements above?

A. 1. 100
   2. is

B. 1. 100
   2. is NOT

C. 1. 25
   2. is

D. 1. 25
   2. is NOT

General Discussion

When the step in ECA-2.1 is reached that determines if S/G feed flow should be reduced, several parameters are checked. First, all NR S/G levels are checked greater than 11%. If not, the operator is sent to the RNO where they are directed to maintain at least 25 GPM flow to the S/G until level is greater than 11%.

Next, the operator checks cooldown rate less than 100°F in one hour. If the cooldown rate is excessive, the operator is directed to the RNO where they will reduce feed flow to 25 GPM. If cooldown is not excessive, they will maintain the current feed flow until NR S/G levels approach 50%. They will then throttle flow to maintain NR S/G levels less than 50%.

A reduction of feed flow to the S/Gs has three primary effects:

1.To minimize any additional cooldown resulting from the addition of feedwater,
2.To prevent S/G tube dry out by maintaining a minimum feed flow of 25 GPM to the S/Gs, (and prevent thermal shock in a dry S/G if feed flow is subsequently raised)
AND
3.To minimize the water inventory in the S/Gs that eventually is the source of additional steam flow to containment or the environment.

Answer A Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is plausible because FR-H.1 will direct this flowrate if S/G level is less than 12%.

Part 2 is correct.

Answer B Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is plausible because FR-H.1 will direct this flowrate if S/G level is less than 12%

Part 2 is plausible because the primary reason for feed flow reduction and overall mitigation strategy of ECA-2.1 is to address the extensive cooldown caused by this event.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the primary reason for feed flow reduction and overall mitigation strategy of ECA-2.1 is to address the extensive cooldown caused by this event.

Basis for meeting the KA

The K/A is matched because the applicant is presented with a set of conditions where they must determine the desired feed flow to all S/Gs based on competing indications (i.e., due to S/G levels, the feed flow must be greater than a minimum of 25 gpm. However, due to the cooldown, feed flow must be lowered to no more than 25 gpm). The applicant is then asked to predict the impact and use procedures (ECA-2.1) to correct, control, or mitigate the consequences of the event.

NOTE: As written, the K/A seems to be asking the impact of feeding a dry S/G and using procedures to control feeding a dry S/G. However, Westinghouse procedures do not address feeding a dry S/G. Westinghouse procedures are written to take actions to prevent S/G dry out. If S/G dry out does occur (i.e. minimum flow cannot be established to prevent dry out), AFW flow is NOT re-established after dry out until plant engineering performs an evaluation as part of the long-term plant recovery operation.

Basis for Hi Cog

This is a higher cognitive level question because it requires multiple mental steps. First, the applicant must recall from memory the requirements of ECA-2.1 for reducing S/G feed flow. Next, the applicant must evaluate the information provided to determine current conditions and the cooldown rate since the event started. Finally, the applicant must associate the recalled information to the evaluated information to determine the correct response.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification

Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):
1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)? NO. No part of this question is associated with systems level knowledge.

2) Can the question be answered solely by knowing immediate operator actions? NO. There are no immediate actions associated with ECA-2.1.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs? NO. The question has nothing to do with procedure entry conditions.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure? NO. Part of the mitigation strategy of ECA-2.1 is to control feed flow. However, this doesn't not tell the operator the specific requirement for controlling feed flow.

5) Does the question require one or more of the following:
- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
YES. The applicant must evaluate the conditions given and based on that evaluation determine which section of the procedure should be performed (i.e. reduce feed flow or maintain current feed flow until S/Gs are at least greater than 11%)

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
NO.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2018 MNS NRC Q78 (Bank 7476)

Development References
ECA-2.1 (Uncontrolled Depressurization of All S/Gs) Rev. 22 ECA-2.1 Background Document Rev. 13

Student References Provided

SYS059 A2.04 - Main Feedwater (MFW) System

Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Feeding a dry S/G ....

Remarks/Status
Rearranged answers from original bank question, correct answer is now "C". SLM 02/05/2019

SYS012 A2.05 - Reactor Protection System (RPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

Faulty or erratic operation of detectors and function generators ....

Given the following on Unit 1:

- The Unit is increasing power following a Refueling Outage
- At 42% reactor power, the P-8 permissive bistable fails "AS IS"

Subsequently:

- Reactor power is currently 52%
- 1A NCP trips

Consider Each Statement Separately

1) Based on the conditions above, an automatic Reactor trip signal ________ be generated.

2) If subsequent conditions require implementation of FR-S.1 (RESPONSE TO NUCLEAR POWER GENERATION/ATWS), the crew will transition from FR-S.1 to E-0 (REACTOR TRIP OR SAFETY INJECTION) ________.

Which ONE of the following completes the statements above?

A. 1. will NOT
   2. after FR-S.1 is performed to completion

B. 1. will
   2. after FR-S.1 is performed to completion

C. 1. will NOT
   2. immediately upon a successful Reactor trip

D. 1. will
   2. immediately upon a successful Reactor trip

General Discussion

On increasing power P-8 enables the 1/4 loop loss of flow Reactor Trip. On decreasing power, P-8 automatically blocks the above listed trip. For the conditions given, because P-8 failed "as is" below the setpoint (48%), a single-loop loss of flow will NOT initiate a reactor trip. In this case, loss of flow would have to occur on a second loop for the reactor trip to occur.

Per the EOP Rules of Usage, once the conditions have been met to implement FR-S.1, it must be entered and performed to completion.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 plausible if applicant confuses operation of the faulty P-8 bistable and concludes the single-loop loss of flow trip is functional.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible since it is logical to conclude that when the entry conditions for FR-S.1 are no longer met, that transition back to E-0 is allowed. Additionally, it is also plausible since it is a common misconception and a common mistake made by Licensed SROs that transition back to E-0 is permissible as soon as the reactor trip is successful.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if applicant confuses operation of the faulty P-8 bistable and concludes the single-loop loss of flow trip is functional.

Part 2 is plausible since it is logical to conclude that when the entry conditions for FR-S.1 are no longer met, that transition back to E-0 is allowed. Additionally, it is also plausible since it is a common misconception and a common mistake made by Licensed SROs that transition back to E-0 is permissible as soon as the reactor trip is successful.

Basis for meeting the KA

The K/A is matched since the applicant must be able to predict the impact of the faulty P-8 permissive bistable on current plant conditions and have knowledge of the Emergency Procedure rules of usage to determine what procedure flowpath is required.

Basis for Hi Cog

This question is a High Cognitive question because the applicant must be able to analyze plant conditions to determine the status of the P-8 permissive when it failed and based on current plant conditions determine the impact this failure will have.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) The question can NOT be answered solely by knowing systems knowledge.
Part 1 of this question can be answered using only systems knowledge and is therefore RO knowledge. However, it is included to meet the "predict the impacts of" part of the K/A.

Part 2 of the question can NOT be answered using system knowledge.

2) The question can NOT be answered by knowing immediate operator actions.
Neither part of this question can be answered by knowing the immediate actions of either E-0 or FR-S.1.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.
Neither part of this question can be answered by knowing the entry conditions of E-0 or FR-S.1. It is related to transition from FR-S.1 back to E-0.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.

5) The question requires knowledge of the EOP rules of usage to determine when procedure transition is allowed. Therefore, it is SRO knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2016 MNS NRC Q76 (Bank 7274)

Development References

REFERENCES:
Lesson Plan OP-MC-IC-IPE
OMP 4-3

Student References Provided

SYS012 A2.05 - Reactor Protection System (RPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

Faulty or erratic operation of detectors and function generators ....

Remarks/Status

ILT 20-1 MNS SRO NRC Examination **QUESTION 78** 78 **C**

SYS076 2.4.47 - Service Water System (SWS)

SYS076 GENERIC

Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material. (CFR: 41.10 / 43.5 / 45.12)

Given the following:

- On August 15th, both Units are at 100% RTP
- The BOP operator reports the following trend of SNSWP parameters:

Time	1600	1700
SNSWP Level (Ft)	739.90	739.70
SNSWP Temp (°F)	81.0	82.5

1) The EARLIEST time that the Standby Nuclear Service Water Pond (SNSWP) is **required** to be declared INOPERABLE is ________.

2) Based on the parameter requirement REQUIRING INOPERABILITY, and in accordance with T.S 3.7.8 (STANDBY NUCLEAR SERVICE WATER POND - SNSWP) Bases, not meeting this surveillance requirement affects the SNSWP's ability to ________.

Which ONE (1) of the following completes the statements above?

A. 1. 1600
   2. cool KC to at least its maximum design temperature

B. 1. 1600
   2. provide sufficient NPSH to operate the RN pumps

C. 1. 1700
   2. cool KC to at least its maximum design temperature

D. 1. 1700
   2. provide sufficient NPSH to operate the RN pumps

General Discussion

Per T.S. 3.7.8, the SNSWP shall be operable in Modes 1-4. Surveillance requirements for the SNSWP require the level to be greater than or equal to 739.50 feet and the temperature must be less than or equal to 82.0 °F.
Per T.S. 3.7.8 Bases, the SR for SNSWP level ensures that sufficient NPSH is available to operate the NSWS pumps.
Per T.S. 3.7.8 Bases, the SR for SNSWP temperature verifies that the NSWS is available to cool the CCW System to at least its maximum design temperature.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the temperature exceeds the acceptance criteria value in the Daily Surveillance PT and would require having maintenance manually determine SNSWP temperature.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude 739.9 feet is equivalent to 739 feet , 9 inches which is the acceptance criteria for level in the Daily Surveillance PT. However the TS requirement for SNSWP level is 739.5 feet.

Part 2 is plausible because this is the concern stated in the bases for not meeting the SNSWP level surveillance requirement and would be correct if the applicant determines SNSWP level is the reason for inoperability.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because this is the concern stated in the bases for not meeting the SNSWP level surveillance requirement and would be correct if the applicant determines SNSWP level is the reason for inoperability (Level is below th acceptance criteria value of the Daily Surveillance).

Basis for meeting the KA

The K/A is matched because the applicant must diagnose/interpret provided control room trends to determine the earliest time (in a timely manner) the SNSWP should be declared inoperable (using control room reference materials).

Basis for Hi Cog

This question is higher cognitive because it requires more than one mental step.
First the applicant must diagnose/interpret the conditions given to determine which the earliest time the SNSWP is required to be declared inoperable.
Next, the applicant must recall from memory the TS bases reason for having to meet the particular surveillance requirement.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):
1) This question can NOT be answered by knowing less than 1 hour Tech Specs

2) This question can NOT be answered by knowing information listed "above-the-line".

3) This question can NOT be answered by knowing the TS Safety Limits or their bases.

4) This question requires the applicant to have knowledge of the Tech Spec Basis and Surveillance requirements. Specifically, it requires the applicant to have knowledge of the Tech Spec Basis (3.7.8) surveillance requirements.

ILT 20-1 MNS SRO NRC Examination **QUESTION 78** 78 **C**

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
T.S. 3.7.8 (Standby Nuclear Service Water Pond - SNSWP) T.S. 3.7.8 Bases

Student References Provided

SYS076 2.4.47 - Service Water System (SWS)

SYS076 GENERIC

Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material. (CFR: 41.10 / 43.5 / 45.12)

Remarks/Status

SYS078 A2.01 - Instrument Air System (IAS)

Ability to (a) predict the impacts of the following malfunctions or operations on the IAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Air dryer and filter malfunctions ....

Given the following:

- The VI system has become contaminated with oil
- The VI air dryer packages rapidly clog
- VI pressure is 88 PSIG and lowering
- Both units have implemented AP-22 (LOSS OF VI)

Based on the conditions above and in accordance with AP-22,

1) The VI Dryer Purge Exhaust Valves ________ auto CLOSED.

2) The CRS will direct implementation of Enclosure 5 (VI DRYER and VI TO VS ISOLATION) if VI pressure lowers to less than a MAXIMUM of ________.

Which ONE (1) of the following completes the statements above?

A. 1. have
   2. 82 PSIG

B. 1. have
   2. 70 PSIG

C. 1. have NOT
   2. 82 PSIG

D. 1. have NOT
   2. 70 PSIG

General Discussion

The three VI Dryer Purge Exhaust Valves operate together and will automatically close when VI pressure is less than 90 psig.

IAW AP-22, step 5F, IF AT ANY TIME VI header pressure goes below 82 PSIG ("VI/VS LO-LO PRESS" alarm), THEN dispatch operator to bypass VI dryers and isolate VS PER Enclosure 5 (VI Dryer and VI to VS System Isolation) using copy of procedure located beside Service Bldg Lube Oil Station door.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because AP-22 will have the CRS direct implementation of Enclosure 6 (D, E and F VI Compressor Operation with Low Control Air) if VI pressure lowers to less than 70 PSIG.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because there are automatic actions concerning the VI dryers that will NOT occur until VI pressure lowers to less than 85 PSIG (VI dryer bypass valve opens).

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because there are automatic actions concerning the VI dryers that will NOT occur until VI pressure lowers to less than 85 PSIG (VI dryer bypass valve opens).

Part 2 is plausible because AP-22 will have the CRS direct implementation of Enclosure 6 (D, E and F VI Compressor Operation with Low Control Air) if VI pressure lowers to less than 70 PSIG.

Basis for meeting the KA

The K/A is matched because the applicant has to "predict the impact of an Air Dryer malfunction" (i.e. what automatic actions have occurred) and use procedures to correct, control or mitigate the malfunction (i.e. which enclosure is required at a specific VI pressure to mitigate the event).

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) The question can NOT be answered solely by knowing systems knowledge.
Part 1 of the question can be answered with system knowledge.

2) The question can NOT be answered by knowing immediate operator actions.
There are NO immediate actions associated with AP-22.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.
The required knowledge is not related to AP-22 entry conditions rather knowledge of the content of AP-22.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.
This is detailed knowledge of procedure step content, not sequence of events within the procedure, or overall mitigative strategy.

5) This question requires the applicant to have knowledge of diagnostic steps and decision points (when to implement attachments) within the procedure which require the applicant to initiate actions based on a specific set of conditions. Therefore, it is SRO level knowledge.

ILT 20-1 MNS SRO NRC Examination **QUESTION 79** 79 **A**

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References
AP-22 (Loss of VI) Rev. 38 Lesson plan SS-VI, Rev 40

Student References Provided

SYS078 A2.01 - Instrument Air System (IAS)

Ability to (a) predict the impacts of the following malfunctions or operations on the IAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Air dryer and filter malfunctions ....

Remarks/Status

ILT 20-1 MNS SRO NRC Examination **QUESTION 80** 80 **D**

SYS103 2.4.21 - Containment System

SYS103 GENERIC

Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc. (CFR: 41.7 / 43.5 / 45.12)

Given the following on Unit 1:

- A LOCA has occurred inside Containment
- Containment pressure is 11 PSIG
- ES-1.3 (TRANSFER TO COLD LEG RECIRC), has been implemented
- The 1A NS pump has been started

Subsequently:

- The 1A NS pump trips
- Containment pressure is 6.5 PSIG

Based on the conditions above,

the current condition of the Containment Critical Safety Function is ___(1)___ AND alignment of 1B NS will be performed per ___(2)___.

Which ONE (1) of the following completes the statement above?

PROCEDURE LEGEND:

FR-Z.1 (RESPONSE TO HIGH CONTAINMENT PRESSURE)
ES-1.3 (TRANSFER TO COLD LEG RECIRC)

A. 1. RED
2. FR-Z.1

B. 1. ORANGE
2. FR-Z.1

C. 1. RED
2. ES-1.3

D. 1. ORANGE
2. ES-1.3

General Discussion

In accordance with ES-1.3 (TRANSFER TO COLD LEG RECIRC), a failure of NS with Containment pressure greater than 3 PSIG will cause a Containment orange path. However, ES-1.3 directs the operators to attempt to restore NS by performing actions in ES-1.3 prior to implementing FR-Z.1. If FR-Z.1 is entered, the procedure will direct operators back to ES-1.3 for the conditions given.

Answer A Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses the Containment Critical Safety Function for a RED and ORANGE path. They could conclude that a loss of NS with Containment pressure greater than 3 PSIG would result in a RED path instead of an ORANGE path. This is plausible since the Containment CSF is one of the cases where both a RED path and ORANGE path lead to the same Functional Restoration Procedure.

Part 2 is plausible because in most cases if a RED or ORANGE path is received, transition to FR-Z.1 would be the correct response. And, if the actions performed in ES-1.3 were unsuccessful, transition to FR-Z.1 would be required.

Answer B Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because in most cases if a RED or ORANGE path is received, transition to FR-Z.1 would be the correct response. And, if the actions performed in ES-1.3 were unsuccessful, transition to FR-Z.1 would be required.

Answer C Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses the Containment Critical Safety Function for a RED and ORANGE path. They could conclude that a loss of NS with Containment pressure greater than 3 PSIG would result in a RED path instead of an ORANGE path. This is plausible since the Containment CSF is one of the cases where both a RED path and ORANGE path lead to the same Functional Restoration Procedure.

Part 2 is correct.

Answer D Discussion

CORRECT. See explanation above.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge of the parameters(containment conditions) that feed into the Containment CSF status tree and the ability to assess the status based on those parameters .

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.
First, the applicant must analyze the conditions given to determine the effect on the Containment Critical Safety Function.
Next, the applicant must recall from memory the required procedural actions based on the conditions given.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):
1) The question can NOT be answered solely by knowing systems knowledge. This question requires detail procedure knowledge and assessment of plant conditions related to procedure selection.

2) The question can NOT be answered by knowing immediate operator actions. This question is related to knowledge of procedure selection criteria within the body of the procedure.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs. These are not related to entry conditions for an EOP. This is related to differentiation between two procedures which would perform the same recovery actions and selection of the appropriate procedure based on plant conditions and specific procedural guidance.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure. This is detailed knowledge of procedure step guidance for appropriate procedure selection.

5) The question requires detailed knowledge of procedure content. It requires the applicant to assess plant conditions based on given information and select the appropriate procedure based on guidance within the body of the procedure. Therefore, it is SRO knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2014 MNS NRC Q78 (Bank 6580)

Development References
FR-Z.1, Response to High Containment Pressure, rev 19 ES-1.3, Transfer to CLR, rev 28 F-0, CSF Status Trees, Containment Status Tree, Rev 6

Student References Provided

SYS103 2.4.21 - Containment System

SYS103 GENERIC

Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc. (CFR: 41.7 / 43.5 / 45.12)

Remarks/Status
Rearranged answers from original bank question, correct answer is now "D". SLM 01/15/2019

SYS028 A2.02 - Hydrogen Recombiner and Purge Control System (HRPS)

Malfunctions or operations on the HRPS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

LOCA condition and related concern over hydrogen ....

Given the following on Unit 1:

- The crew has implemented EP/1/A/5000/E-1 (LOSS OF REACTOR OR SECONDARY COOLANT) following a LOCA
- Containment Pressure is 2.2 psig
- Containment Sump Level is 10.6 ft
- Containment Radiation is 28 R/Hr
- Containment Hydrogen Concentration is 6.8%

1) Per the Containment CSF status tree, MINIMUM requirements for entry into EP/1/A/5000/FR-Z.4 (RESPONSE TO HIGH CONTAINMENT HYDROGEN CONCENTRATION) ________ met.

2) Based on the conditions above, the CRS ________ required to direct energizing the Hydrogen Ignitors.

Which ONE of the following completes the statements above?

A. 1. are NOT
 2. is

B 1. are NOT
 2. is NOT

C. 1. are
 2. is

D 1. are
 2. is NOT

General Discussion

Per F-0, the following parameters are required for entry into FR-Z.4:
Containment Pressure < 3 psig
Containment Sump Level < 12.5 ft
Containment Radiation Level < 35 R/hr
Containment Hydrogen > 0.5%

E-1 and FR-Z.4 will only direct energizing hydrogen ignitors if Containment Hydrogen concentration is < 6%. Otherwise, station management will be consulted for recommendation of other methods.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant is unaware of the additional parameters (beyond H2 concentration) required in order to meet FR-Z.4 entry. For example, Containment Radiation >35 would result in FR-Z.2 entry and bypass this CSF function. Additionally, multiple Eps provide H2 control guidance following a LOCA which could lead one to reason this procedure would not necessarily be required for mitigation.

Part 2 is plausible if the applicant is unaware of the high Containment Hydrogen limit and the applicant reasons that a higher concentration would require use of the Hydrogen Ignitors.

Answer B Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant is unaware of the additional parameters (beyond H2 concentration) required in order to meet FR-Z.4 entry. For example, Containment Radiation >35 would result in FR-Z.2 entry and bypass this CSF function. Additionally, multiple EPs provide H2 control guidance following a LOCA which could lead one to reason this procedure would not necessarily be required for mitigation.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above:

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant is unaware of the high Containment Hydrogen limit and the applicant reasons that a higher concentration would require use of the Hydrogen Ignitors.

Answer D Discussion

CORRECT. See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant is required to demonstrate the ability to use procedures to mitigate the actions of a high containment hydrogen concentration through knowledge of the operation of the HRPS system.

Basis for Hi Cog

This question is higher cognitive because it requires more than one mental step:
1. The applicant must compare provided information with that recalled from memory in order to determine entry requirements for a CSF recovery procedure.
2. The applicant must compare provided information with that recalled from memory in order to determine proper operation of the Hydrogen Ignitor system.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):
1) This question can NOT be answered solely by knowing systems knowledge.

2) This question can NOT be answered by knowing immediate operator actions.

3) This question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.

4) This question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure.

ILT 20-1 MNS SRO NRC Examination **QUESTION 81** 81 **D**

This question requires knowledge of yellow path CSF entry criteria (SRO only) and detailed knowledge of the associated procedure.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2017 CNS NRC (Bank 7188)

Development References

F-0 (Critical Safety Function Status Trees), Rev. 6
FR-Z.4 (Response to High Containment Hydrogen Concentration), Rev. 2
E-1 (Loss of Reactor or Secondary Coolant), Rev. 18

Student References Provided

SYS028 A2.02 - Hydrogen Recombiner and Purge Control System (HRPS)

Malfunctions or operations on the HRPS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

LOCA condition and related concern over hydrogen ....

Remarks/Status

Rearranged answers from original bank question, correct answer is now "D". SLM 01/15/2019

FOR REVIEW ONLY - DO NOT DISTRIBUTE

SYS029 2.1.23 - Containment Purge System (CPS)
SYS029 GENERIC
Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)

Given the following on Unit 1:

- Unit is cooling down for a refueling outage
- Containment purge has been initiated in preparation for Containment entry

Subsequently,

- 1EMF-39L (CONTAINMENT GAS - LOW RANGE) experiences a loss of power and is subsequently declared INOPERABLE

Based on the conditions above and in accordance with OP/1/A/6450/015 (CONTAINMENT PURGE SYSTEM),

1) VP will be aligned for shutdown using ________.

2) when 1EMF-39 is restored to OPERABLE, VP ________ be re-started using the current GWR permit.

Which ONE (1) of the following completes the statements above?

A. 1. Enclosure 4.3 (VP SHUTDOWN)
2. can

B. 1. Enclosure 4.3 (VP SHUTDOWN)
2. can NOT

C. 1. Enclosure 4.6 (TEMPORARY SHUTDOWN OF VP)
2. can

D. 1. Enclosure 4.6 (TEMPORARY SHUTDOWN OF VP)
2. can NOT

General Discussion

Per OP/1/A/6450/015,
IF VP will NOT be restarted OR is being secured due to 1EMF 38/39/40 package being inoperable, THEN shutdown per Enclosure 4.3 (VP System Shutdown).
When VP is shutdown per Enclosure 4.3, the release paperwork is completed for that GWR permit.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because when VP is routinely stopped or is terminated due to a trip 2 condition on 1EMF-39, procedural guidance is to use temporary shutdown enclosure which allows restart with existing GWR paperwork (permit).

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because a trip 2 condition has occurred due to the loss of power, if the EMF had not been declared inoperable this would be the correct answer.

Part 2 is plausible because when VP is routinely stopped or is terminated due to a trip 2 condition on 1EMF-39, procedural guidance is to use temporary shutdown enclosure which allows restart with existing GWR paperwork (permit).

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because a trip 2 condition has occurred due to the loss of power, if the EMF had not been declared inoperable this would be the correct answer.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the operator must demonstrate the ability to perform specific system and integrated plant procedures (OP/1/A/6450/015 , Containment Purge System) during all modes of plant operation (Specifically, when containment purge is being used in Mode 5 during a plant shutdown).

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.
The applicant must analyze the conditions given in the stem to determine the required procedural actions (selecting the correct enclosure) and then determine the affect the procedure selection will have on the status of the GWR permit

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):
1) The question can NOT be answered solely by knowing systems knowledge.

2) The question can NOT be answered by knowing immediate operator actions.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.

5) The question requires detailed knowledge of procedure content. It requires the applicant to assess plant conditions based on given information and select the appropriate procedure enclosure based on guidance within the body of the procedure. Therefore, it is SRO knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

ILT 20-1 MNS SRO NRC Examination **QUESTION 82** 82 **B**

Development References
OP/1/A/6450/015, Containment Purge System, Rev 41

Student References Provided

SYS029 2.1.23 - Containment Purge System (CPS)
SYS029 GENERIC
Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)

Remarks/Status
401-9 Comments: SAT   029 2.1.23 I think this meets the K/A at the SRO level Facility Response: NONE

SYS068 A2.04 - Liquid Radwaste System (LRS)

Ability to (a) predict the impacts of the following malfunctions or operations on the Liquid Radwaste System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operatios: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Failure of automatic isolation ....

Given the following on Unit 1:

- Unit is at 100% RTP
- An approved Waste Monitor Tank discharge to RC is occurring

Subsequently,

- 0EMF-49 HI RAD annunciator alarms but the release fails to automatically terminate

1) If the unmonitored release continues, the SLC 16.11.3 (DOSE - LIQUID EFFLUENTS) MAXIMUM dose commitment for any calendar quarter of ________ to the total body could be exceeded.

2) If the SLC 16.11.3 dose commitment is exceeded, a(an) ________ is required to be provided to the NRC.

Which ONE (1) of the following completes the statements above?

A. 1. 1.5 mrem
   2. immediate notification

B. 1. 1.5 mrem
   2. 30 day special report

C. 1. 3.0 mrem
   2. immediate notification

D. 1. 3.0 mrem
   2. 30 day special report

General Discussion

Per SLC 16.11.3 Dose - Liquid Effluents:
The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released from each unit to UNRESTRICTED AREAS (see Figure16.11.1-1) shall be limited:
a. During any calendar quarter, to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ, and
b. During any calendar year, to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

Prepare and submit a Special Report to the NRC which identifies the causes for exceeding the limits, corrective actions taken to reduce releases, and actions taken to ensure that subsequent releases are within limits within 30 days.

Per RP-10 (NRC Immediate Notification Requirements):
Any event involving by-product, source, OR special nuclear material possessed by the licensee that may have caused OR threatens to cause any of the following conditions: An individual to receive:
1) A total effective dose equivalent of 25 rems (0.25 Sv) OR more;
2) A lens dose equivalent of 75 rems (0.75 Sv) OR more.
3) A shallow-dose equivalent to the skin OR extremities of 250 rads (2.5 Gy) OR more.
4) The release of radioactive material, inside outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake five times the annual limit on intake (the provisions of this paragraph do NOT apply to locations where personnel are NOT normally stationed during routine operations, such as hot-cells OR process enclosures).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because RP-10 (NRC Immediate Notification Requirements), provides several examples where immdeiate notification is required based on dose rates and/or releases to the public.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 3.0 mrem is the SLC 16.11.3 limit to the total body for any calendar year.

Part 2 is plausible because RP-10 (NRC Immediate Notification Requirements), provides several examples where immdeiate notification is required based on dose rates and/or releases to the public.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 3.0 mrem is the SLC 16.11.3 limit to the total body for any calendar year.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the ability to predict the impact (to members of the public) of a failure to auto isolate a liquid effluent release and control the consequences by adhering to SLC limits.

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):

1) Question can not be answered solely by knowing less than or equal to 1 hour TS Action.

2) Question can not be answered solely by knowing the LCO information listed "above the line". Question 1 can be answered by knowing above the line information but answering question 2 requires knowledge of SLC bases.

3) Question can not be answered solely by knowing the TS Safety Limits.

4) Question does require applicants to apply knowledge of SLC bases information, therefore the question is SRO-only.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References
SLC 16.11.3, Dose - Liquid Effluents, Rev 0 RP-10, NRC Immediate Notification Requirements, Rev 031

Student References Provided

SYS068 A2.04 - Liquid Radwaste System (LRS)

Ability to (a) predict the impacts of the following malfunctions or operations on the Liquid Radwaste System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operatios: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Failure of automatic isolation ....

Remarks/Status

EPE029 EA2.02 - Anticipated Transient Without Scram (ATWS)
Ability to determine or interpret the following as they apply to a ATWS : (CFR 43.5 / 45.13)
Reactor trip alarm ....

Given the following on Unit 1:

- The unit is at 30% RTP
- NC pump 1C trips during I&E testing

Five minutes after the NCP trip,

- A lockout occurs on 1A Busline due to a fault
- The Reactor Trip breakers remain CLOSED

Based on the conditions above,

1) annunciator 1FO-1/F3 (LO FLO P7 PERMIS RX TRIP) ________ be in alarm.

2) a required subsequent action and basis for the action is to ________.

Which ONE (1) of the following completes the statements above?

PROCEDURE LEGEND:

Technical Specification 3.4.4 (RCS LOOPS MODES 1 & 2)

A. 1. will
2. manually trip the turbine to conserve SG inventory

B. 1. will
2. manually trip the turbine to generate a redundant reactor trip signal

C. 1. will NOT
2. restart 1C NC pump within 6 hours to comply with TS 3.4.4

D. 1. will NOT
2. place the unit in MODE 3 within 6 hours to comply with TS 3.4.4

General Discussion

For the conditions given, because the 1C NC pump has tripped prior to 1A Busline Lockout, a slow transfer of 1TA and 1TC will occur. The slow transfer will result in an underfrequency condition on 1TA and 1TC which will cause all four NC pumps to trip. This results in a reactor trip signal (2 loop loss of flow above P7). Since the reactor trip breakers remain closed, an ATWS condition exists.
One of the actions required for the ATWS condition is to manually trip the main turbine to conserve inventory in the SGs. The worse case ATWS scenario is a failure of the reactor to trip coincident with a loss of heat sink.
Had the 1B or 1D NC pump tripped prior to the 1A Busline Lockout, a fast transfer of the 1TA and 1TC busses would have occurred, no underfrequency condition would have occurred, and the remaining NC pumps would still be running. Therefore, an ATWS condition would not exist. However, since the unit would be in MODE 1 with less than 4 NC loops in service, a shutdown to MODE 3 within 6 hours would be required IAW TS 3.4.4. Additionally, if power was less than 25% RTP, the NC pump could be restarted per OP/1/A/6150/002A (Reactor Coolant Pump Operation) and the actions of TS 3.4.4 would not be required.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because tripping the turbine would provide a redundant reactor trip signal when above P-8.
Additionally, because manually initiating a protective feature to cause another protective feature to actuate is SOMETIMES true in the EOPs. For example, in ECA-0.0 (Loss of All AC Power), one of the actions taken is to initiate
Safety Injection. The basis for this is to generate a LOCA signal to the sequencer which may start the DG.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes conditions are met for a fast transfer of 1TA and 1TC. If that were the case the auto-swap would occur and no reactor trip signal would be generated, therefore an ATWS condition would not exist.

Part 2 is plausible if the applicant concludes that a fast transfer of 1TA and 1TC has occurred (i.e., no ATWS is in progress) and does NOT recall the requirement that a Reactor Coolant Pump cannot be started with power greater than 25% RTP. If so, the applicant would conclude that restarting the NC pump is possible and that after the pump is started (i.e. the loop returned to service) the LCO requirements of TS 3.4.4 would be met. In other words, if a fast transfer had occurred and power was less than 25% RTP, this would be the correct answer.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes conditions are met for a fast transfer of 1TA and 1TC. If that were the case the auto-swap would occur and no reactor trip signal would be generated, therefore an ATWS condition would not exist.

Part 2 is plausible if the applicant concludes that a fast transfer of 1TA and 1TC has occurred. If a fast transfer of 1TA and 1TC had occurred the Reactor should NOT trip and an ATWS would not be in progress. Consequently, since a Reactor Coolant Pump cannot be started with power greater than 25% RTP, this would be the correct action.

Basis for meeting the KA

This K/A is matched because the applicant is being asked to evaluate (interpret) a set of plant conditions and determine whether or not a reactor trip signal exists (by the presence of a first out annunciator) and therefore, if an ATWS has occurred. The applicant is then asked about actions contained in the ATWS EOP (tripping the main turbine) and the reason for that action.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.
First, the applicant must analyze the conditions given to determine if a reactor trip should have occurred.
The applicant must then recall from memory the action to be taken and the reason for that action based on the results of the analysis from the first part of the question.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) The question can NOT be answered solely by knowing systems knowledge.
Part 1 of the question can be answered with system knowledge and is therefore RO-level knowledge.

2) The question can NOT be answered by knowing immediate operator actions.
The question cannot be answered solely by knowing immediate actions. While A2 and B2 are related to the immediate actions of FR-S.1, the applicant must be able to select between those actions and the actions in C2 and D2. Additionally, the only way the applicant could select between A2 and B2 would be to know the reason for performing that action which can only be gained by detailed knowledge of the FR-S.1 Background documents. That is NOT expected knowledge for Ros.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.
The question is related to procedure actions and NOT procedure entry conditions.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.
This is detailed knowledge of procedure content related to knowing the plant shutdown requirements.

5) The question also requires the applicant to assess given plant conditions and determine whether or not an ATWS has actually occurred and then selecting a given action that is contained in the correct procedure to mitigate the event and the basis for that action. Therefore, it is SRO-level knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	MODIFIED	2018 MNS NRC Q84 (Bank 7482)

Development References
OMP 4.3 (Use of Abnormal and Emergency Procedures) Rev. 47 OP/1/A/6100/010 A (Annunciator Response for Panel 1FO-1, Rev 14 FRS (ATWS) Bckgd Document Rev. 14 TS 3.4.4 (RCS Loops Modes 1 and 2)

Student References Provided

EPE029 EA2.02 - Anticipated Transient Without Scram (ATWS)
Ability to determine or interpret the following as they apply to a ATWS : (CFR 43.5 / 45.13)
Reactor trip alarm ....

Remarks/Status
401-9 Comments: SAT EPE029 EA2.02 - Anticipated Transient Without Scram (ATWS) Since the 2nd question has 4 differing answers, the first question is not relevant except to meet the K/A. I think this is OK Facility Response: NONE

EPE038 2.2.44 - Steam Generator Tube Rupture (SGTR)

EPE038 GENERIC

Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions. (CFR: 41.5 / 43.5 / 45.12)

Given the following on Unit 2:

- The crew has implemented E-3 (STEAM GENERATOR TUBE RUPTURE)
- Initial cooldown of the NC system to the target CET temperature has been completed
- The OATC reports subcooling based on CETs is 25°F and lowering

1) In accordance with the E-3 background document, the purpose of the INITIAL cooldown of the NC system is to establish a MINIMUM of ________ of subcooling.

2) If the above amount of subcooling can NOT be maintained after the cooldown is stopped, The CRS will direct the crew to GO TO ________ in accordance with E-3.

Which ONE (1) of the following completes the statements above?

PROCEDURE LEGEND

ECA-3.1 (SGTR WITH LOSS OF REACTOR COOLANT SUBCOOLED RECOVERY DESIRED)
ECA-3.2 (SGTR WITH LOSS OF REACTOR COOLANT SATURATED RECOVERY DESIRED)

A. 1. 20°F
   2. ECA-3.1

B. 1. 20°F
   2. ECA-3.2

C. 1. 0°F
   2. ECA-3.1

D. 1. 0°F
   2. ECA-3.2

General Discussion

Per the E-3 bckgd doc,
The NC cooldown completed in Step 16 is designed to establish a 20 degreeF subcooling margin in the primary system at the ruptured S/G pressure. For SGTR events, including multiple tube failures, the primary pressure will stabilize at a value greater than the ruptured S/G pressure with S/I on. Consequently, at this stage of the recovery, the subcooling margin is expected to be greater than 20 degreeF. If not, a loss of reactor coolant is suspected.
Per E-3,
IF NC subcooling cannot be promptly restored to greater than 20°F, THEN GO TO EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant - Subcooled Recovery Desired).

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because if adequate subcooling can not be maintained, procedures in the EP network typically require transition to a procedure that deals with "saturated" recovery.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because NC subcooling less than 0 degrees F is a point at which the depressurization performed in E-3, to stop the primary to secondary leakage, is secured. However the initial cooldown is performed to ensure that a minimum of 20 degrees of subcooling exists prior to beginning the depressurization.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because NC subcooling less than 0 degrees F is a point at which the depressurization performed in E-3, to stop the primary to secondary leakage, is secured. However the initial cooldown is performed to ensure that a minimum of 20 degrees of subcooling exists prior to beginning the depressurization.

Part 2 is plausible because if adequate subcooling can not be maintained, procedures in the EP network typically require transition to a procedure that deals with "saturated" recovery.

Basis for meeting the KA

The K/A is matched because the applicant is required to interpret control room indications (Core Exit Thermocouples) and determine proper procedure transition based on those indications.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. First, the applicant is required to evaluate the conditions in the stem and determine the affect those conditions will have on proper procedure selection and then recall from memory a specific setpoint from the background document.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

Question can NOT be answered solely by knowing "systems knowledge".

Question can NOT be answered solely by knowing the immediate operator actions.

Question can NOT be answered solely by knowing entry conditions or plant parameters that required direct entry into major EOPs.

Question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.

Question DOES require knowledge of diagnostic steps and a decision point in E-3 that involves a transition to an emergency contingency

procedure (ECA-3.1) and is therefore an SRO only question.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2016 CNS NRC (Bank 6380)

Development References
E-3 (S/G Tube Rupture), Rev 25 E-3 Background document, Rev 14

Student References Provided

EPE038 2.2.44 - Steam Generator Tube Rupture (SGTR)

EPE038 GENERIC

Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions. (CFR: 41.5 / 43.5 / 45.12)

Remarks/Status

APE054 2.4.35 - Loss of Main Feedwater (MFW)
APE054 GENERIC
Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. (CFR: 41.10 / 43.5 / 45.13)

Given the following on Unit 2:

- Unit was at 100% RTP
- A feedwater line break inside containment has occurred
- 2A and 2B MDCA Pumps did NOT auto start
- TDCA pump tripped on mechanical overspeed and can NOT be reset
- The operating crew entered FR-H.1, (RESPONSE TO LOSS OF SECONDARY HEAT SINK)

Subsequently,

- All S/G WR Levels are 48% and lowering slowly
- The BOP operator is able to manually start 2A MDCA pump
- An AO reports the 2B MDCA pump breaker tripped on over-current
- The crew determines the discharge path to the associated S/Gs from 2A MDCA pump can NOT be established

Based on the conditions above and in accordance with FR-H.1,

1) the CRS will direct implementation of FR-H.1, Enclosure ________.

2) after implementation of the enclosure, TOTAL CA flow to all S/Gs will be limited to a MAXIMUM of ________ GPM, to prevent pump runout.

Which ONE (1) of the following completes the statements above?

PROCEDURE LEGEND:

Enclosure 5 (MD CA PUMP TRAIN A/B CROSS-TIE ALIGNMENT)
Enclosure 6 (LOCAL CA VALVE ALIGNMENT)

A. 1. 6
2. 600

B. 1. 6
2. 700

C. 1. 5
2. 600

D. 1. 5
2. 700

General Discussion

Per FR-H.1, Response to Loss of Heat Sink:
IF only one MD CA pump is on, AND its discharge path cannot be reopened to its associated S/Gs, THEN evaluate aligning flow to another S/G through MD CA train A/B cross-tie PER Enclosure 5 (MD CA Pump Train A/B Cross-tie Alignment).

Limit MD CA pump flow in next steps to the following limits to prevent pump runout:
Total CA flow to all S/Gs less than 600 GPM

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because enclosure 6 is required to be performed in FR-H.1 if no CA flow is indicated and no CA pump can be started.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because enclosure 6 is required to be performed in FR-H.1 if no CA flow is indicated and no CA pump can be started.

Part 2 is plausible because 700 gpm is the acceptable CA flow required to adequately remove heat generation during an ATWS event.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 700 gpm is the acceptable CA flow required to adequately remove heat generation during an ATWS event.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of local auxiliary operator tasks (performing alignments in Enclosure 5) and the resultant operational effects of those alignments (limits on total CA flow).

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved.
First, the applicant must analyze the conditions in the stem to determine the correct enclosure to mitigate the event. Then, the applicant is required to recall from memory the CA flow limits based on the new system alignment.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) The question can NOT be answered solely by knowing systems knowledge.

2) The question can NOT be answered by knowing immediate operator actions.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.

5) The question requires detailed knowledge of procedure steps and requires the applicant to analyze the conditions given and based on that analysis determine the appropriate enclosure to implement. Therefore, it is SRO knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

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Development References
FR-H.1, Response to Loss of Secondary Heat Sink, Rev 24 EP-FR-S, Response to Nuclear Power Generation/ATWS, lesson plan, Rev 14

Student References Provided

APE054 2.4.35 - Loss of Main Feedwater (MFW)

APE054 GENERIC

Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

EPE055 EA2.02 - Loss of Offsite and Onsite Power (Station Blackout)
Ability to determine or interpret the following as they apply to a Station Blackout : (CFR 43.5 / 45.13)
RCS core cooling through natural circulation cooling to S/G cooling .....

Given the following on Unit 1:

- The crew has implemented ECA-0.0 (LOSS OF ALL AC POWER)
- The Standby Makeup pump has failed to start
- All S/Gs are being depressurized to 290 PSIG

In accordance with ECA-0.0,

1) if Rx vessel upper head voiding occurs, the crew ________ required to stop the S/G depressurization.

2) if the 1A S/G depressurization continues below 290 PSIG and can NOT be stopped from the control room, the CRS will dispatch an operator to ________ the 1A SM PORV.

Which ONE (1) of the following completes the statements above?

A. 1. is
2. locally operate

B. 1. is
2. bypass the solenoid for

C. 1. is NOT
2. locally operate

D. 1. is NOT
2. bypass the solenoid for

General Discussion

In accordance with ECA-0.0 and ECA-0.0 bckgd document:
A note prior to step 31indicates that Pzr level may be lost and reactor vessel head voiding may occur due to depressurization of S/Gs. Depressurization should not be stopped to prevent these occurrences.

Step 31 K requires throttling SM PORVs to maintain S/G pressure at 290PSIG. IF this cant be achieved the RNO requires performing the RNO for Step 31 F.
Step 31 F RNO is also used to begin the S/G depressurization with the SM PORVs. If a single SM PORV is not operating correctly, an operator is dispatched to operate the valve locally. If all SM PORVs fail to operate correctly, an operator is dispatched to bypass the solenoid valves.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because stopping the S/G depressurization to 290 psig is required for other conditions (if S/G NR level in intact S/Gs goes below 11% or if an inadvertent criticality occurs).

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because stopping the S/G depressurization to 290 psig is required for other conditions (if S/G NR level in intact S/Gs goes below 11% or if an inadvertent criticality occurs).

Part 2 is plausible because If all SM PORVs fail to operate correctly, an operator is dispatched to bypass the solenoid valves.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because If all SM PORVs fail to operate correctly, an operator is dispatched to bypass the solenoid valves.

Basis for meeting the KA

The K/A is matched because the applicant must demonstrate the ability to interpret plant conditions and determine if S/G depressurization must be terminated, therefore affecting the cooldown rate of the NC system.

Basis for Hi Cog

The question is higher cognitive because more than one mental step is involved. First, the applicant must analyze the conditions to determine if depressurization to 290 psig is required to be stopped , then recall from memory specific procedure actions to terminate depressurization prior to going below 190 psig.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):
1) The question can NOT be answered solely by knowing systems knowledge.

2) The question can NOT be answered by knowing immediate operator actions.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.

5) The question requires detailed knowledge of procedure steps and requires the applicant to analyze the conditions given and based on that analysis determine the appropriate action. Therefore, it is SRO knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References	Student References Provided
EP-ECA-0.0, Loss of All AC Power, Rev 44 (Step 31) OP-MC-EP-ECA-0 Bckgd doc Rev 28 (pages 19 and 20)	

EPE055 EA2.02 - Loss of Offsite and Onsite Power (Station Blackout)

Ability to determine or interpret the following as they apply to a Station Blackout : (CFR 43.5 / 45.13)

RCS core cooling through natural circulation cooling to S/G cooling .....

Remarks/Status

401-9 Comments: UNSAT

EPE055 EA2.06
On the first question, "and blocked from closing" implies that the breaker is opened. I'm really not a big fan of this K/A. It is tough to get a good question at the SRO. Let's change out the K/A.

CE provided new K/A : EPE055 EA2.02

Facility Response:
Replaced K/A and wrote a new question. SLM 09/24/2019

APE058 2.2.37 - Loss of DC Power
APE058 GENERIC
Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Given the following on Unit 1:

- The unit is at 100% RTP
- A loss of Battery Charger EVCA has occurred

Following restoration, Battery EVCA conditions are as follows:

- For two connected cells, the Specific Gravity is 1.180
- For all connected cells, the average Specific Gravity is 1.202
- Electrolyte temperature is 76°F

1) Based on the conditions above, Battery EVCA ________ OPERABLE.

2) In accordance with T.S. 3.8.6 (BATTERY CELL PARAMETERS) Basis, the operability of the DC Distribution System ensures that as a MINIMUM, at least ONE DC ________ is available assuming a loss of off-site OR on-site power coincident with a worst case single failure.

Which ONE (1) of the following completes the statements above?

REFERENCE PROVIDED

A. 1. is NOT
2. Train

B. 1. is
2. Train

C. 1. is NOT
2. Channel

D. 1. is
2. Channel

General Discussion

Per T.S. 3.8.6 basis:
With one or more cells in one or more batteries not within limits (i.e.,Category A limits not met, Category B limits not met, or Category A and B limits not met) but within the Category C limits specified in Table 3.8.6-1in the accompanying LCO, the battery is degraded but there is still sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered INOPERABLE solely as a result of Category A or B limits not met and operation is permitted for a limited period.
Category C defines the limits for each connected cell. These values, although reduced, provide assurance that sufficient capacity exists to perform the intended function and maintain a margin of safety. When any battery parameter is outside the Category C limits, the assurance of sufficient capacity described above no longer exists, and the battery must be declared INOPERABLE.

In the example given in the stem, Category B (Limits for each connected cell) and Category C (Allowable Limits for Each Cell) of T.S. 3.8.6, Table 3.8.6-1, are not met.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining at least one train of DC sources OPERABLE during accident conditions, in the event of:
a. An assumed loss of all offsite AC power or all onsite AC power; and
b. A worst case single failure.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because T.S. Table 3.8.6-1 Category B limits are exceeded and per T.S. basis the battery would be OPERABLE but degraded. If the applicant concludes that Category C limits are met, this would be the correct answer.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible becauseT.S. 3.8.9 (Distribution Systems - Operating) Basis describes the DC portion of the system as, four independent channels (two per train) of DC.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because T.S. Table 3.8.6-1 Category B limits are exceeded and per T.S. basis the battery would be OPERABLE but degraded. If the applicant conludes that Category C limits are met, this would be the correct answer.

Part 2 is plausible becauseT.S. 3.8.9 (Distribution Systems - Operating) Basis describes the DC portion of the system as, four independent channels (two per train) of DC.

Basis for meeting the KA

The K/A is matched because the applicant must determine operability of selected safety related equipment (Vital Battery) related to a Loss of DC Power.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. First, the applicant is required to evaluate parameters given in the stem using the applicable technical specification to make an operability call and then recall from memory information from the technical specification basis.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):

1) Question can not be answered solely by knowing less than or equal to 1 hour TS Action.

2) Question can not be answered solely by knowing the LCO information listed "above the line".

3) Question can not be answered solely by knowing the TS Safety Limits.

4) Question does require applicants to apply knowledge of TS bases information that is required to analyze TS required actions and terminology, therefore the question is SRO-only.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2008 MNS NRC Q81 (Bank 2979)

Development References

TS 3.8.6 (Battery Cell Parameters)
T.S. 3.8.6 Basis

Student References Provided

Copy of TS 3.8.6

APE058 2.2.37 - Loss of DC Power
APE058 GENERIC
Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Remarks/Status

Rearranged answers from original bank question, correct answer is now "A". SLM 01/10/2019

APE077 AA2.02 - Generator Voltage and Electric Grid Disturbances

Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: (CFR: 41.5 and 43.5 / 45.5, 45.7, and 45.8)

Voltage outside the generator capability curve............................

Given the following on Unit 1:

- Unit is at 100% RTP
- The TCC has reported that Real Time Contingency Analysis (RTCA) indicates INADEQUATE switchyard voltage
- The crew has entered AP/1/A/5500/05 (GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES)
- Main Generator operating conditions are as follows
  - Hydrogen Pressure (PSIG) 60
  - Generator VARS 660
  - Generator MW 1200
  - Generator Voltage (kV) 23.6

In accordance with AP/05:

1) the CRS will direct the OATC to lower ________.

2) once the required jumpers are placed in accordance with Enclosure 3 (RTCA ACTIONS with UNIT ON-LINE), both trains of OFFSITE power will ________.

Which ONE (1) of the following completes the statements above?

REFERENCE PROVIDED

A. 1. turbine load
   2. be restored to OPERABLE

B. 1. turbine load
   2. remain INOPERABLE

C. 1. generator voltage
   2. be restored to OPERABLE

D. 1. generator voltage
   2. remain INOPERABLE

General Discussion

AP/05 contains steps to adjust generator voltage in order to maintain operation within the limits of the Capability Curve. There is guidance for a load reduction to maintain reactor power less than 100% and to mitigate generator under frequency events..

Inadequate switchyard voltage indicated by the Real Time Contingency Analysis will require ECCS, Offsite Power, NSW, and shared ventilation systems to be declared inoperable. Installation of jumpers for the purpose of preventing "Double Sequencing" will allow the unit to exit inoperability actions for ECCS ONLY. Offsite power will remain inoperable.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because AP/05 does contain guidance for decreasing turbine load to maintain reactor power less than 100% and to mitigate generator under frequency events.

Part 2 is plausible because ECCS will be restored to OPERABLE once jumpers are installed.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because AP/05 does contain guidance for decreasing turbine load to maintain reactor power less than 100% and to mitigate generator under frequency events.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because ECCS will be restored to OPERABLE once jumpers are installed.

Answer D Discussion

CORRECT. See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant is required to demonstrate the ability to interpret an operating point on the generator capability curve and apply to procedural guidance. The applicant is also required to determine Tech Spec required actions for an Electric Grid Disturbance.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to apply given data to a chart and then recall from memory the Tech Spec application, requiring more than one mental step.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):
1) This question can NOT be answered by knowing less than 1 hour Tech Specs

2) This question can NOT be answered by knowing information listed "above-the-line".

3) This question can NOT be answered by knowing the TS Safety Limits or their bases.

4) This question requires the applicant to have knowledge of the Tech Spec Basis.
Specifically, it requires the applicant to have knowledge of the Design-Basis requirements for offsite circuitry along with Tech Spec application of an additional requirement based on discovery of an unanalyzed event.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2015 CNS NRC (Bank 6677)

Development References
T.S.B 3.8.1 (AC Sources - Operating), AP/1/A/5500/05 (Generator Voltage and Electric Grid Disturbances), Rev 13 AP/05 Bckgd. Document, Rev 13

Student References Provided
Generator Capability Curve.

APE077 AA2.02 - Generator Voltage and Electric Grid Disturbances

Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: (CFR: 41.5 and 43.5 / 45.5, 45.7, and 45.8)

Voltage outside the generator capability curve.............................

Remarks/Status
Rearranged answers from original bank question, correct answer is now "D". SLM 01/22/2019

APE051 AA2.01 - Loss of Condenser Vacuum

Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: (CFR: 43.5 / 45.13)

Cause for low vacuum condition ....

Given the following on Unit 2:

- The unit is at 45% RTP
- A failure of the RC system has occurred resulting in a reduction in RC flow to the main condenser
- Main Condenser vacuum is at 25" Hg and DEGRADING
- AP-23 (LOSS OF CONDENSER VACUUM) has been implemented

Based on the conditions above and in accordance with AP-23,

1) the CRS will direct the crew to ________ in attempt to mitigate this transient.

2) When turbine trip criteria is exceeded, the CRS will transition to ________.

Which ONE (1) of the following completes the statements above?

PROCEDURE LEGEND:

AP-02 (TURBINE GENERATOR TRIP)
E-0 (REACTOR TRIP OR SAFETY INJECTION)

A. 1. reduce turbine load AND start additional RC pumps
2. E-0

B. 1. start main vacuum pumps
2. E-0

C. 1 reduce turbine load AND start additional RC pumps
2. AP-02

D. 1. start main vacuum pumps
2. AP-02

General Discussion

For the given plant conditions, main condenser vacuum is above the trip setpoint of 20". This directs the crew to the RNO column for Step 2, which directs the crew to step 5 to attempt to mitigate the event. In this event vacuum will decrease until a turbine trip is warranted. This will occur at 20" vacuum and AP-23, Step 2 RNO directs going to step 3 to check the turbine tripped. If the turbine is tripped or not, the crew will be directed to trip the reactor in Step 3 RNO or Step 4 and go to E-0.

Per AP-23 bckgd doc,
First action listed is to reduce turbine generator load. This should help maintain condenser vacuum especially on scenarios involving a reduction in RC cooling.
The next action listed is to start additional RC pumps. Like the above action, this is most effective for scenarios involving an insufficient amount of RC cooling.
The next action listed is to start Main Vacuum Pumps. This action should be most effective in scenarios involving the buildup of non-condensable gas vs insufficient RC cooling.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this action is recommended in AP-23, but it will only help in cases where vacuum degradation is due to buildup of non-condensable gases.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the low vacuum condition will cause a turbine trip and with Rx power less than P-8, a Rx trip would not be generated, therefore, the applicant may conclude that AP-02 is the correct flowpath.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this action is recommended in AP-23, but it will only help in cases where vacuum degradation is due to buildup of non-condensable gases.

Part 2 is plausible because the low vacuum condition will cause a turbine trip and with Rx power less than P-8, a Rx trip would not be generated, therefore, the applicant may conclude that AP-02 is the correct flowpath.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the ability to interpret the reason for the loss of vacuum by evaluating plant conditions and choosing the correct actions that will mitigate the specific reason for the loss of vacuum.

Basis for Hi Cog

This question is higher cognitive because it requires the applicant to evaluate overall plant conditions and understand multiple indications (Main Vacuum below trip setpoint, Steam Dumps not available, etc.) in order to determine the correct course of action and procedural flowpath.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) The question can NOT be answered solely by knowing systems knowledge.

2) The question can NOT be answered by knowing immediate operator actions.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.

5) The question requires detailed knowledge of procedure steps and the AP background document and requires the applicant to analyze the

conditions given and based on that analysis determine the appropriate procedures to implement. Therefore, it is SRO knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	MODIFIED	2009 MNS NRC Q76 (Bank 3091)

Development References
AP-23 (Loss of Condenser Vacuum), Rev 8 AP-23 Background Document, Rev 5

Student References Provided

APE051 AA2.01 - Loss of Condenser Vacuum

Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: (CFR: 43.5 / 45.13)

Cause for low vacuum condition ....

Remarks/Status

APE061 2.1.25 - Area Radiation Monitoring (ARM) System Alarms
APE061 GENERIC
Ability to interpret reference materials, such as graphs, curves, tables, etc. (CFR: 41.10 / 43.5 / 45.12)

Given the following plant conditions:

- Due to a plant event, Unit 1 was tripped at 0820
- An unexplained increase in plant radiation levels is occurring and RP is currently attempting to determine the source of the increased radiation levels
- The SM is preparing to make an emergency declaration based on observation of the following OAC EMF Graphic indications:

		TIME		
Units	**EMF**	**08:30**	**08:50**	**09:10**
mr/Hr	1EMF-51A	90 R/hr	80 R/hr	50 R/hr
CPM	EMF-36L	3.20E+03	4.50E+04	1.00E+06
	EMF-36H	1.80E+02	3.80E+03	4.80E+03

1) The Emergency Classification in accordance with RP-000 (EMERGENCY CLASSIFICATION) based on OAC radiation monitor indications at 08:30 is ________.

2) After the Initial Notification, the SM re-evaluates the OAC radiation monitor indications at 09:10 and the Emergency Classification is ________.

Which ONE (1) of the following completes the statements above?

REFERENCE PROVIDED

A. 1. Unusual Event
   2. Alert

B. 1. Alert
   2. Site Area Emergency

C. 1. Unusual Event
   2. Site Area Emergency

D. 1. Alert
   2. Alert

General Discussion

Based on the OAC EMF data provided and RP-000 (EMERGENCY CLASSIFICATION) EAL wallchart, the applicant should determine that, at 08:30 the Emergency Classification is an ALERT. This is based on Table F-1 (Fission Product Barrier Threshold Matrix). Analyzing the 08:30 EMF data would reveal that EMF-51A indicates > 8.8 R/hr with time after S/D being 0-1 hrs (Table F-2), which results in an ALERT, FA1.1 (Any loss or potential loss of either Fuel Clad or NCS) due to EMF-51A /B > Table F-2 column "NCS Loss".

Upon re-evaluation at 09:10, the applicant should determine that the Emergency Classification is now a SAE. This is based on EMF-36H being >2.61E+03 for greater than 15 minutes. To make this determination the applicant must look at the EMF data from 08:50 at which time EMF-36H indication is already >2.61E+03 (actually 3.8E+03) and then at 09:10 EMF-36H is still >2.61E+03 (actually 4.8E+03). In accordance with RP-000 EAL Wallchart, this results in a Site Area Emergency (RS1.1).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the EMF-36L reading at 0830 exceeds the EAL wallchart Table R-1 threshold for an unusual event.

Part 2 is plausible because an analysis of the fission product barriers at this time would result in an Alert based on 1EMF-51A being greater than 8.8 R/hr at time 0-1 hrs after shutdown.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the EMF-36L reading at 0830 exceeds the EAL wallchart Table R-1 threshold for an unusual event.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because an analysis of the fission product barriers at this time would result in an Alert based on 1EMF-51A being greater than 8.8 R/hr at time 0-1 hrs after shutdown.

Basis for meeting the KA

The K/A is matched because it requires the applicant to interpret reference materials (table of plant computer indications) to evaluate the plant's emergency status.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.
First, it requires the applicant to evaluate the radiation monitor indications provided to determine the plant Emergency Action Level.
Next, it requires the applicant to evaluate a change in radiation monitor indications to determine if the Emergency Action Level status has changed and, if so, what the new Emergency Action Level is.

Basis for SRO only

This question is SRO level because it requires the applicant to evaluate plant conditions and determine the Emergency Action Level based on application of RP-000 (Emergency Classification) EAL wallcharts.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	MODIFIED	2014 MNS NRC Q90 (Bank 5904)

Development References
RP-000 (Classification of Emergency) EAL wallcharts, Rev 29

Student References Provided
RP-000 (CLASSIFICATION OF EMERGENCY) EAL Wallcharts

APE061 2.1.25 - Area Radiation Monitoring (ARM) System Alarms
APE061 GENERIC

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Ability to interpret reference materials, such as graphs, curves, tables, etc. (CFR: 41.10 / 43.5 / 45.12)

Remarks/Status

WE13 EA2.2 - Steam Generator Overpressure

Ability to determine and interpret the following as they apply to the (Steam Generator Overpressure)

(CFR: 43.5 / 45.13)

Adherence to appropriate procedures and operation within the limitations in the facility*s license and amendments.

Given the following on Unit 1:

- The unit has tripped from 100% RTP
- The crew has implemented EP/1/A/5000/F-0, (Critical Safety Function Status Trees)
- 1B S/G pressure is being maintained at approximately 1210 PSIG following failure of the associated S/G PORV

1) To mitigate this event, the CRS will direct the crew to enter ________.

2) Per T.S. 3.7.4 (SG PORVs) Bases, the most limiting event assumed in the safety analysis is an NC cooldown ________.

Which ONE (1) of the following completes the statements above?

PROCEDURE LEGEND:

FR-H.2 (RESPONSE TO STEAM GENERATOR OVERPRESSURE)
FR-H.4 (RESPONSE TO LOSS OF NORMAL STEAM RELEASE CAPABILITIES)

A. 1. FR-H.2
2. coincident with a loss of offsite power

B. 1. FR-H.2
2. following a S/G tube rupture

C. 1. FR-H.4
2. coincident with a loss of offsite power

D. 1. FR-H.4
2. following a S/G tube rupture

General Discussion

The lift setpoints for the SG PORVs and safeties are as follows:

1125 PSIG - PORV
1170 PSIG - Safety
1190 PSIG - Safety
1205 PSIG - Safety
1220 PSIG - Safety
1225 PSIG - Safety

For the given conditions (1B S/G pressure at 1210 psig), 3 safety valves will have already failed to control pressure. They have NOT functioned as designed, since pressure has risen above their lift setpoints.

In accordance with F-0, Critical Safety Function Status Trees for Heat Sink, if pressure is less 1225 psig, but greater than 1170 psig, the SRO implements FR-H.4.

In the accident analysis presented in Reference 2, the SG PORVs are assumed to be used by the operator to cool down the unit to RHR entry conditions for accidents accompanied by a loss of offsite power.

For the recovery from a steam generator tube rupture (SGTR) event, the operator is also required to perform a limited cooldown to establish adequate subcooling as a necessary step to terminate the primary to secondary break flow into the ruptured steam generator. The time required to terminate the primary to secondary break flow for an SGTR is more critical than the time required to cool down to RHR conditions for this event and also for other accidents. Thus, the SGTR is the limiting event for the SG PORVs.

Answer A Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because three main steam safety valves have failed thus far for S/G pressure to be at 1210 PSIG. Therefore the applicant may conclude that FR-H.2 is required.

Part 2 is plausible because TS 3.7.4 bases dicusses that in the accident analysis, the SG PORVs are assumed to be used by the operator to cool down the unit to RHR entry conditions for accidents accompanied by a loss of offsite power.

Answer B Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because three main steam safety valves have failed thus far for S/G pressure to be at 1210 PSIG. Therefore the applicant may conclude that FR-H.2 is required.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because TS 3.7.4 bases dicusses that in the accident analysis, the SG PORVs are assumed to be used by the operator to cool down the unit to RHR entry conditions for accidents accompanied by a loss of offsite power.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant must apply knowledge of the S/G PORVs, and code safety setpoints with detailed knowledge of functional restoration procedures and critical safety function status trees to aid in making a decision on which FRP to implement.

Basis for Hi Cog

This is a high cognitive level question because it involves a level of analysis of a given set of conditions, and applying system knowledge to make a conclusion on which success path is implemented for the conditions.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification

Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):
1) The question can NOT be answered by knowing systems knowledge alone.

2) The question can NOT be answered by knowing immediate Operator actions.

3) The question can NOT be answered by knowing AOP or EOP entry conditions.

4) The question can NOT be answered by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.

5.)The question requires the applicant to assess plant conditions, and then select the FR procedure transition for mitigation. Yellow Path FR procedures entry conditions and mitigative strategy knowledge requirements apply to SROs only.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2016 CNS Audit (Bank 6488)

Development References

FR-H.2 (Response to S/G Overpressure), Rev 3
FR-H.4 (Response to Loss of Normal Steam Release Capabilities), Rev 2
STM-SM (Main Steam System Lesson Plan), Rev 31
TS 3.7.4 Basis
TS 3.4.11 Basis

Student References Provided

WE13 EA2.2 - Steam Generator Overpressure
Ability to determine and interpret the following as they apply to the (Steam Generator Overpressure)
(CFR: 43.5 / 45.13)
Adherence to appropriate procedures and operation within the limitations in the facility*s license and amendments.

Remarks/Status

Rearranged answers from original bank question, correct answer is now "D". SLM 01/10/2019

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APE032 2.2.40 - Loss of Source Range Nuclear Instrumentation
APE032 GENERIC
Ability to apply Technical Specifications for a system. (CFR: 41.10 / 43.2 / 43.5 / 45.3)

Given the following on Unit 1:

- Unit is in Mode 6
- Fuel offload in progress
- N-31 and N-32 are in service
- "A" Train Wide Range (Gamma-Metrics) is in service

Subsequently,

- Source Range Instrument (N-31) fails

1) The CRS ________ required to enter the action statement of LCO 3.9.3 (Nuclear Instrumentation).

2) In order to meet the operability requirements of LCO 3.9.3, source range audible indication ________ required.

Which ONE (1) of the following completes the statements above?

A. 1. is NOT
2. is NOT

B. 1. is NOT
2. is

C. 1. is
2. is NOT

D. 1. is
2. is

General Discussion

T.S. 3.9.3 requires 2 of the 4 available neutron flux monitors (2 Wide range Gamma-Metrics and 2 SR NIs) to be operable in Mode 6. The failure of one SR NI will not require entry into the actions of the LCO.
The background section of the bases for this TS 3.9.3 states that audible indication and alarm are not required for operability. Only visual indication is required.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because audible indication is expected to be in operation during fuel movement, as required by the refueling procedure.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because in TS applications (3.3.1) for other shutdown modes, both SR NIs are required and no other monitor can be used to satisfy the requirement.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because in TS applications (3.3.1) for other shutdown modes, both SR NIs are required and no other monitor can be used to satisfy the requirement.

Part 2 is plausible because audible indication is expected to be in operation during fuel movement, as required by the refueling procedure.

Basis for meeting the KA

The K/A is matched because the applicant is required to apply information contained in the LCO bases to determine specific component operability.

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):
1) This question can NOT be answered by knowing less than 1 hour Tech Specs

2) This question can NOT be answered by knowing information listed "above-the-line".

3) This question can NOT be answered by knowing the TS Safety Limits or their bases.

4) This question requires the applicant to have knowledge of the Tech Spec Bases. Specifically, it requires the applicant to have knowledge of the operability requirements related to Source Range Instrumentation contained in the Tech Spec Bases.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	2015 CNS NRC (Bank 6680)

Development References

T.S.3.9.3 (Nuclear Instrumentation)
T.S.3.9.3 (Nuclear Instrumentation) Bases

Student References Provided

APE032 2.2.40 - Loss of Source Range Nuclear Instrumentation
APE032 GENERIC

ILT 20-1 MNS SRO NRC Examination **QUESTION 93** | 93 | **A**

Ability to apply Technical Specifications for a system. (CFR: 41.10 / 43.2 / 43.5 / 45.3)

Remarks/Status
Rearranged answers from original bank question, correct answer is now "A". SLM 01/31/2019

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GEN2.1 2.1.4 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc. (CFR: 41.10 / 43.2)

In accordance with Tech Spec 5.1 (RESPONSIBILITY), an active licensed STA may assume the duties of the Control Room Supervisor provided:

1) the CRS or relief SRO is available to return to the control room within ________ minutes

   AND

2) the periods during which the STA assumes SRO duties ________ exceed 15 minutes in duration.

(Assume MODE 1 conditions)

Which ONE (1) of the following completes the statements above?

A. 1. 10
   2. can

B. 1. 10
   2. can NOT

C. 1. 15
   2. can

D. 1. 15
   2. can NOT

General Discussion

Technical Specifications allows the STA to assume the control room command function and perform the duties of the CRS in Modes 1, 2, 3, and 4 during periods when the CRS and the relief SRO are required to be absent from the control room. However, the following requirements must be met:

- The STA must hold an SRO license for the unit.
- The CRS or relief SRO must be available to return to the control room within 10 minutes.
- The periods during which the STA may perform the control room SRO duties may not exceed 15 minutes in duration or a total of 1 hour for the entire shift.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because AD-OP-ALL-1000, Conduct of Operations allows a short term relief as long as the operator requiring short term relief has adequate communications with the control room and is capable of responding to the control room within 20 minutes.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses the allowable duration of the relief by the STA with the time for the CRS or relief SRO to return to the control room.

Part 2 is plausible because AD-OP-ALL-1000, Conduct of Operations allows a short term relief as long as the operator requiring short term relief has adequate communications with the control room and is capable of responding to the control room within 20 minutes.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses the allowable duration of the relief by the STA with the time for the CRS or relief SRO to return to the control room.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates knowledge of the control room staffing requirements for the individual fulfilling the control room supervisor-command function.

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):

1) This question can NOT be answered by knowing less than 1 hour Tech Specs. These requirements are in 5.1.2 which has no action statements.

2) This question can NOT be answered by knowing information listed "above-the-line". These are administrative requirements. There is no "above-the-line" knowledge.

3) This question can NOT be answered by knowing the TS Safety Limits or their bases. This is TS 5.1.2. not TS Safety Limits.

4) This question requires the applicant to have knowledge of TS administrative requirements contain in Section 5 of Tech Specs. This is SRO level knowledge.

ILT 20-1 MNS SRO NRC Examination QUESTION 94 | 94 | **B**

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	2014 MNS NRC Q94 (Bank 5024)

Development References
Technical Specification 5.1.2, amendment 213 and 194

Student References Provided

GEN2.1 2.1.4 - GENERIC - Conduct of Operations

Conduct of Operations

Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, no-solo operation, maintenance of active license status, 10CFR55, etc. (CFR: 41.10 / 43.2)

Remarks/Status
Rearranged answers from original bank question, correct answer is now "B". SLM 01/14/2019

GEN2.1 2.1.41 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of the refueling process. (CFR: 41.2 / 41.10 / 43.6 / 45.13)

Given the following on Unit 2:

- Refueling is in progress
- NC W/R Level is 372.75 inches and stable
- No water additions are being made to the system
- 2A ND train is OPERABLE and has been in continuous operation for the previous 24 hours
- 2B ND train is INOPERABLE

Subsequently:

- Fuel Handling SRO desires stopping the 2A ND Pump to aid in inserting fuel assemblies
- Fuel Handling SRO expects to restart the 2A ND pump in approximately 15 minutes

1) To allow the above request, the CRS ________ be required to enter one or more Tech Spec CONDITIONs/REQUIRED ACTIONs.

2) Tech Spec bases states that only one RHR loop is required to be OPERABLE, because ________ provides adequate backup decay heat removal capability.

Which ONE (1) of the following completes the statements above?

A. 1. will
2. the volume of water above the reactor vessel flange

B. 1. will
2. the Spent Fuel Cooling system

C. 1. will NOT
2. the volume of water above the reactor vessel flange

D. 1. will NOT
2. the Spent Fuel Cooling system

General Discussion

Tech Spec 3.9.5 requires that one RHR loop shall be OPERABLE and in operation in Mode 6 with the water level > or equal to 23 ft above the top of the reactor vessel flange. A note at the top of this LCO states "The required RHR loop may be removed from operation for < 1 hour per 8 hour period, provided no operations are permitted that would cause introduction of coolant into the Reactor Coolant System with boron concentration less than required to meet the minimum required boron concentration of LCO 3.9.1."

The bases of Tech Spec 3.9.5 states "Only one RHR loop is required to be OPERABLE, because the volume of water above the reactor vessel flange provides backup decay heat removal capability."

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the LCO states that one RHR loop shall be operable and in operation. If the applicant does not recall the note allowing the pump to be stopped, then they will conclude that this is correct.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the LCO states that one RHR loop shall be operable and in operation. If the applicant does not recall the note allowing the pump to be stopped, then they will conclude that this is correct.

Part 2 is plausible since Spent Fuel Cooling (SFC) helps to provide decay heat removal but is not the basis for requiring only one operable ND pump.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible since Spent Fuel Cooling (SFC) helps to provide decay heat removal but is not the basis for requiring only one operable ND pump.

Basis for meeting the KA

The K/A is matched because the applicant is required to have knowledge of the refueling process including whether Tech Specs allows an ND pump to be stopped for the given conditions.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is required. First, the applicants are required to use the parameters given in the stem to determine which TS is applicable and apply this TS correctly. Then recall from memory TS basis information.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):

1) Question can not be answered solely by knowing less than or equal to 1 hour TS Action.

2) Question can not be answered solely by knowing the LCO information listed "above the line".

3) Question can not be answered solely by knowing the TS Safety Limits.

4) Question does require applicants to apply knowledge of TS bases information that is required to analyze TS required actions and terminology, therefore the question is SRO-only.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2016 CNS NRC (Bank 6397)

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C

Development References	Student References Provided
Tech Spec 3.9.5 Tech Spec 3.9.5 Bases	

GEN2.1 2.1.41 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of the refueling process. (CFR: 41.2 / 41.10 / 43.6 / 45.13)

Remarks/Status
Rearranged answers from original bank question, correct answer is now "C". SLM 01/14/2019

GEN2.2 2.2.7 - GENERIC - Equipment Control
Equipment Control
Knowledge of the process for conducting special or infrequent tests. (CFR: 41.10 / 43.3 / 45.13)

In accordance with AD-OP-ALL-106, CONDUCT OF INFREQUENTLY PERFORMED TESTS OR EVOLUTIONS (IPTE):

1) IPTE briefings shall include the IPTE Manager, Test/Evolution Coordinator, and the ________.

2) If an IPTE Brief is scheduled greater than a MINIMUM of ________ before execution, then the IPTE Manager shall evaluate the need for a refocus brief prior to task execution.

Which ONE (1) of the following completes the statements above?

A. 1. Shift Manager
   2. 7 days

B. 1. Shift Manager
   2. 72 hours

C. 1. Operations Manager
   2. 7 days

D. 1. Operations Manager
   2. 72 hours

General Discussion

Per AD-OP-ALL-106:
The Pre-IPTE Briefing should include all personnel directly involved with performance of the test or evolution. The IPTE Manager, the Test or Evolution Coordinator, and Operations Shift Manager (or designee) shall attend the briefing.

IPTE Briefings will be performed within 7 days prior to execution. If an IPTE Brief is scheduled greater than 72 hours before execution, then the IPTE Manager shall evaluate the need for a refocus brief prior to task execution.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because IPTE briefings are required to be performed within 7 days of execution.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the Operations Manager is heavily involved in the IPTE process, including reviewing and approving all IPTEs developed by other department managers.

Part 2 is plausible because IPTE briefings are required to be performed within 7 days of execution.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the Operations Manager is heavily involved in the IPTE process, including reviewing and approving all IPTEs developed by other department managers.

Part 2 is correct..

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of the Fleet Procedure requirements (AD-OP-ALL-106) regarding the conduct of infrequently performed tests or evolutions.

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" linked to 10CFR55.43(b)(3) (Facility licensee procedures required to obtain authority for design and operating changes in the facility):
* Screening and evaluation processes under 10 CFR 50.59, "Changes, Tests and Experiments".

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References
AD-OP-ALL-106, Conduct of IPTEs, Rev 4 AD-OP-ALL-1000, Conduct of Operations, Rev 13

Student References Provided

GEN2.2 2.2.7 - GENERIC - Equipment Control
Equipment Control
Knowledge of the process for conducting special or infrequent tests. (CFR: 41.10 / 43.3 / 45.13)

FOR REVIEW ONLY - DO NOT DISTRIBUTE

Remarks/Status

FOR REVIEW ONLY - DO NOT DISTRIBUTE

GEN2.2 2.2.13 - GENERIC - Equipment Control
Equipment Control
Knowledge of tagging and clearance procedures. (CFR: 41.10 / 45.13)

In accordance with AD-OP-ALL-200 (CLEARANCE AND TAGGING):

1) A previously licensed SRO ________ sign as clearance APPROVER.

2) If a clearance is designated as an Exceptional Clearance, at a minimum, it is required to be approved by an Operations ________ and a Work Group Supervisor.

Which ONE (1) of the following completes the statements above?

A. 1. can
   2. Shift Supervisor

B. 1. can
   2. Shift Manager

C. 1. can NOT
   2. Shift Supervisor

D. 1. can NOT
   2. Shift Manager

General Discussion

Per AD-OP-ALL-0200 (Clearance and Tagging):
Clearance approval requires an active/current SRO license.
Clearance review can be performed by a licensed operator or a previous licensed operator at the station.
All clearances shall be evaluated to determine if they are exceptional per Attachment 3, Exceptional Clearances.
Exceptional clearances shall be approved by the following:
1) A Shift Manager (SM) or higher level Operations Manager
2) A Work Group Supervisor (or higher level manager of the work group)

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because previously licensed operators are allowed to sign for clearance reviewer in accordance with AD-OP-ALL-0200.

Part 2 is plausible because in accordance with AD-OP-ALL-0200, clearance approval requires an active/current SRO license.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because previously licensed operators are allowed to sign for clearance reviewer in accordance with AD-OP-ALL-0200.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because in accordance with AD-OP-ALL-0200, clearance approval requires an active/current SRO license.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant is required to have knowledge of the clearance and tagging procedures (AD-OP-ALL-0200).

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" linked to 10CFR55.43(b)(3) (Facility licensee procedures required to obtain authority for design and operating changes in the facility):
* Requires knowledge of authority for operating changes (Clearance and Tagging) in the facility.
Both questions are functions that are only performed by an active licensed SRO or higher level of Operations management.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References
AD-OP-ALL-0200, Clearnace and Tagging, Rev 19

Student References Provided

GEN2.2 2.2.13 - GENERIC - Equipment Control
Equipment Control
Knowledge of tagging and clearance procedures. (CFR: 41.10 / 45.13)

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Remarks/Status
401-9 Comments: UNSAT GEN2.2 2.2.13 I m not sure that this meets SRO level. I know that the second part is too system specific. Generics need to maintain that 30,000 ft look at administrative requirements. Facility Response: Changed Q1 to clearance approver because this is a function requiring an active/current SRO license. Wrote new Q2 to align with administrative requirements of the AD. Changes made as suggested by CE comments. SLM 10/01/2019

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GEN2.3 2.3.14 - GENERIC - Radiation Control

Radiation Control

Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities. (CFR: 41.12 / 43.4 / 45.10)

Given the following on Unit 2:

- The crew is responding to a large LOCA with 10% failed fuel
- The SM has determined that manual alignment of 2NI-184B (1B ND PUMP SUCTION FROM CONT SUMP ISOL) is required to protect Valuable Property
- Expected dose rates in the area of the valve are 120 REM/hr

1) In accordance with RP/004 (GENERAL EMERGENCY), Attachment 4, (Request for Emergency Exposure), the MAXIMUM time allowed for opening 2NI-184B, prior to exceeding the Total Effective Dose Equivalent (TEDE) dose, is ________ minutes. **(Disregard any dose received in transit to and from 2NI-184B)**

2) In accordance with RP/004 and considering ALL other administrative requirements are met, the EOF Director or ________ is authorized to APPROVE the Emergency Exposure.

Which ONE of the following completes the statements above?

A. 1. 5.0
   2. Emergency Coordinator

B. 1. 5.0
   2. RP Manager

C. 1. 12.5
   2. Emergency Coordinator

D. 1. 12.5
   2. RP Manager

General Discussion

Per RP/004, 10 Rem dose is allowed to protect plant equipment during an emergency following approval of the dose extension. With the given dose rate, 5 minutes is the maximum time limit to manually open 2NI-184B.

Per RP/004, the Emergency Coordinator or EOF Director will approve all emergency dose extensions.

Answer A Discussion

CORRECT - See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the RP Manager is required to acknowledge the Emergency Worker Dose Extension, but does not approve it.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 25 Rem is allowed to save lives or protect the health and safety of the public and 12.5 minutes is the calculated time allowed without exceeding 25 Rem.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 25 Rem is allowed to save lives or protect the health and safety of the public and 12.5 minutes is the calculated time allowed without exceeding 25 Rem.

Part 2 is plausible because the RP Manager is required to acknowledge the Emergency Worker Dose Extension, but does not approve it.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of the emergency worker dose limits for equipment saving activities and who can approve the dose limit extensions needed.

Basis for Hi Cog

This question is higher coginitive due to the applicant being required to apply knowledge of emergency worker dose limits for protecting plant equipment and using the given dose rate in the area, calculate the maximum amount of time that an emergency dose worker could take to manually open 2NI-184B.

Basis for SRO only

This is an SRO Only question linked to 10CFR55.43(b)(4), Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions. This question requires the candidate to have knowledge of emergency dose for equipment saving activities. This level of knowledge is not expected of a Reactor Operator.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2017 CNS Audit (Bank 7297)

Development References	Student References Provided
RP-04 (General Emergency) Rev. 034 Enclosure 4.4 (Request for Emergency Exposure)	

GEN2.3 2.3.14 - GENERIC - Radiation Control

Radiation Control

Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities. (CFR: 41.12 / 43.4 / 45.10)

Remarks/Status
Rearranged answers from original bank question, correct answer is now "A". SLM 01/21/2019

GEN2.4 2.4.28 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of procedures relating to a security event (non-safeguards information). (CFR: 41.10 / 43.5 / 45.13)

Given the following:

- The Control Room has been notified by the NRC Headquarters Operations Center that a 747 commercial aircraft has been hijacked
- Ground intelligence indicates a nuclear plant is the intended target
- The airplane's current flight path will intersect with McGuire in **20 minutes**

In accordance with AP-47 (SECURITY EVENTS),

1) the CRS will transition to ________.

2) all non-essential personnel on site will be directed to ________.

Which ONE (1) of the following completes the statements above?

PROCEDURE LEGEND:

Enclosure 1 (AIRCRAFT IMMINENT THREAT)
Enclosure 2 (AIRCRAFT PROBABLE THREAT)

A. 1. Enclosure 1
2. relocate to the MOC

B. 1. Enclosure 2
2. relocate to the MOC

C. 1. Enclosure 1
2. seek shelter in the nearest building

D. 1. Enclosure 2
2. seek shelter in the nearest building

General Discussion

Since time to impact is 20 minutes, AP-47 directs the crew to implement Enclosure 2. Enclosure 2 will direct implementation of Enclosure 21 (Site Relocation During Probable Aircraft Threat). Enclosure 21 directs relocation of plant personnel to the MOC.

If impact time was less than 5 minutes, AP-47 would direct transition to Enclosure 1 (Aircraft Imminent Threat).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because AP-47 requires transition to Enclosure 1 if time to impact is less than 5 minutes.

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because AP-47 requires transition to Enclosure 1 if time to impact is less than 5 minutes.

Part2 is plausible because if impact time is less than 5 minutes, Enclosure 1 will have the crew make an annoucement per Enclosure 16 for site personnel to seek shelter in the nearest building.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because if impact time is less than 5 minutes, Enclosure 1 will have the crew make an annoucement per Enclosure 16 for site personnel to seek shelter in the nearest building.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge of the procedure associated with a security event (i.e. AP-47 - Security Events).

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) The question can NOT be answered solely by knowing systems knowledge.
The information in the in the first part of the question is in no way related to systems knowledge.
The second part of the question is related to how a system will be operated under a specific set of conditions. This can only be answered based on detailed procedure knowledge and therefore does not constitute system level knowledge.

2) The question can NOT be answered by knowing immediate operator actions.
There are no immediate actions in AP-47.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.
Neither part of this question deals with with entry conditions of AP-47.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.
This is detailed knowledge of procedure steps and not the purpose, sequence of events, or overall mitigative strategy of he procedure.

5) The question requires the applicant to analyze the conditions given and based on that analysis determine the appropriate procedure transition.
Therefore, it is SRO knowledge.

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B

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	2015 MNS NRC Q99 (Bank 5995)

Development References
REFERENCES: AP-47 (Security Events) AP-47 Background Documents

Student References Provided

GEN2.4 2.4.28 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

Knowledge of procedures relating to a security event (non-safeguards information). (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
Rearranged answers from original bank question, correct answer is now "B". SLG 01/15/2019

GEN2.4 2.4.30 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator. (CFR: 41.10 / 43.5 / 45.11)

Given the following:

0800	A LOCA occurs on Unit 1
0810	The SM declared an Alert
0815	The SM completed the Emergency Notification Form
0845	Due to complications the SM upgrades to a Site Area Emergency

1) The **LATEST** allowable notification time required by RP/0/B/5700/029 (Notifications to Offsite Agencies from the Control Room) for the Alert classification is ________.

2) When the Site Area Emergency is declared, Protective Action Recommendations (PARS) ________ required to be made.

Which ONE (1) of the following completes the statements above?

A. 1. 0825
2. are

B. 1. 0825
2. are NOT

C. 1. 0830
2. are

D. 1. 0830
2. are NOT

General Discussion

In accordance with RP-29, the state and counties must be notified within 15 minutes of the declaration of an event.

In accordance with AD-EP-ALL-0109 (Offsite Protective Action Recommendations), PARs are made whenever a General Emergency is declared.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct

Part 2 is plausible because evacuation of non-essential personnel may be performed during a SAE and shall be performed for a General Emergency. It is plausible that the applicant concludes PARs may also be performed for a SAE.

Answer B Discussion

CORRECT. See explanation above.

Answer C Discussion

INCORRECT: See explanation above

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that 15 minutes is allowed after the form is completed, since the ENF form is used during the notification, per procedure.

Part 2 is plausible because evacuation of non-essential personnel may be performed during a SAE and shall be performed for a General Emergency. It is plausible that the applicant concludes PARs may also be performed for a SAE.

Answer D Discussion

INCORRECT: See explanation above

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that 15 minutes is allowed after the form is completed, since the ENF form is used during the notification, per procedure.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge of the reporting requirements to offsite agencies related to an event that required entry into emergency plan procedures.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant must recall from memory the reporting time requirements to the states and counties (15 minutes).

Next, the applicant must analyze the sequence of events to determine when the "reporting clock" starts, add the appropriate reporting time requirement to the start time, and determine from times in each answer which one corresponds to the calculated time.

Basis for SRO only

AT MNS, EAL Classification is strictly a SRO Only Task (OP-MC-EP-EAL Objective 6)

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	MODIFIED	2016 CNS Audit (Bank 6478)

Development References

References:
RP/0/A/5700/011
RP/0/B/5700/029
AD-EP-ALL-0109

Student References Provided

GEN2.4 2.4.30 - GENERIC - Emergency Procedures / Plan

ILT 20-1 MNS SRO NRC Examination **QUESTION 100** 100 **B**

Emergency Procedures / Plan

Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator. (CFR: 41.10 / 43.5 / 45.11)

Remarks/Status

- Verify total controlled leakage is less than 38 gpm.

5. Return Pzr level control to "AUTO".
6. Adjust seal injection total flow control valve to obtain approximately 8 gpm to each pump.
7. Verify Pressurizer level is maintained near program level

3.2 Abnormal and Emergency Operation

3.2.1 Plant Response to a single NCP Trip

- When a Reactor Coolant Pump trips, flow in the affected loop will decrease and then reverse at a lower flow rate. The affected loop reverse flow will flow from the reactor to the cold leg and return to the top of the reactor vessel through the hot leg. Thot in the affected loop will increase initially as the pump coasts down, but reverse flow will cause Thot to decrease to a value equal to or slightly less than Tcold. Steam flow from the Steam Generators and heat removal from the NC system in unaffected loops will increase and Tcold in the unaffected loops will decrease.

3.2.2 AP/1/A/5500/08, Malfunction of NC Pump

The purpose of this procedure is to verify proper response in the event of a malfunction of a NC Pump and to identify the appropriate actions. Refer to AP/08 to discuss entry symptoms.

Conduct of Operational Focus; Procedure Entry Conditions (AD-OP-ALL-1001 Conduct of Abnormal Operations):
Entry into appropriate Event Procedure is required when entry conditions or symptoms are met. If multiple Event Procedure entry conditions are met, then the CRS will prioritize implementation of the Event Procedures.

Given the following conditions on Unit 1:

- Unit is at 100% RTP

Subsequently:

- 1C NC pump trips due to an operator error on the Main Control Board
- The crew verifies the reactor trips

1C S/G N/R level will initially _____(1)_____ than the other S/Gs after the 1C NC pump trips.

NC loop 1C delta T would initially be _____(2)_____ than the other NC loops delta Ts.

Which ONE (1) of the following completes the statements above?

A. 1. shrink lower
   2. lower

B. 1. swell higher
   2. lower

C. 1. swell higher
   2. higher

D. 1. shrink lower
   2. higher

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EXAM BANK QUESTION: 6332 CNS A

General Discussion

The IFE lesson plan states that "SHRINK occurs when a transient results in a DECREASE in steam voiding. This appears as a rapid DECREASE in N/R S/G level. This can be caused by:
An INCREASE in Steam Pressure. This occurs on rapid decreases in steam demand, e.g. turbine runback or SM isolation valve closure.
An INCREASE in Feedwater Flow. This is especially pronounced at low power levels, where feed temperature is low.
A DECREASE in Reactor Power"

The NCP lesson plan states that "The SG steam flow in the affected loop will decrease due to the lower, reverse NC flow and lower reactor coolant temperature in the loop. Due to the lower steaming rate in the affected SG, the level will initially decrease due to shrinkage. "

The delta T in the affected loop will decrease. Reverse flow in the loop will cause Thot to decrease and thereby decrasing the delta T.

Answer A Discussion

CORRECT - See discussion above.

Answer B Discussion

INCORRECT:

Plausible because the delta T would be lower in the affected loop, but S/G N/R level would decrease due to the lower steam flow in the affected loop.

Answer C Discussion

INCORRECT:

Plausible because the overall core delta T will increase due to only 3 NC pumps remaining in operation, but S/G N/R level would decrease due to the decrease in steam flow in the affected loop.

Answer D Discussion

INCORRECT:

Plausible because S/G N/R level would decrease in the affected loop. Also plausible because the overall core delta T would increase due to only 3 NC pumps running, but the affected loop delta T would decrease due to reverse flow in that loop.

Basis for meeting the KA

The KA is matched because applicants are tested on knowledge of the operational implications of NC pump coastdown on NC system parameters (delta T).

Basis for Hi Cog

This question is of a higher cognitive order due to requiring multiple mental steps to answer correctly.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT16 CNS NRC Examination

Development References	Student References Provided
OP-CN-PS-NCP (Rev 100) page 32 OP-CN-CF-IFE (Rev 103) page 7	

KA	KA_desc
SYS003 K5.02	Knowledge of the operational implications of the following concepts as they apply to the RCPS: (CFR: 41.5 / 45.7)Effects of RCP coastdown on RCS parameters ....

started and increases speed, the pawls disengage, the ratchet plate is returned to its original position by the spring return, and the pawls ratchet. When the rotor reaches approximately 80 rpm, centrifugal forces acting on the pawls cause them to elevate and return to the running position (ratcheting ends).

Reference drawing 7.7. The Oil Lift System supplies high pressure oil to establish an oil film between both upper and lower shoes of the thrust bearing and the thrust collar to provide rotor lift and bearing lubrication prior to NCP start. The system also sprays oil on the upper radial bearing to ensure bearing lubrication during a pump start. Lifting the rotor with an oil film between the lower shoes and the collar reduces starting current and also reduces wear on the lower shoes and thrust collar surfaces. Two Oil Lift Pumps are provided for each NCP and obtain their oil supply and NPSH from the lower oil reservoir. The Oil Lift Pumps are interlocked so that only one can run at a time. The interlock operation is as follows:

- If pump No. 1 is running, pump No. 2 can be started; when No. 2 starts, No. 1 will stop and No. 2 continues running.
- If pump No. 2 is running, pump No. 1 cannot be started.

One Oil Lift Pump is started two minutes prior to starting a NCP. One minute after the NCP starts (Safety Breaker closed) the Oil Lift Pump will automatically stop. If the NCP is not started OR the NCP Safety Breaker opens (NCP stops) prior to the one minute time delay the Oil Lift Pump will continue to run until stopped by the operator. The NCP Safety Breaker will not close (NCP will not start) unless oil lift pressure sensed by 2 of 3 pressure switches is greater than 600 psig. Two additional pressure switches, one for each Oil Lift Pump, provide input for OAC indication when there is greater than 600 psig oil lift pressure. The Oil Lift Pumps are controlled by START/ STOP push-button switches located on the Main Control Board. The STOP button locks down to prevent inadvertent operation of the pump. The Oil Lift Pumps are powered from MXM and MXN.

The NCP Motors are designed to prevent oil leakage from the components containing oil. All pipes and assemblies containing oil at the lower bearing area are located inside the motor air frame. All pipes and assemblies containing oil at the upper bearing area are located inside a shroud external to the frame. Each NCP motor is provided with a drain tank to collect oil leakage in the upper shroud and motor air frame. They are sized to contain the combined oil volume of the upper and lower oil reservoirs and associated piping. The NCP motor drain tank pump transports the oil from the drain tanks to the waste oil storage tank. The pumps are powered from MXN. The NCP oil collection system is designed to withstand an SSE.

Operator Fundamental Focus; Knowledge and Control

Before operating a component, confirm an understanding of its function and interactions with other components, such as the operation and interaction between the No. 1 and No 2 lift pumps.

are provided for the standpipe to warn of potential seal problems. A high level alarm may indicate excessive No. 2 seal leak-off flow. Excessive No. 2 seal leakage results in a rise in the standpipe level and eventual overflow to the NCDT via a second overflow connection.

Approximately 100 cc/hr from the No. 2 seal is directed to the No. 3 seal. During normal operation the pressure drops from 3 psig below the seal to the surrounding atmospheric pressure above the seal. Leak-off from the No. 3 seal is directed to the NCDT.

Reference drawing 7.3. Each NCP No. 1 seal leak-off line has a seal return isolation valve. The valves are closed when NC System pressure is less than 100 psig to prevent backflow from the NV System to the NCP seals. Backflow will flush contaminants out of the seal water return filter and back to the seals. The isolation valves are also used in the event of a failure (excessive leakage) of the No. 1 seal. When No. 1 seal leak-off flow is high, water flows from the NC System up through the thermal barrier regardless of seal injection flow. If flow is high enough, there may be insufficient heat removal by the thermal barrier heat exchanger to adequately cool the flow. The hot water may cause damage to the No. 2 and No. 3 seals. When the seal return valve is closed, the No. 2 seal becomes the primary seal and maintains the large ΔP. The No. 2 seal is designed to withstand a high ΔP for a short period with the NCP running, therefore the pump must be stopped within 5 minutes.

Reference drawings 7.3 and 7.6. A minimum differential pressure across the No. 1 seal surfaces of 200 psid is required to ensure proper water film during pump operation. No surface contact will occur between the No. 1 seal faces as long as the ΔP is maintained above the leak-off flow versus differential pressure minimum as shown on the No. 1 Seal Differential Pressure (PSID) curve.

The NCPs are equipped with a common No. 1 seal bypass valve. This valve is only opened at low system pressures (100-1000 psig) when there is insufficient flow to adequately cool the seals (leak-off temperature >200°F). At very low NCS pressure, it may be necessary to open the No. 1 seal bypass valve to ensure adequate flow through the radial bearings.

Each of the NCP No. 1 seal leak-off lines has a leak-off breakdown orifice upstream of the seal return isolation valve. These orifices reduce the seal leak-off flow rate during a loss of all seal cooling event to meet the specified NCP seal leak-off flow rates (< 21 gpm) assumed in the Westinghouse test/analyses for a postulated loss of all seal cooling event. With the orifices installed, the calculated flow rate at McGuire is approximately 16 gpm during an Extended Loss of AC Power (ELAP) event.

Operational considerations:

- For an NCP start at normal system pressure, there must be approximately 1 gpm seal leak-off flow at 2200 psid.
- The minimum flow rate for seal injection water is 6 gpm
- The minimum temperature for seal injection water is 50°F
- The maximum flow rate for seal injection water is 12 gpm

3.2 Starting 1A NC Pump

1. **Check** the associated 6900 V supply breaker CLOSED. ☐
2. **Check** reactor power less than 25%. ☐
3. **Check** 1A NC Pump No. 1 Seal D/P greater than 200 psid. ☐
4. **Check** VCT pressure equal to **OR** greater than 15 psig. ☐
5. **Check** 8 gpm seal injection flow established to 1A NC Pump. ☐

NOTE

- NORMAL is described as ZERO static level. ☐
- The preferred method to check NC Pump oil level is by visual inspection. ☐

CAUTION

Starting an NC motor with LOW oil has the risk of an immediate bearing wipe. ☐

6. **Check** the following Normal via OAC **OR** by visual inspection of 1A NC Pump. ☐
   a. Upper oil pot level ☐
   b. Lower oil pot level ☐

B

SYS003 K6.14 - Reactor Coolant Pump System (RCPS)

Knowledge of the effect of a loss or malfunction on the following will have on the RCPS: (CFR: 41.7 / 45/5)

Starting requirements ....

Given the following initial conditions on Unit 1:

- NCS Tavg is 215°F
- NCS pressure is 250 PSIG
- VCT pressure is 28 PSIG
- The 1A NC pump is to be started for a unit heatup

Subsequently:

- The 1A2 Oil Lift pump is started
- Oil Lift pressure is 580 PSIG

In accordance with OP/1/A/6150/002A (REACTOR COOLANT PUMP OPERATION) Enclosure 4.1 (STARTUP AND OPERATION), the MINIMUM required #1 Seal differential pressure for starting the NC pump ___(1)___ met.

Based on the conditions above, if the 1A NC PUMP SAFETY BKR "**START**" pushbutton is depressed, the pump ___(2)___ start.

Which ONE (1) of the following completes the statements above?

A. 1. is
   2. will

B. 1. is
   2. will NOT

C. 1. is NOT
   2. will

D. 1. is NOT
   2. will NOT

General Discussion

The minimum #1 Seal D/P for starting an NC pump is 200 PSID as stated in OP/1/A/6150/002 A (NCP Operation).

The NC Pump will not start (safety breaker will not close) unless oil lift pressure is greater than 600 psig.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is correct and therefore plausible.

Part 2 is plausible if the applicant does not recall there is a bearing oil lift pressure interlock for starting an NCP.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant does not recall 200 PSID is the minimum required #1 seal differential pressure required by OP/1/A/6150/002 A. It is also typical for #1 seal differential pressure to be greater than 300 PSID during an NC pump start.

Part 2 is plausible since the 1A NCP can be started with low #1 seal differential pressure. However, the bearing oil lift interlock pressure for starting an NCP is not met.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant does not recall 200 PSID is the minimum required #1 seal differential pressure required by OP/1/A/6150/002 A. It is also typical for #1 seal differential pressure to be greater than 300 PSID during an NC pump start.

Part 2 is correct and therefore plausible .

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of the starting requirements for an NC pump to be able to identify when a malfunction has occurred that would effect whether or not an NC pump could be started.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to perform more than one mental step. First the applicant must analyze the parameters given in the stem and then calculate NCP seal d/p.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
Lesson Plan OP-MC-PS-NCP Section 2.1 & Section 2.3.2

LEARNING OBJECTIVES:
OP-MC-PS-NCP Objectives 6 & 12

OP/1/A/6150/002 A (NCP Operation) Encl. 4.1 pg 7 of 17

Student References Provided

SYS003 K6.14 - Reactor Coolant Pump System (RCPS)
Knowledge of the effect of a loss or malfunction on the following will have on the RCPS: (CFR: 41.7 / 45/5)

FOR REVIEW ONLY - DO NOT DISTRIBUTE

ILT-31 MNS SRO NRC Examination QUESTION 2

2

B

Starting requirements ....

401-9 Comments:	Remarks/Status
	401-9 Comments from Chief Examiner: ENHANCEMENT For the first part question, need to state something to the effect of "In accordance with OP/1/A/6150/002 (Procedure Name)". For the second part question, need to specify something to the effect of, "If the NC pump switch is placed in the start position" Throughout the exam, when asking requirements, need to tie it to the specific procedure, TS, etc. Facility Response: The facility concurs with Chief Examiner's comments and the question has been revised per Chief Examiner's recommendation. HCF 03/26/15

3.5 Rapid Recirculation of BAT

> **NOTE:** Rapid recirculation makes boration flow path from BAT to NC System via NV Pumps inoperable and unavailable.

______ 3.5.1 Evaluate SLC concerning Boration Flowpath.
SRO

______ 3.5.2 Ensure the following off:

- ☐ 1A BA Trans Pump
- ☐ 1B BA Trans Pump

> **CAUTION:** Exceeding three turns on 1NV-392 (BAT Recirc Orifice Byp) may result in pump run-out.

______ 3.5.3 Throttle 1NV-392 (BAT Recirc Orifice Byp) open two to three turns from closed position. (733+6, NN-53, operated from reach-rod)

______ 3.5.4 Unlock 1NV-393 (BAT Recirc Inlet). (733+10, PP-53, in Room 737 beside 1NVFE7800)

______ 3.5.5 Close 1NV-393 (BAT Recirc Inlet).

______ 3.5.6 Select "Start" on one of the following:

- ☐ 1A BA Trans Pump

<u>OR</u>

- ☐ 1B BA Trans Pump

______ 3.5.7 Notify Primary Chemistry of BAT recirc status.

________________________________ ______/______
Person Notified Date Time

______ 3.5.8 Update status of BAT recirc in the following:
{CAPR, NCR 01646039}

- ☐ C/R Status Board
- ☐ Narrative Log
- ☐ Mlog

16.9 AUXILIARY SYSTEMS

16.9.9 Boration Systems Flow Path (Operating)

COMMITMENT Two of the following three boron injection flow paths shall be OPERABLE:

a. The flow path from a boric acid tank via a boric acid transfer pump and a charging pump to the reactor coolant system, and

b. Two flow paths from the refueling water storage tank via charging pumps to the reactor coolant system.

Note: An OPERABLE charging pump used to satisfy OPERABILITY requirements of one boration flow path may not be used to satisfy OPERABILITY requirements for a second boration flow path.

APPLICABILITY MODES 1, 2, and 3.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required boron injection flow path inoperable.	A.1 Restore the required boron injection flow path to OPERABLE status.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3.	6 hours
	<u>AND</u>	
	B.2 Borate to the SDM requirements of Tech Spec 3.1.1.	6 hours
	<u>AND</u>	
	B.3 Restore the required boron injection flow path to OPERABLE status.	7 days

(continued)

16.9 AUXILIARY SYSTEMS

16.9.12 Boration Systems – Flow Path (Shutdown)

COMMITMENT

As a minimum, one of the following boron injection flow paths shall be FUNCTIONAL and capable of being powered by an OPERABLE emergency power source:

a. a flow path from a boric acid tank via a boric acid transfer pump and a charging pump to the reactor coolant system if the boric acid storage tank in SLC 16.9.14 is FUNCTIONAL,

Note: Exception to the OPERABLE emergency power source requirement is allowed in Mode 6 for valves 1/2NV-265B provided the valves are capable of being opened via local manual operation.

or

b. the flow path from the refueling water storage tank (RWST) via a charging pump to the reactor coolant system if the refueling water storage tank in SLC 16.9.14 is FUNCTIONAL.

Note: A FUNCTIONAL safety injection pump (and associated suction from RWST and discharge flowpath to cold legs) may be used in lieu of the charging pump in (b.) during Modes 5 and 6 when seal injection is not needed.

APPLICABILITY

MODES 4, 5, and 6.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required boron injection flow path non-functional. <u>OR</u> Required boron injection flow path not capable of being powered from an OPERABLE emergency power source.	A.1 Suspend CORE ALTERATIONS. <u>AND</u> A.2 Suspend positive reactivity additions.	Immediately Immediately

TESTING REQUIREMENTS

<table>
<tr><td rowspan="2">Duke Energy
McGuire Nuclear Station

CHEMICAL AND VOLUME CONTROL SYSTEM
CHARGING</td><td>Procedure No.
OP/2/A/6200/001 B</td></tr>
<tr><td>Revision No.
076</td></tr>
<tr><td>Continuous Use</td><td>Electronic Reference No.
MC007013</td></tr>
</table>

3. Procedure

☐ 3.1 Evaluate all outstanding Clearances that may impact performance of this procedure.

3.2 Perform the following section, as applicable:

- ☐ Section 3.3, Shifting From 2A NV Pump to 2B NV Pump With All Reactor Coolant Cold Leg Temperatures Greater Than 300°F
- ☐ Section 3.4, Shifting From 2B NV Pump to 2A NV Pump With All NC Cold Leg Temperatures Greater Than 300°F
- ☐ Section 3.5, Shifting From 2A NV Pump to 2B NV Pump With Any Reactor Coolant Cold Leg Temperature Less Than 300°F
- ☐ Section 3.6, Shifting From 2B NV Pump to 2A NV Pump With Any Reactor Coolant Cold Leg Temperature Less Than 300°F
- ☐ Section 3.7, Starting 2A NV Pump for a Functional
- ☐ Section 3.8, Starting 2B NV Pump for a Functional

3.3 Shifting From 2A NV Pump to 2B NV Pump With All Reactor Coolant Cold Leg Temperatures Greater Than 300°F

CAUTION:	Shifting NV Pumps at low NC System pressure with NC Pump(s) operating may result in NC Pump No. 1 seal damage. {NCR 01625731}

_____ SRO 3.3.1 **IF** NC System pressure is less than 400 psig, NC Pump(s) are in service **AND** either of the following conditions exists,
THEN evaluate increasing NC System pressure to 340 - 350 psig:

- ☐ NC Pumps No. 1 Seal DP less than 280 psid
- ☐ Lowest operating NC Pump No. 1 seal low range seal leakoff flow less than 0.4 gpm

_____ 3.3.2 **IF** immediate pump swap required,
THEN go to Step 3.3.5.

Unit 2

NOTE:
- Due to potential differences in boron concentration between NV Pump suction and discharge piping, the following steps vent the pump and flush approximately 5% from the VCT to minimize differences. {NCR 01607186} (R.M.)
- Flushing the idle NV Pump before planned pump swap reduces the stagnant corrosion products in the pump assembly from entering the NC System and NC Pump seals. (R.M.) {NCR 01667726}
- The following steps are intended to equilibrate captive piping boron concentration with NC boron concentration following non routine operations (i.e. refueling, startup, Rx trip recovery, etc.) (R.M.)

_____ 3.3.3 **IF** immediate pump swap is **NOT** required,
THEN flush via 2NV-292 (B CCP Flush & Vt. Isol) as follows:

_____ 3.3.3.1 Notify Radwaste of input to the WEFT Sump.

_____ 3.3.3.2 Ensure VCT level greater than 50%.

☐ 3.3.3.3 Record VCT level: ____________.

_____ (CV) _____ 3.3.3.4 Fully open 2NV-292 (B CCP Flush & Vt. Isol).

CAUTION: Fully opening 2NV-296 (B CCP Overflow) may cause water to back up in the drain header and result in contaminated water spilling out of the pump seal leakoff trough.

_____ 3.3.3.5 Throttle 2NV-296 (B CCP Overflow).

_____ 3.3.3.6 **HOLD** until VCT level has decreased 5% as indicated by Control Room indication,
THEN close the following:

_____ A. 2NV-296 (B CCP Overflow).

_____ (CV) _____ B. 2NV-292 (B CCP Flush & Vt. Isol).

_____ 3.3.4 **IF** immediate pump swap **NOT** required,
THEN perform the following:

_____ 3.3.4.1 **IF** 2B NV Pump flush performed per Step 3.3.3,
THEN notify operator performing venting of 2B NV Pump that vent **OR** UT of only 2NV-1073 (2B NV Pump Suction Hdr Hi Pt Vt) needs to be performed. (Vent **OR** UT of 2NV-292 (B CCP Flush & Vt. Isol) is **NOT** required.)

☐ 3.3.4.2 Vent 2B NV Pump per Encl. 4.14 (Venting NV Pumps).

_____ 3.3.4.3 **HOLD** until 2B NV Pump venting complete.

_____ 3.3.5 Start 2B NV Lube Oil Pump.

_____ 3.3.6 **IF** this is a routine start of the 2B NV Pump,
THEN HOLD until 2B NV Lube Oil Pump has run for 1 minute.

NOTE: For pre-planned NV Pump swaps, minimize the time NV pumps operate in parallel due to potential for 2NV-238 control system transients. If 2NV-238 operation becomes erratic, it may be necessary to place it in manual to minimize the transient. {NCR 01687446}

_____ 3.3.7 **IF** charging flow greater than 100 gpm,
THEN place 2NV-238 to manual.

_____ 3.3.8 **IF AT ANY TIME** operation of 2NV-238 (Charging Line Flow Control) becomes erratic with both NV pumps operating,
THEN place 2NV-238 to manual.

_____ 3.3.9 Start 2B NV Pump.

_____ 3.3.10 Place in "AUTO" 2B NV Lube Oil Pump. {NCR 01697693}

_____ 3.3.11 Depress "STP" for 2B NV Lube Oil Pump.

☐ 3.3.12 Check "START" pushbutton released **AND** "OFF" lit for 2B NV Lube Oil Pump.

_____ 3.3.13 Stop 2A NV Pump.

☐ 3.3.14 Adjust charging flow **AND** seal flow as needed.

_____ 3.3.15 **IF** 2NV-238 (Charging Line Flow Control) placed in manual **AND** charging **AND** seal flow have been adjusted as needed,
THEN perform the following:

☐ 3.3.15.1 Place 2NV-238 (Charging Line Flow Control) in auto.

☐ 3.3.15.2 Adjust "PZR LEVEL MASTER" output until Process Variable (PV) within +/- 0.2% of setpoint.

☐ 3.3.15.3 Place "PZR LEVEL MASTER" in auto.

_____ _____ 3.3.16 Calculate DP between Seal Balance Line Pressure **AND** Suction Pressure for 2B NV pump: {NCR 01710965}
IV

____________psig	–	____________ psig	=	__________psid
Seal Balance Line Pressure (2NVPG-5820)	–	Suction Pressure (2NVPG-5800)	=	DP

_____ 3.3.17 **IF** DP between Seal Balance Line Pressure **AND** Suction Pressure greater than 50 psid,
THEN notify Engineering.

________________________ _____/_____
Person Notified Date Time

NOTE:	• 2NV-238 (Charging Line Flow Control) output is normally 56 - 70% with 2NV-241 (Seal Inj Flow Control) at 58 - 60% and less than 80 gpm charging flow. • With 2NV-238 output greater than or equal to 74%, there is reduced capability to further increase charging flow.

3.3.18 Evaluate back leakage through 2A NV Pump as follows:

_____ 3.3.18.1 **HOLD** until Pzr level stable at setpoint,
THEN check 2NV-238 (Charging Line Flow Control) output.

_____ 3.3.18.2 **IF** charging flow less than **OR** equal to 75 gpm **AND** 2NV-238 (Charging Line Flow Control) output greater than 74%,
THEN notify Engineering via phone **OR** email.

________________________ _____/_____
Person Notified Date Time

3.4 Shifting From 2B NV Pump to 2A NV Pump With All NC Cold Leg Temperatures Greater Than 300°F

CAUTION: Shifting NV Pumps at low NC System pressure with NC Pump(s) operating may result in NC Pump No. 1 seal damage. {NCR 01625731}

_____ SRO 3.4.1 **IF** NC System pressure is less than 400 psig, NC Pump(s) are in service **AND** either of the following conditions exists,
THEN evaluate increasing NC System pressure to 340 - 350 psig:

- ☐ NC Pumps No. 1 Seal DP less than 280 psid
- ☐ Lowest operating NC Pump No. 1 seal low range seal leakoff flow less than 0.4 gpm

_____ 3.4.2 **IF** immediate pump swap required,
THEN go to Step 3.4.5.

NOTE:
- Due to potential differences in boron concentration between NV Pump suction and discharge piping, the following steps vent the pump and flush approximately 5% from the VCT to minimize differences. {NCR 01607186} (R.M.)
- Flushing the idle NV Pump before planned pump swap reduces the stagnant corrosion products in the pump assembly from entering the NC System and NC Pump seals. (R.M.) {NCR 01667726}
- The following steps are intended to equilibrate captive piping boron concentration with NC boron concentration following non routine operations (i.e. refueling, startup, Rx trip recovery, etc.) (R.M.)

_____ 3.4.3 **IF** immediate pump swap is **NOT** required,
THEN flush via 2NV-281 (A CCP Flush & Vt. Isol) as follows:

_____ 3.4.3.1 Notify Radwaste of input to the WEFT Sump.

_____ 3.4.3.2 Ensure VCT level greater than 50%.

☐ 3.4.3.3 Record VCT level: ____________.

_____ CV _____ 3.4.3.4 Fully open 2NV-281 (A CCP Flush & Vt. Isol).

CAUTION: Fully opening 2NV-285 (A CCP Overflow) may cause water to back up in the drain header and result in contaminated water spilling out of the pump seal leakoff trough.

_____ 3.4.3.5 Throttle 2NV-285 (A CCP Overflow).

_____ 3.4.3.6 **<u>HOLD</u>** until VCT level has decreased 5% as indicated by Control Room indication,
<u>THEN</u> close the following:

_____ A. 2NV-285 (A CCP Overflow).

_____ _____ B. 2NV-281 (A CCP Flush & Vt. Isol).
CV

_____ 3.4.4 **<u>IF</u>** immediate pump swap **<u>NOT</u>** required,
<u>THEN</u> perform the following:

_____ 3.4.4.1 **<u>IF</u>** 2A NV Pump flush performed per Step 3.4.3,
<u>THEN</u> notify operator performing venting of 2A NV Pump that <u>vent</u> **<u>OR</u>** <u>UT of only 2NV-1072 (2A NV Pump Suction Hi Pt Vt) needs to be performed</u>. (Vent **<u>OR</u>** UT of 2NV-281 (A CCP Flush & Vt. Isol) is **<u>NOT</u>** required.)

☐ 3.4.4.2 Vent 2A NV Pump per Encl. 4.14 (Venting NV Pumps).

_____ 3.4.4.3 **<u>HOLD</u>** until 2A NV Pump venting complete.

_____ 3.4.5 Start 2A NV Lube Oil Pump.

_____ 3.4.6 **<u>IF</u>** this is a routine start of the 2A NV Pump,
<u>THEN</u> **<u>HOLD</u>** until 2A NV Lube Oil Pump has run for 1 minute.

NOTE:	For pre-planned NV Pump swaps, minimize the time NV pumps operate in parallel due to potential for 2NV-238 control system transients. If 2NV-238 operation becomes erratic, it may be necessary to place it in manual to minimize the transient. {NCR 01687446}

_____ 3.4.7 **<u>IF</u>** charging flow greater than 100 gpm,
<u>THEN</u> place 2NV-238 to manual.

_____ 3.4.8 **<u>IF AT ANY TIME</u>** operation of 2NV-238 (Charging Line Flow Control) becomes erratic with both NV pumps operating,
<u>THEN</u> place 2NV-238 to manual.

_____ 3.4.9 Start 2A NV Pump.

_____ 3.4.10 Place in "AUTO" 2A NV Lube Oil Pump. {NCR 01697693}

_____ 3.4.11 Depress "STP" for 2A NV Lube Oil Pump.

☐ 3.4.12 Check "START" pushbutton released **<u>AND</u>** "OFF" lit for 2A NV Lube Oil Pump.

_____ 3.4.13 Stop 2B NV Pump.

☐ 3.4.14 Adjust charging flow **AND** seal flow as needed.

_____ 3.4.15 **IF** 2NV-238 (Charging Line Flow Control) placed in manual **AND** charging **AND** seal flow have been adjusted as needed,
THEN perform the following:

☐ 3.4.15.1 Place 2NV-238 (Charging Line Flow Control) in auto.

☐ 3.4.15.2 Adjust "PZR LEVEL MASTER" output until Process Variable (PV) within +/- 0.2% of setpoint.

☐ 3.4.15.3 Place "PZR LEVEL MASTER" in auto.

_____ _____ 3.4.16 Calculate DP between Seal Balance Line Pressure **AND** Suction Pressure for 2A NV pump: {NCR 01710965}
IV

______________psig	–	______________ psig	=	__________psid
Seal Balance Line Pressure (2NVPG-5810)	–	Suction Pressure (2NVPG-5790)	=	DP

_____ 3.4.17 **IF** DP between Seal Balance Line Pressure **AND** Suction Pressure greater than 50 psid,
THEN notify Engineering.

________________________ _____/_____
Person Notified Date Time

> **NOTE:**
> - 2NV-238 (Charging Line Flow Control) output is normally 56 - 70% with 2NV-241 (Seal Inj Flow Control) at 58 - 60% and less than 80 gpm charging flow.
> - With 2NV-238 (Charging Line Flow Control) output greater than or equal to 74%, there is reduced capability to further increase charging flow.

3.4.18 Evaluate back leakage through 2B NV Pump as follows:

_____ 3.4.18.1 **HOLD** until Pzr level stable at setpoint,
THEN check 2NV-238 (Charging Line Flow Control) output.

_____ 3.4.18.2 **IF** charging flow less than **OR** equal to 75 gpm **AND** 2NV-238 (Charging Line Flow Control) output greater than 74%,
THEN notify Engineering via phone **OR** email.

________________________ _____/_____
Person Notified Date Time

This is important for the operator to know to help in diagnosing NCP seal failures or assessing No. 1 seal condition.

Chart Recorders

Boric Acid Flow – Total Blender

AD-7 Annunciator Alarms

VCT Hi Temperature	116°F
VCT Abnormal Pressure	14.1 psig / 65 psig
VCT Abnormal Level	16% / 96%
Charging Line Demand Low Flow	38 gpm
Charging Line Abnormal Flow	58 gpm / 150 gpm
Excess Letdown HX Hi Flow (KC)	275 gpm
Letdown HX Outlet Hi Flow	130 gpm
Letdown HX Outlet Hi Pressure	506 psig
Letdown HX Outlet Hi Temperature	120°F
Excess Letdown HX Hi Temperature	176°F
Regen HX Letdown Hi Temperature	395°F
Boric Acid Flow Deviation	0.8 gpm deviation Hi/Lo (for > 20 sec)
Letdown Relief Hi Temperature	140°F
NC Pump Seal Injection Low Flow	7 gpm
BABT Hi Temperature	120°F
BAT Abnormal Temperature	70°F / 145°F
BAT Empty	13%
BAT Abnormal Level	49% / 96%
BAT Low-Low Level	38%
Seal Water Injection Filter Hi D/P	40 psid

SI-8 Status Indication

NV Pump A Speed Reducer & Brg Oil Cooler Lo Flow

NV Pump B Speed Reducer & Brg Oil Cooler Lo Flow

NV Pump A Aux Lube Oil Pump Running

NV Pump B Aux Lube Oil Pump Running

Manual Loaders

NV-26B, Excess Letdown Heat Exchanger Outlet Press Control

NV-241, Seal Injection Flow Control

Q5 References

3.10.7 Remove Fuel Transfer Tube Blind Flange by performing the following:

_____ CCC 3.10.7.1 Evaluate Containment Closure requirements for the following:

- ☐ Transfer Tube Blind Flange removal
- ☐ Opening 1NV-842A,C (Standby M/U Pump Inlet Isol).

_____ 3.10.7.2 Initiate Clearance for removal of the Fuel Transfer Tube Blind Flange.

NOTE:	Refueling Cavity Drains must be closed and locked per Step 3.10.6 prior to removing the Fuel Transfer Tube Blind Flange to maintain QA Seismic Boundary.

_____ 3.10.7.3 **WHEN** Transfer Tube draining has stopped, **THEN** notify Maintenance to remove Fuel Transfer Tube Blind Flange **AND** to expect water.

______________________ _____/_____
Person Notified Date Time

_____ 3.10.7.4 **WHEN** Fuel Transfer Tube Blind Flange removed, **THEN** perform the following:

_____ A. Remove the Clearance for the Fuel Transfer Tube Blind Flange.

_____ B. Close 1NV-842AC (Standby M/U Pump Inlet Isol).

_____ CCC C. Evaluate Containment Closure requirements for closing 1NV-842AC (Standby M/U Pump Inlet Isol).

3.11 Perform the following:

_____ 3.11.1 Notify designated Operator that the requirement to be capable of removing tag **AND** racking in an NI Pump breaker within 15 minutes of dispatch is no longer in effect.

☐ 3.11.2 Delete this item from SRO Turnover Checklist.

3.12 Open: {NRC Commitment per MCTC-1561-ND.V001-01}

- ☐ 1EMXD-8D (1ND-1B)
- ☐ 1EMXA4-3C (1ND-2A)

Unit 1

ND-1B and ND-2AC may be controlled from the Auxiliary Shutdown panel following a control room evacuation, to help bring the unit to a safe shutdown condition. ND-2AC can also be operated from the Safe Shutdown Facility (SSF) Control Panel.

Portable motor starter and control stations are provided to control residual heat removal letdown valves after a postulated fire disables normal power supplies to these valves. The power operation of these valves with portable equipment is required to achieve cold shutdown without the need to enter containment to manually operate valves. Emergency power is obtained from motor control centers (MCC) located in the Diesel Generator rooms and is connected to the valves through normal containment penetrations. Portable power supplies and receiver gauges are used to monitor the reactor coolant system pressure should normal indications be lost. This is required by 10CFR50 Appendix R for fire damage control.

The single failure of ND-1B or ND-2AC could prevent the use of the residual heat removal system. Temporary motor starters and actuator hand-wheels are provided to enhance reliability, and low ND flow alarms are provided to alert the operators of system isolation. Additionally, Duke Power committed to have power removed from ND-1B and ND-2AC while the reactor head is unbolted and the refueling canal was filled, to reduce the possibility of a loss of ND suction (Ref. FSAR Question 212.72).

The normal system configuration is to remove power from ND-1B and ND-2AC after the Unit has reached Mode 5 during shutdown (while performing OP/1or 2/A/6100/SD-12, Cooldown to 100°F). Maintaining power during Mode 4 allows the ND suction isolation valves to be operated from the control room while the NC system is a high energy system and ND piping has high thermal stresses, minimizing shutdown LOCA risk. Power is removed from the valves in Mode 5 to minimize the risk of a loss of ND event due to spurious valve movement. During plant startup, power is removed from ND-1B and ND-2AC after the unit has entered Mode 4 but prior to 350°F while performing OP/1or 2/A/6100/SU-14 (Removing ND from Service).

The OPERABILITY requirements for these valves can be found in the DBD.

2.3.2 ND-4B (B ND Pump Suction From FWST Or NC) and ND-19A (A ND Pump Suction From FWST Or NC)

Objective #5

These valves are controlled from MC11 by open/close pushbuttons. They will auto close when their train related containment sump isolation valve fully opens (NI-184B or NI-185A). This interlock is designed to prevent the FWST from being drained to the containment sump.

ND-4B is interlocked so that it cannot be opened unless the following valves are closed:

- NS-38B (B ND to NS Cont. Outside Isol.) prevents NCS coolant from being pumped to the containment spray ring.
- NI-136B (B NI Pump Suction From ND) prevents NI system suction from being overpressurized

C

The following conditions exist on Unit 1:

- Plant shutdown and cooldown to 100°F is in progress.
- NC System temperature 180°F.
- Both trains of ND are in service in accordance with station procedures.

The power supplies to 1ND-1B and 1ND-2AC are 600V _____1_____ Load Centers and the status of their motor breakers are ______2_______.

A. (1) Unit
(2) OPEN

B. (1) Unit
(2) CLOSED

C. (1) Essential
(2) OPEN

D. (1) Essential
(2) CLOSED

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EXAM BANK QUESTION: 3221 MNS C

General Discussion

Answer A Discussion

A.Incorrect. Wrong power supply.

Answer B Discussion

B.Incorrect. Wrong power supply, wrong breaker position.

Answer C Discussion

C.Correct. Page 21 of OP-MC-PS-ND (ND System Lesson Plan) indicates that these valves are capable of being closed during a Station Blackout or Loss of Offsite Power. This means that they must be powered by the Essential Power distribution busses. Page 23 states The normal configuration is to remove power from 1ND-1B and 1ND-2AC after the Unit has reached Mode 5 during shutdown. OP/1/A/6100/SD-12 identifies the breakers as 1EMXD-8D and 1EMXA/4-3C which are MCCs powered from the 600V Essential Load Centers, and tags the breakers open when the plant is in Mode during a cooldown to 100oF.

Answer D Discussion

D.Incorrect. Correct power supply, wrong breaker position for given plant configuration.

Basis for meeting the KA

KA is matched because item directly evaluates power source for MOVs, and further discriminates by asking breaker position

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	

Development References

Student References Provided

KA	KA_desc
SYS005 K2.03	Knowledge of bus power supplies to the following: (CFR: 41.7)RCS pressure boundary motor-operated valves ....

2.3.8 ND-67B (B ND Pump & B HX Mini-flow) and ND-68A (A ND Pump & A HX Mini-flow)

These safety related, normally closed motor operated valves are interlocked to automatically open on a train related pump start when ND flow through its train related ND heat exchanger falls below the 750 gpm setpoint (as sensed by NDFT5250 for pump A and NDFT5260 for pump B). When flow reaches the 1400 gpm setpoint or if the associated pump stops, the valve will close.

2.3.9 ND-35 (ND System to FWST Isolation)

This valve is an 8" manually operated gate valve. ND-35 is used during outage periods to transfer water from the reactor coolant system or refueling canal to the refueling water storage tank. ND-35 is also used as a gravity flow path from the FWST to the NC system during loss of ND events.

ND-35 shall not be opened during Modes 1 - 4. Opening this valve during Modes 1 - 3 would allow both trains of ND to recirculate to the FWST, since ND-15B and ND-30A are required to remain open. With the ND to FWST recirculation path open, both trains of ND would be inoperable due to the insufficient ECCS injection flowrate to the NC loops. Opening this valve while in Mode 4 with the ND System in service could cause a rapid loss of reactor coolant inventory and void the 24" FW header with steam, making all ECCS trains inoperable. Therefore, ND-35 shall remain locked closed during Modes 1 - 4.

2.3.10 NI-184B (RB Sump to Train B ND & NS) and NI-185A (RB Sump to Train A ND & NS)

Objective # 7

NI-184B and NI-185A have open/close pushbuttons on the ND section of MC11. These valves are designed to automatically open on FWST low level (95"), following a safety injection signal, to swap the ND pump suction from the FWST to the containment sump. Each valve has an S-latch control circuit which ensures that the valves will not swap to the containment sump unless certain conditions exist (Refer to drawing 7.2). The S latch is activated by the train related safety injection signal and has two train related indication/switches on MC11. When the S_S signal is actuated, the S LATCHED indication will illuminate and remain lit until the SS RESET pushbutton is depressed. The S LATCH seals in the S_S SIGNAL, therefore the automatic swap will be enabled even if the S_S signal is reset. The S-latch allows the automatic opening of NI-184B and/or NI-185A on 2 of 3 FWST LO level bistables provided the FWST level instruments are not in test.

Operator Fundamental Focus; Monitoring and Control
Operators are expected to monitor for automatic system and component response and, if the expected response does not occur, take manual action.

The S-latch switch also has a BYPASS pushbutton which has a mechanical latch which allows the operator to open the valves with their open pushbuttons in the event that:

- the S_S signal did not actuate the S Latch
- the S-latch had been prematurely reset
- it is desired to transfer to the containment sump prior to the FWST LO Level setpoint, or
- testing of the circuit is required

The BYPASS pushbutton allows opening of the containment sump valves with ND-19A (A ND Pump Suction from FWST or NC) and ND-4B (B ND Pump Suction from FWST or NC) open however, NS-1B (B NS Pump from Cont Sump) and NS-18A (A NS Pump from Cont Sump) must be closed. This accomplishes the auto transfer of ND Suction from FWST to the containment sump since ND-19A and ND-4B will automatically close once its train related containment sump isolation valve reaches the fully open position. The REL pushbutton removes the mechanical latch on the BYPASS pushbutton. This pushbutton is used when the BYPASS function is no longer needed.

The S_S Reset pushbutton will restore the NI-184B(185A) open interlock and disables the 2/3 FWST LO level auto open signal. When depressed, the S latch light will go out.

NI-184B(185A) can be manually opened using their Control Room pushbuttons if

NS-1(18) are closed and one of the following conditions are met:

- the S LATCH contacts are closed or
- the S LATCH BYPASS is depressed or
- ND-4B(19A) is closed.

Minor Modification MM-7161 and MM-7220 added equalization lines from the bonnet of valves NI-184B and NI-185A to the downstream side of the valve. These valves are flex-wedge gate valves and have the potential to trap high pressure water and air between the disks. The trapped water and air are postulated under certain conditions to cause the disks to seat so tightly that the valve operator would be unable to open the valve when necessary. The equalization line consists of a 1/2 inch tubing line tapped and welded into the valve body and welded to a 1/2 inch class B packless valve (NI-856 for valve NI-184B and valve NI-857 for NI-185A) which is fully qualified for the service conditions of this application. Equalization valves NI-856 and NI-857 will be normally open. The downstream side of the equalization valve is 1/2 inch tubing which is routed back to the NI valve on the downstream side (toward the pump). The equalization line is thus configured to maintain the pressure in the bonnet at a pressure no more than the operating pressure in the ND pump suction piping. The equalization valves act as check valves to prevent pressurization of the bonnet in normal operating alignments.

Nomenclature: **PRT HI TEMP** Window: **C9**

Setpoint: 114°F

Origin: Temperature transmitter on tank (1NCRD-5350) via DCS digital output NCDJ 5350

Probable Cause:
- Excessive primary plant leakage
- Pressurizer PORV lifting
- High Lower Containment ambient temperature

Automatic Action: None

Immediate Action: **IF** required to control PRT temperature, pressure, or level, go to OP/1/A/6150/004 (Pressurizer Relief Tank).

Supplementary Action:

1. **IF** PRT high temperature due to containment ambient conditions, evaluate placing 1B VL AHU in service per OP/1/A/6450/001 (Containment Ventilation System) to provide cooling in vicinity of PRT.
2. Refer to Tech Specs for leakage limits.

References:
- Tech Specs
- MCFD-1553
- NSM MG-1-2126
- DCS Control Builder Sheet 313, Drop 9

End Of Response

2.9 Pressurizer Relief Tank (PRT)

Objective # 19

The purpose of the pressurizer relief tank is to condense and cool discharge water from the PORVs and safeties. The tank normally contains water and a N_2 cover gas. The N_2 gas overpressure is used to prevent the O_2 from entering the tank and forming an explosive mixture with the H_2 gas present. The N_2 gas is supplied from bulk N_2 (GN system) or from Shutdown Tank B. When the relief valves lift, the steam is discharged into the PRT through a sparger pipe (under water). The PRT design is based on the requirement to:

- be able absorb the pressurizer discharge during a step load decrease of 10% (equivalent to 110% continuous discharge from the pressurizer).
- the spray rate is designed to cool the tank from 200^0 F to 120^0 F in approximately one hour following the design discharge.
- the volume of the N_2 gas in the PRT is selected to limit the maximum pressure following a design discharge to 50 psig.

The PRT is not designed for relief valve continuous discharge, therefore, it has two rupture discs designed to prevent it from exceeding its design pressure of 100 psig. The rupture disc setting is also 100 psig which is twice the calculated pressure resulting from the maximum design safety valve discharge. The tank and rupture discs are also designed for full vacuum to prevent tank collapse if the contents cool following a discharge without nitrogen being added.

The PRT can be vented to containment atmosphere through a manual vent valve at the tank (NC51). Due to ALARA concerns this is not normally performed with the Unit at power. This line has a capped connection designed to accept a filter assembly to reduce radioactivity released from the tank to containment. The PRT can also be aligned to the waste gas system for venting. The PRT has pressure indication on 1(2)MC10 and alarms on 1(2)AD6 “PRT Hi Press”.

The PRT is equipped with internal spray and drain system to cool the tank. The PRT is cooled by recirculating its contents with the Reactor Coolant Drain Tank (NCDT) Pump through the NCDT heat exchanger. If the NCDT pumps are unavailable, the PRT can be cooled by increasing PRT N_2 pressure, initiating PRT spray flow from the RMWST while cycling NC107 to maintain level. The PRT has a temperature indication on 1(2)MC10 and an alarm on 1(2)AD6 “PRT Hi Temp” to inform the operator that the tank needs cooling. PRT level can be lowered by opening NC-107A (PRT Drain to NCDT system) or by opening NC-109 (PRT #1 Sample) to the containment floor and equipment sump. PRT level can be raised by opening NC-58A (PRT Spray Supply Block) and either using gravity fill from the RMWST or starting an RMWST pump in the recirculation mode. The PRT has level indication on 1(2)MC10 and alarms on 1(2)AD6 “PRT Abnormal Level”.

Refer to OP/1(2)/A/6150/004 Pressurizer Relief Tank, for PRT operations.

1. Limits and Precautions

1.1 PRT temperature should be maintained less than 114°F.

1.2 Shutdown Tank "B" or Bulk Nitrogen shall maintain a N2 blanket on the PRT during normal operations.

1.3 PRT level should be maintained 64 - 88% during normal operations.

1.4 Venting of PRT to WG must be coordinated with Radwaste.

1.5 Maximum NCDT Pump discharge flow is 150 gpm (one pump) in PRT cooling alignment (pump runout concern).

1.6 Minimum NCDT and PRT pressure is 0 psig. {PIP-M-99-5074}

2. Initial Conditions

_____ 2.1 PRT operating per Enclosure 4.1 (Establishing PRT Normal Operating Conditions).

_____ 2.2 NCDT Subsystem operating per OP/1/A/6500/001 (Liquid Waste System).

3. Procedure

☐ 3.1 Evaluate all outstanding R&Rs that may impact performance of this procedure.

_____ 3.2 **IF** 1NC-109 (PRT #1 Sample) being used to lower/stabilize level in PRT, go to Enclosure 4.2 (Adjusting PRT Level), Section 3.4, Raising PRT Level Using Reactor Makeup Water Pump and use PRT Spray as primary means to cool PRT.

_____ 3.3 **IF** desired to prevent Waste Gas Compressor trip on high suction pressure, close 1WL-41B (NCDT Vent Cont Outside Isol).

_____ 3.4 **IF** 1WL-41B (NCDT Vent Outside Isol) open, notify Radwaste that Waste Gas Compressor may trip on high suction pressure.

NOTE:
- Equalizing pressure between PRT and NCDT reduces possibility of NCDT Pump trips.
- **IF** unequal pressure between PRT and NCDT, level in NCDT can change quickly during system alignments.

_____ 3.5 **IF** desired to raise PRT pressure, notify Radwaste to raise PRT pressure per OP/0/A/6200/518 (Waste Gas Operation).

CAUTION: NCDT pressure will rise rapidly to PRT pressure. **IF** NCDT pressure goes above VCT pressure, NC Pump #2 and #3 seals will be adversely affected.

_____ 3.6 **IF** 1NV-94AC (U1 NC Pumps Seal Water Return Cont Inside Isol) **AND** 1NV-95B (U1 NC Pump Seal Water Return Cont Outside Isol) open, check VCT pressure is greater than PRT pressure.

NOTE: **IF** 1WL-41B (NCDT Vent Cont Outside Isol) open, Steps 3.7 - 3.9 should be performed without delay.

_____ 3.7 Open 1NC-107A (Unit 1 PRT To NCDT Pump Drn Isol).

_____ 3.8 Open 1WL-33 (NCDT Pumps to PRT).

3.9 Close:

- _____ 1WL-3 (Unit 1 NCDT Outlet Isol)
- _____ 1WL-36 (NCDT Pumps Recirc)

3.10 Align 1WL-23 (NCDT Pumps Disch Control) as follows:

_____ 3.10.1 Select "MAN" on "1WL-23 Mode Select".

_____ 3.10.2 Close 1WL-23 (NCDT Pumps Disch Control).

_____ 3.11 **IF** 1WL-41B (NCDT Vent Cont Outside Isol) open, perform the following:

☐ 3.11.1 Monitor NCDT level.

_____ 3.11.2 **IF** NCDT level approaches 90%, close 1WL-41B (NCDT Vent Cont Outside Isol).

_____ 3.12 **WHEN** PRT at desired temperature **OR** necessary to stop and lower NCDT level, perform the following:

3.12.1 Open the following:

- _____ 1WL-3 (Unit 1 NCDT Outlet Isol)
- _____ 1WL-36 (NCDT Pumps Recirc)

3.12.2 Close the following:

- _____ 1WL-33 (NCDT Pumps to PRT)
- _____ 1NC-107A (Unit 1 PRT To NCDT Pump Drn Isol)

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Precautions

1. KC contains a corrosion inhibitor and shall be processed per Chemistry direction prior to release to environment.

2. It is preferred to drain KC to the KC Drain Tank.

3. Disposing of KC water in Containment Sump is prohibited.

4. KC water is hazardous to the skin and eyes.

3.2 Limitations

1. Maximum Discharge Header Flow for one KC pump is 4000 gpm or 8000 gpm for both pumps.

2. When an ND pump is running with discharge temperature greater than 150F, then KC flow shall be aligned to ND Pump Mechanical Seal Hx.

3. KC flow to each ND Hx in service must be maintained per OP/1/A/6100/022 (Unit 1 Data Book) Enclosure 4.3, Section 2.10.10 or Section 2.10.11 when both of the following conditions exist: [8.7.5]

   - NC System temperature greater than or equal to 160F
   - ND in RHR Mode with 1NI-173A or 1NI-178B OPEN

4. If one KC Pump tagged, then KC to associated ND HX should be throttled to less than 4000 gpm using HX manual isolation (1KC-52 or 1KC-55).

5. If both trains of KC in service and total KC flow to ND HXs exceeds 6000 gpm, then the Aux Bldg Non-Essential Header must be isolated to prevent KC pump run out during blackout conditions. (One 4160V bus fails to energize.)

6. During normal operation, minimum KC HX outlet temperature is 45F.

4.0 GENERAL INFORMATION

This procedure affects Containment Closure.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE If both trains of KC Aux Bldg Non-essential Header isolation valves are open, 1A KC Train can supply cooling to 1B ND Hx.

33. **Establish KC to running ND Train(s) and any ND Train that is to be placed in service, as follows:**

__ a. Check 1A ND Pump - ON.

RNO a. Perform the following:

__ 1) **IF** 1A ND Pump will be started, **THEN GO TO** Step 33.b.

__ 2) **GO TO** Step 33.c.

b. Align KC to 1A ND Hx as follows:

__ 1) Limit KC Pump flow to 4000 GPM per operating KC Pump in next step.

__ 2) THROTTLE OPEN 1KC-56A (1A ND Hx KC Inlet Isol) to establish 2000 GPM to 5000 GPM KC flow to 1A ND Hx.

__ c. Check any 1B Train KC Pump - ON.

RNO __ c. **GO TO** 33.e.

__ d. **GO TO** Step 33.f.

e. Check the following valves - OPEN:

- __ 1KC-2B (Trn B Aux Bldg Non Ess Ret Isol)
- __ 1KC-53B (Trn B Aux Bldg Non Ess Sup Isol)
- __ 1KC-1A (Trn A Aux Bldg Non Ess Ret Isol)
- __ 1KC-50A (Trn A Aux Bldg Non Ess Sup Isol).

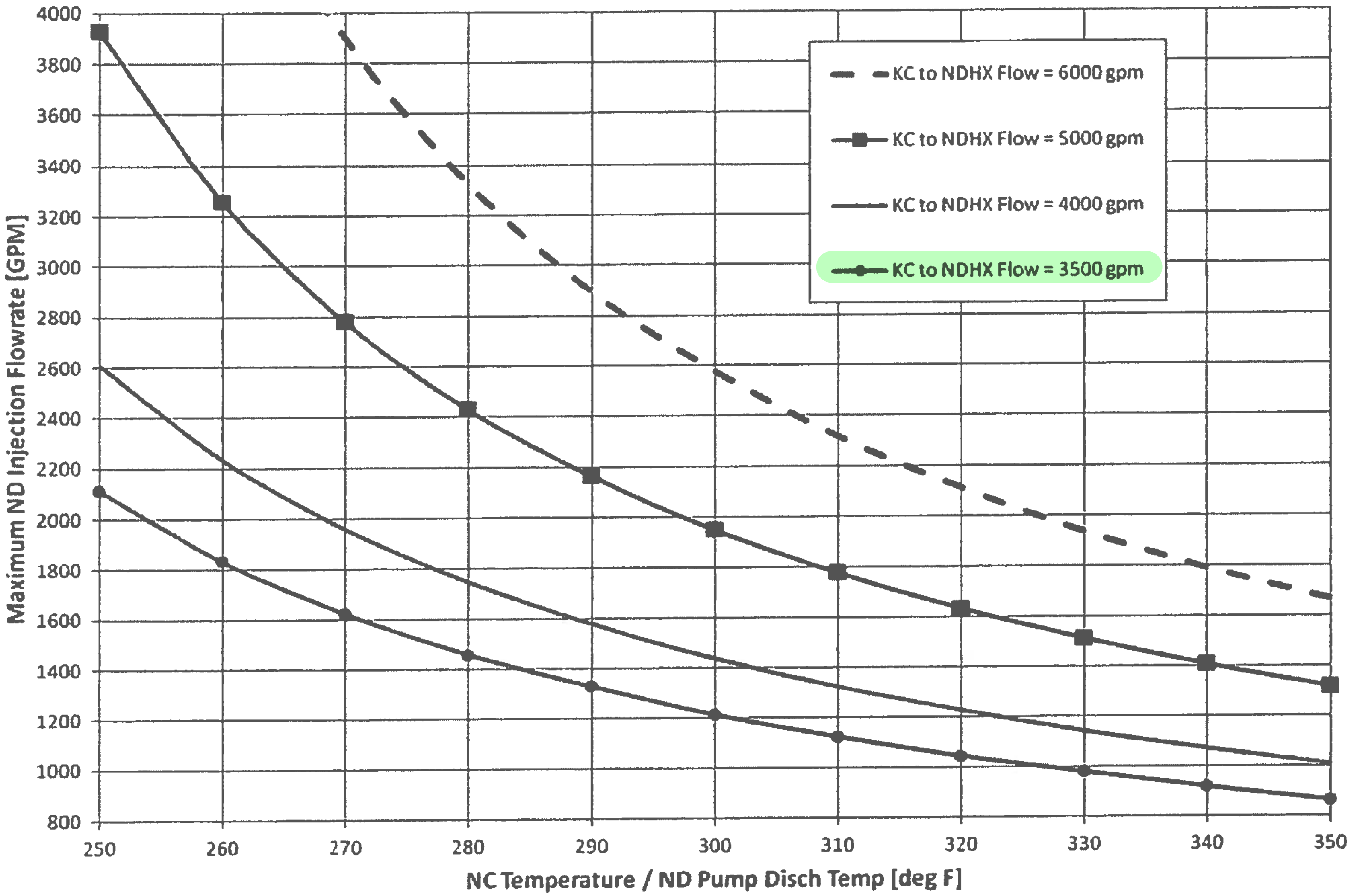
RNO __ e. **GO TO** Step 34.

UNIT 1

OP/1/A/6100/022, Enclosure 4.3; Section 2.10.10

Maxiumum Allowable ND Injection Flowrate

1) Bounding assumption: KC-to-NDHX inlet temperature is </= 110 F.
2) These injection flow limits ensure KC outlet temperature is < 160 F.



UNIT 1

Given the following conditions on Unit 1:

- The unit is in HOT SHUTDOWN on ND Cooling (Both Train A and B)
- B Train KC is aligned to supply Reactor and Aux Bldg Non-Essential Headers with both 1B1 and 1B2 pumps in operation
- A Train KC is aligned to supply the A ND HX Header with both 1A1 and 1A2 pumps in operation
- The 1A1 KC pump has just tripped

In accordance with the Limits and Precautions of OP/1/A/6400/005 (Component Cooling Water System), KC flow through the 1A ND Heat Exchanger shall be throttled to less than a MAXIMUM of _______.

Which ONE (1) of the following completes the statement above?

A. 2000 GPM

B. 4000 GPM

C. 5000 GPM

D. 6000 GPM

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EXAM BANK QUESTION: 5920 MNS

B

General Discussion

In accordance with the KC System Limits and Precautions:

* IF one KC Pump tagged, KC to associated ND HX should be throttled to less than 4000 gpm using HX manual isolation (KC-52 or KC-55).

Basis: To prevent KC pump runout

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because 2000 GPM is the minimum KC flow to the operating ND train with NC system temperature greater than 200°F.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because AP-21 (Loss of KC or KC System Leakage)
Enclosure 4 specifies a flow range of 2000 to 5000 GPM flow when starting a KC Train.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because 6000 GPM is the limit on total KC flow through the ND HXs with both trains of KC in service.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of the CCW flow rate limit through the ND Hx with only one KC pump in service.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	ILT-31 MNS NRC Examination

Development References

REFERENCES:
Lesson Plan OP-MC-PSS-KC

LEARNING OBJECTIVES:
OP-MC-PSS-KC Objective 13

Student References Provided

KA	KA_desc
SYS008 A1.01	Ability to predict and/or monitor changes in parameters to prevent exceeding design limits) associated with operating the CCWS controls including : (CFR: 41.5 / 45.5)CCW flow rate ....

2.4.4 This alternate regulated power supply (1KRP for Unit 1 and 2KRP for Unit 2) will allow an uninterruptible manual transfer of power to only one of the four unit associated AC power panelboards (1EKVA, 1EKVB, 1EKVC, or 1EKVD for Unit 1 and 2EKVA, 2EKVB, 2EKVC, or 2EKVD for Unit 2).

Objective # 16

2.4.5 A Kirk-Key Interlock scheme is provided on all four feeder breakers, of the regulated power supply (1KRP or 2KRP), such that only one breaker may be closed at a time.

2.4.6 This interlock prevents:

1. ***The operator from supplying both Train A and Train B from a single power source***
2. ***The loss of two instrument and control channels from the failure of one power source***

2.4.7 1KRP receives its power from two shared MCCs (SMXT or SMXY) through voltage regulators 1VRA or 1VRB and its associated transformer.

2.4.8 2KRP receives its power from two shared MCCs (SMXW or SMXU) through voltage regulators 2VRA or 2VRB and its associated transformer.

Both of these power supplies, 1KRP and 2KRP, are located in the Vital I&C Battery Room on the south outside wall of the EVCB and EVCD Battery Rooms, between the accesses to Battery Chargers EVCB and EVCD (1KRP is on the Unit 2 side and 2KRP on the Unit 1 side). Several plant transients, including a reactor trip, have been attributed to the operator manipulating the wrong unit's KRP during Vital Inverter Startup/Shutdown operation.

Objective # 17

2.4.9 An automatic transfer switch will transfer the incoming power to KRP from one MCC to the other on a loss of power. Once an automatic transfer has taken place an operator must locally (at the respective unit's KRP distribution center) make a manual transfer back to the normal power source (1VRA for Unit 1 / 2VRB for Unit 2).

2.4.10 This system provides four independent channels for instrumentation and control power to both Unit 1 and Unit 2 (the A Train loads are fed from channels A and C while the B Train loads are fed from channels B and D). Three of the four channels ensure that the overall system functional capability is maintained, comparable to the original design standards for safe operation, however, a loss of any two of these sources will result in a reactor trip or forced reactor shutdown (Technical Specifications) of the unit.

Operator Fundamental Focus; Knowledge and Monitoring
Explain *that, during normal operation, the N_2 backup from the CLA is not normally selected. The CLAs have a minimum pressure required by Tech Specs therefore possible leakage or operation of the PORVs could allow the N_2 pressure to fall below the Tech Spec requirement. Thus the N_2 is only enabled when the operating mode does not have a CLA Tech Spec pressure requirement.*

Reinforce *that understanding this will prevent the operators from aligning the CLAs to the PORVs and having the undesirable consequence of impacting OPERABILTITY of the CLAs.*

Objective # 15

The common discharge line from the PORVs has a temperature element which provides indication for PORV discharge temperature via meter located on 1(2)MC10 and an alarm on 1(2)AD6 " Pzr PORV Disch Hi Temp". This indication is used to assist in identifying if a PORV is leaking which has Tech Spec implications.

Objective # 16

Each PORV has a loop seal between the PORV and its electric isolation. These loop seals were designed to assist in preventing the leakage of H_2 through the PORV valve seat. Industry concerns were raised over potential water slug acceleration and subsequent piping damage when a PORV or safety was opened. It was determined, as documented in NCR# 1702097 that in this application a water slug would not damage the piping to the extent that the PORVs would become inoperable. However, each loop seal between the PORV block valve and PORV has a drain line which normally drains the condensate back to the pressurizer (Refer to **Drawing 7.7**). Each drain line has normally open isolation valve (NC-269, 270, 271). Each valve is solenoid actuated and can be operated from the control room on 1(2)MC10. If a PORV is leaking, its associated block valve and loop seal drain isolation valve will be closed to prevent bypass of the block valve function. These drain valves do not have to be open for the PORVs to be operable.

2.8 Pressurizer Code Safety Valves

Objective #15, 17,18

The purpose of the safety valves (NC1,2 and 3) is to prevent the NCS from being pressurized above its safety limit of 2735 psig. Each unit has three totally enclosed pop-type, spring loaded, self-actuated safety valves set at 2485 psig. The combined capacity of the three valves is greater than or equal to the maximum surge capacity following a complete loss of load without a reactor trip. The 6 inch pipes connecting the pressurizer nozzles to their respective code safety valves are shaped in the form of a loop seal. Originally, the loops seals were designed to collect condensate, as a result of normal heat losses to the containment atmosphere. The condensate was to prevent any

leakage of hydrogen gas or steam through the safety valve seats. However, a concern was raised that if a water slug were to be accelerated when the safety valve opened, the resultant water hammer could result in severe damage to the valve and/or downstream piping which could result in an unisolable leak from the steam space of the pressurizer. Therefore the safety valve internals were replaced with a design that could seal on steam and drains for the loops seals were added to continuously drain condensate back to the pressurizer via one of the upper pressurizer level detector penetrations. Each of these drain lines has a strap on RTD which provides temperature indication on the OAC. LO (approx. 110 degrees) and LO LO (approx. 100 degrees). OAC alarms are provided to notify Engineering to assess operability of the Safety Valves at low temperatures.

The discharge line from each safety also has a temperature element which provides meter indication on 1(2)MC10 and an alarm on 1(2)AD6 “PZR Safety Discharge Hi Temp ". This indication alerts the operator of leaking/lifting safety valve(s). The discharge line also has an acoustic monitor which “listens” for sounds of a safety valve discharge. This monitor provides input to an alarm on 1(2)AD6 “NC1, 2, or 3 FLO DETECTED" and also to a control board light "FLOW/NO FLOW". Each pressurizer safety valve is equipped with an accelerometer to detect leakage. The accelerometers provide a signal for each pressurizer safety valve at panel ALDM-1 (733 electrical penetration room).

Operator Fundamental Focus; Teamwork
Explain *that Operations can direct an AO and an IAE technician to panel ALDM-1 when flow has been detected by the control room alarm. Describe the fact that this local panel can give bar graph readout "relative" to leakage indication with IAE assistance. However, this is not a GPM read out but rather a 1 to 10 scale of 0**%** to 100**%** flow anticipated from a pressurizer safety at full temperature and pressure.*
Reinforce *that understanding this alternate indication, and what it can provide to the AO, will assist them with communicating the status of this parameter to the operating crew when needed, which is an attribute of the Operator Fundamental Teamwork.*

Keys to Life
Stay focused. Stay safe.

Hazardous Energy Isolation:
Fully identifying and isolating high temperature/pressure fluids) as well as the various electrical support/control systems should never be taken for granted. Always verify any assumptions, and use good peer checking while researching any clearance/tagging tasks.

Nomenclature:	NC 1, 2, OR 3 FLO DETECTED	Window:	F5

Setpoint: Acoustic detector set at maximum sensitivity

Origin: Acoustic leak detection monitor

Probable Cause:
- Leaking Pressurizer safety relief valve
- Pressurizer safety relief valve lifted
- Loss of power to monitor (1EKVD-breaker 15)

Automatic Action: None

Immediate Action: Check pressurizer pressure is less than safety relief setpoint (2485 psig).

Supplementary Action:
1. Monitor outlet temperature of 1NC-1, 1NC-2, and 1NC-3 to determine which safety relief valve is leaking.
2. Notify SM.
3. Refer to Tech Specs for primary system leakage.
4. **IF** in Mode 1, 2, or 3, ensure transient monitor freeze triggered. {NCR 01721033}

References:
- Tech Specs
- MC-1731-02.06
- NSM MG-1-2126
- NCR 01721033

End Of Response

Unit 1

A steady state Main Steam depressurization rate of less than 2 psi/sec should not result in a Main Steam Isolation (MSI).

> ***Operator Fundamental Focus; Monitoring and Control***
> *<u>NOTE:</u> Some emergency procedures require controlled depressurization of one or more S/G's. The rate of depressurization (psi/sec) can be monitored on the OAC by selecting an individual affected S/G.* ***Explain*** *that the use of the OAC for this function aids the operator in monitoring this critical parameter during S/G depressurization, which is an attribute of the Operator Fundamental* ***Monitoring****.*
>
> ***Emphasize*** *that use of the information available on the OAC allows the operator to depressurize at a maximum rate while avoiding a Main Steam Isolation.*

Main Steam Isolation (MSI) may be reset if initiating signal is cleared or blocked (The Hi Hi Containment pressure is the one initiating signal that can still exist and allow us to reset.) There are two pushbuttons, one for each train.
MSI (Main Steam Isolation) "Reset" permits MSIV operation, allows PORV "Reset" and allows MSIV Bypass "Reset".

NOTE: In order to operate the PORV's or the MSIV bypasses, the MSIV "Resets" must be depressed and then the PORV "Resets" or MSIV Bypass "Resets" must be depressed.

3.1.8 <u>Main Feedwater Isolation (FWI)</u>

Main Feedwater Isolation (FWI) is initiated by:

- Safety Injection (SS)
- Reactor trip and low T-avg (P-4 and 553□F on 2/4 channels)
- High High S/G level 83% on 2/3 channels on 1/4 S/G (P-14)
- Manually (1/2 pushbuttons)

Feedwater Isolation (FWI) Initiating Signal Automatic Actions to CF (Main Feedwater)

SS (Safety Injection)

- FWI (Feedwater Isolation)
- Turbine trip
- Both FWPT's trip

P-4 and Low T-avg

- FWI (Feedwater Isolation)
- P-4 generates turbine trip
- FWPT's go to Man Speed Control (2800rpm)

P-14

- FWI (Feedwater Isolation)

- Turbine trip
- Both FWPT's trip

Manual

- FWI (Feedwater Isolation)
- FWPT's go to Man Speed Control (2800rpm)

Valves that close from FWI (Feedwater Isolation) signal

- S/G CF Control Valves (CF-32, 23, 20, 17)
- S/G CF Control Valve Bypasses (CF-104, 105, 106, 107)
- S/G CF Containment Isolations (CF-35, 30, 28, 26)
- CF to CA Nozzle Isolations (CF-126, 127, 128, 129)

A Hi Hi Doghouse level will terminate forward CF flow going to the effected doghouse in the event of a postulated main feedwater pipe break to prevent flooding safety-related equipment essential to the safe shutdown of the plant. When two of three level switches reach (12 inches) on either train for one doghouse, isolation of the CF associated with that doghouse will occur. The following actions will occur on a Hi Hi Doghouse Level:

- Isolate respective Doghouse feedwater lines
- Inner Doghouse closes CF20, 23, 105, 106, and 30, 28, 127, 128
- Outer Doghouse closes CF32, 17, 104, 107 and 35, 26, 126, 129
- Both main CF pumps trip
- Both CF pump discharge valves close
- CF-150 (common tempering flow valve) closes

Restoring Feedwater Isolation (FWI) Component Control

If the Feedwater Isolation was due to a Safety Injection; control of Feedwater Isolation components is regained by resetting Safety Injection and then closing the reactor trip breakers. (The Feedwater Isolation "Reset" Pushbutton does not need to be depressed.)

If the Feedwater Isolation was due to P-14; control of Feedwater Isolation components is regained by clearing the P-14 and then closing the reactor trip breakers. (The Feedwater Isolation "Reset" Pushbutton does not need to be depressed.) If a P-4 signal is not present, the Feedwater Isolation due to P-14 will automatically reset when P-14 clears.

If the Feedwater Isolation was due to P-4/Low T-avg; control of Feedwater Isolation components may be regained by depressing the Feedwater Isolation "Resets", even with the initiating signal present (i.e., Rx trip breakers can be open and temperature can be < 553□F).

If the Feedwater Isolation was due to "Manual"; control of Feedwater Isolation components is regained by depressing the Feedwater Isolation "Resets" (Rx trip breakers can be open).

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Given the following:

- The plant was at 100% when a SI occurred

Which ONE of the following correctly completes the statements below regarding the Feed Reg Valves and the Feed Reg Bypass Valves?

Following the SI signal, the **Feed Reg Bypass Valves** ____(1)____ receive a CLOSE signal.

The **Feed Reg Valves** ____(2)_____ be available when the SI is RESET and the Feedwater Isolation OVRD/RESET key switches are placed in OVRD/RESET.

A. (1) will
(2) will

B. (1) will NOT
(2) will

C. (1) will
(2) will NOT

D. (1) will NOT
(2) will NOT

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EXAM BANK QUESTION: 6142 RNP

C

General Discussion

Answer A Discussion

Incorrect. 1st part correct, 2nd part wrong. This is incorrect because the Feed Reg Valves would remain isolated until the reactor trip breakers are closed, regardless of Feedwater Isolation OVRD/RESET key switch position (NOT available). This is plausible because the operator may incorrectly believe that the Feed Reg Valves are not interlocked with the reactor trip breakers, and would be available.

Answer B Discussion

Incorrect. 1st part wrong, 2nd part wrong. See A and D.

Answer C Discussion

Correct. According to ST-027 (p29; Rev 6) a Safety Injection signal closes Feed Reg Valves, Bypass Valves, Feedwater Block Valves, trips Feedwater Pumps, and trips the turbine. (p37-38) The feedwater isolation circuitry is a portion of the safeguards system that isolates water flow from the main feedwater system to the steam generators under certain conditions (2/3 Hi Hi steam generator level and safety injection). There are three key operated switches on the RTGB that are used to reset and/or override the Feedwater Isolation signals (2/3 Hi-Hi steam generator level and safety injection). Placing the Feedwater Isolation OVRD/RESET key switches in the OVRD/RESET position would allow the main Feedwater Pumps to be started and the Feed Reg Bypass Valves to be opened. The Feed Reg Valves would still remain isolated, and will remain isolated until the reactor trip breakers are closed, and are therfore NOT available.

Answer D Discussion

Incorrect. 1st part wrong, 2nd part correct. This is incorrect because the Feed Reg Bypass valves will also close with the SI. This is plausible because the FWIS generated by a reactor trip will only close the Feed Reg Valves, not the Fed Reg Bypass Valves, and the operator may incorrectly recall which isolation affects which valves.

Basis for meeting the KA

The KA is matched because the operator must demonstrate Knowledge of the physical connections and/or cause effect relationships between the RPS and the Feedwater Isolation Signal (ESFAS).

Basis for Hi Cog

The question is at the Memory cognitive level because the operator must recall what valves in the feedwater system will close due to a FWIS generated by SI actuation and what conditions are needed to re-open the valves one the keyswitches are placed in OVRD/RESET, in order to answer the question correctly.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	ILC15 RNP NRC Examination

Development References
ST-027 (p37-38; Rev 6) 10 CFR 55.41.7

Student References Provided

KA	KA_desc
SYS012 K1.05	Knowledge of the physical connections and/or cause effect relationships between the RPS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)ESFAS ....

Annulus Ventilation System (VE) start maintains negative pressure in annulus. It is actuated automatically by a Hi Hi Containment pressure signal or manually by either depressing Phase “B" Containment Isolation Pushbutton or placing VE (Annulus Ventilation) to "ON".

To reset the start signal we must reset the Phase "B" isolation, then, place VE (Annulus Ventilation) fan switch to "Reset" and place back in "auto".

3.1.6 H_2 Skimmer and Air Return Fan (VX)

H2 Skimmer and Air Return Fan (VX) starts on a Hi Hi Containment Pressure (Sp) with CPCS or Manually by Phase B pushbutton and CPCS after a 10 minute time delay.

Objective # 14

3.1.7 Main Steam Isolation (MSI)

A Main Steam Isolation (MSI) signal closes the MSIV's, MSIV bypasses and the PORV's. It can be actuated by any one of the following signals:

Manually		**$^1/_2$ pushbuttons**	
Hi Hi Containment Pressure	**> 3.0 psig**	**$^2/_4$ channels**	
Low Steam Pressure	**< 775 psig**	**$^2/_3$ channels on $^1/_4$ S/G**	**> P-11**
High steamline pressure negative rate	**(-)100 psig/sec**	**$^2/_3$ channels on $^1/_4$ S/G**	**below P-11 if the Lo Press Stm Line Isol is blocked**

If a lower SM depressurization rate is maintained over time, eventually the Main Steam Isolation (MSI) can occur. The 100 psi/sec rate is somewhat of a misnomer. If SM press drops 100 psi in 1 sec, you will get an isolation, but lower rates can also give you an isolation. Here are some examples that will result in a Main Steam Isolation (MSI):

- 100 psi/sec for 1 sec
- 25 psi/sec for approximately 4 seconds
- 8.7 psi/sec for approximately 13 seconds
- 4.3 psi/sec for approximately 30 seconds
- 2.2 psi/sec for approximately 120 seconds
- 2.0 psi/sec for approximately 360 seconds

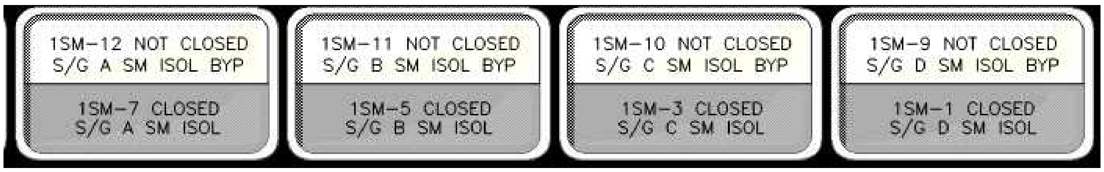
APE040 AA1.13 - Steam Line Rupture

Ability to operate and / or monitor the following as they apply to the Steam Line Rupture: (CFR 41.7 / 45.5 / 45.6)

Steam line isolation valve indications ....

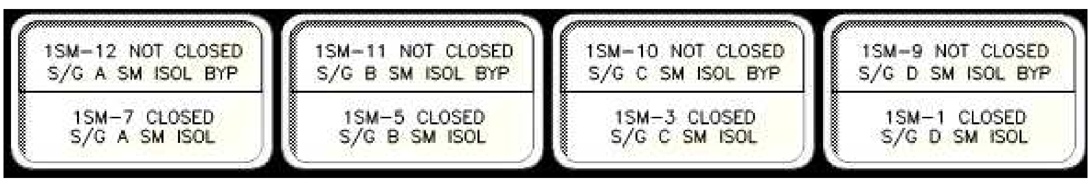
Given the following initial conditions on Unit 1:

- The unit is at 10% RTP
- The turbine is rolling at 1800 RPM in preparation for a unit startup
- Status lights on **1SI-3** indicate the following:



Subsequently,

- A steam line break occurs upstream of the 1D S/G MSIV
- 1D S/G pressure is 700 PSIG
- The status lights on **1SI-3** currently indicate the following:



Based on the indications above:

1) the Main Steam Isolation valves ________ operated as required.

2) the Main Steam Isolation Bypass valves ________ operated as required.

Which ONE (1) of the following completes the statements above?

(ASSUME NO OPERATOR ACTIONS HAVE BEEN TAKEN)

A. 1. have
   2. have

B. 1. have
   2. have NOT

C. 1. have NOT
   2. have

D. 1. have NOT
   2. have NOT

General Discussion

Individual status lights for the MSIVs will be illuminated upon MSIV closure and individual status lights for MSIV Bypass valves will be dark upon closure.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct and therefore plausible.

Second part is plausible if the applicant concludes that the MSIV Bypass valves were already in their required positions prior to the event. This could easily happen as status lights being lit typically indicated that a component in is Safety-Related position. However, the MSIV Bypass valve status lights are an example of an exepction to the general rule regarding status lights.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Based on the conditions given, the status light indications should have swapped (i.e. MSIV status lights should be lit and the MSIV Bypass valve status lights should be dark). If the applicant understands that they should have swapped but confuses the two sets of valves, they could conclude that the MSIVs should be dark. If so, they would choose this answer as being correct.

Second part is plausible if the applicant concludes that the MSIV Bypass valves were already in their required positions prior to the event. This could easily happen as status lights being lit typically indicated that a component in is Safety-Related position. However, the MSIV Bypass valve status lights are an example of an exepction to the general rule regarding status lights.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
The first part is plausible if the applicant concludes that the MSIVs were already in their safety-related position prior to the event. If so, the applicant would conclude that the MSIVs changing positions has resulted in them no longer being in their safety-related positions.

The second part is correct.

Basis for meeting the KA

The KA is matched because the applicant must demonstrate the ability to monitor steam line isolation valve indications upon receipt of an MSI signal as a result of a steam line rupture.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
Lesson Plan OP-MC-ECC-ISE (Engineered Safeguards Actuation System) Rev. 37
MNS Main Control Board Indications (Simulator) for specific event

LEARNING OBJECTIVES:
NONE

Student References Provided

APE040 AA1.13 - Steam Line Rupture

Ability to operate and / or monitor the following as they apply to the Steam Line Rupture: (CFR 41.7 / 45.5 / 45.6)

Steam line isolation valve indications ....

Remarks/Status

401-9 Comments: UNSAT

APE040 AA1.13
K/A is met.
LOD is 1 on this one. If they can read the tiles, they can answer the question. No plant knowledge is required. drl 2/9/16

Facility Response:
The facility concurs with Chief Examiner's assessment of the question. Consequently, the question was re-written such that the student has to evaluate a change in status light indication and determine whether equipment has operated as required. As such, the question should no longer be an LOD=1. Will present new question to Chief Examiner for re-evaluation. HCF 02/24/2016

Submitted revised question to Chief Examiner for review. Chief Examiner approved revised question as SAT. HCF 03/02/2016

- Solid State Protection Channel IV (Train A & B)
- Solid State Protection Train B Output Cabinet
- Auxiliary Safeguards Cabinet Train B

3.0 SYSTEM OPERATION

3.1 Normal Operation

Objective # 7

3.1.1 Safety Injection Actuation (S_S)

Actuation Signals and logic

Signal	Setpoint	Logic	Interlocks	Reason
Manual		$^1/_2$ pushbuttons		Operator Judgment
Lo-pressurizer pressure	<1845 psig	$^2/_4$ channels	P-11	LOCA Protection
Hi-containment pressure	>1.0 psig	$^2/_3$ channels		LOCA and Steam Break Protection

LOCA protection is provided by the Low Pressurizer Pressure (1845 psig) and the High Containment Pressure (1 psig) Safety Injection Signals.
Steam break protection is provided by the High Containment Pressure (1 psig) Safety Injection Signal.

> ***Conduct of Operations Focus:***
> ***Explain*** *to the class that if degrading plant conditions are recognized in sufficient time, then crews are expected to take manual actions prior to reaching the automatic setpoint for prescribed ESF and RPS actuations, unless otherwise directed by site specific procedures.* ***Reinforce*** *the importance of knowing all safety system actuation setpoints so that if an automatic action does not occur the operators will be able to recognize the condition and take manual action to ensure the plant is maintained in a safe condition.*

Objective # 8

Safety Injection Signal (S_S) initiates the following functions:

- Reactor Trip (P4)
- D/G sequencer which in turn starts the following:
  1) Centrifugal Charging Pumps (NV)

(St) and Safety Injection (Ss) differ in that the Safety Injection signal aligns key essential valves and components throughout the plant, the Phase "A" Containment Isolation signal only aligns valves associated with the isolation of containment penetrations. A Manual Phase "A" (St) Containment Isolation actuation will also actuate SH (Containment Ventilation Isolation).
The initiate pushbutton for Phase "A" Containment Isolation (St) is also the initiate pushbutton for Containment Ventilation Isolation (SH) but they have separate reset pushbuttons. Phase "A" Containment Isolation can be reset with SS (Safety Injection) signal present (not reset), via Control Board Pushbuttons.

3.1.3 Phase "B" Containment Isolation (Sp)

Phase "B" Containment Isolation (Sp) is actuated by:

Hi Hi Containment Pressure	**> 3.0 psig on $^2/_4$ channels**
Manually	**$^1/_2$ pushbuttons**

Phase B Containment Isolation actuation secures Component Cooling Water (KC) to the Reactor Coolant pumps, Nuclear Service Water (RN) to the Reactor Coolant Pump Motor Coolers, Containment Ventilation Cooling Water (RV) and Instrument Air (VI) to the containment.
Phase "B" Containment Isolation can be reset with signal still present, once resets are pushed; we regain control of valves that close on the Phase "B" Containment Isolation signal.

3.1.4 Containment Ventilation Isolation (S_H) is initiated by any of the following:

- Safety Injection (S_S)
- Manual Phase "A" Containment Isolation (S_t)
- Manual Phase "B" Containment Isolation
- Trip 2 alarm on EMF-38, 39, or 40

Containment Ventilation Isolation (S_H) signal secures VQ and VP.

To "Reset" Containment Ventilation Isolation following a Safety Injection, Manual Phase "A" Containment Isolation, or Manual Phase "B" Containment Isolation, the Containment Ventilation (S_H) "Reset" Pushbuttons must be depressed (can reset without resetting the initiating signal).

To "Reset" Containment Ventilation following an EMF 38, 39, 40 Trip II, the EMF must be reset, then the Containment Ventilation "Reset Pushbuttons must be depressed.

NOTE: Resetting the S_H signal will allow manual control of VQ valves. VQ valves do not have an auto function.

3.1.5 Annulus Ventilation System (VE)

Table 3.3.2-1 (page 1 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	NOMINAL TRIP SETPOINT
1. Safety Injection						
a. Manual Initiation	1,2,3,4	2	B	SR 3.3.2.7	NA	NA
b. Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
c. Containment Pressure - High	1,2,3	3	D	SR 3.3.2.1 SR 3.3.2.5 SR 3.3.2.8 SR 3.3.2.9	≤ 1.2 psig	1.1 psig
d. Pressurizer Pressure - Low Low	1,2,3[(a)]	4	D	SR 3.3.2.1 SR 3.3.2.5 SR 3.3.2.8 SR 3.3.2.9	≥ 1835 psig	1845 psig
2. Not Used						
3. Containment Isolation						
a. Phase A Isolation						
(1) Manual Initiation	1,2,3,4	2	B	SR 3.3.2.7	NA	NA
(2) Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA

(continued)

(a) Above the P-11 (Pressurizer Pressure) interlock.

Table 3.3.2-1 (page 2 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	NOMINAL TRIP SETPOINT
3. Containment Isolation (continued)						
(3) Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					
b. Phase B Isolation						
(1) Manual Initiation	1,2,3,4	1 per train, 2 trains	B	SR 3.3.2.7	NA	NA
(2) Automatic Actuation Logic and Actuation Relays	1,2,3,4	2 trains	C	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
(3) Containment Pressure - High High	1,2,3	4	E	SR 3.3.2.1 SR 3.3.2.5 SR 3.3.2.8	≤ 3.0 psig	2.9 psig
4. Steam Line Isolation						
a. Manual Initiation						
(1) System	1,2[(b)],3[(b)]	2 trains	F	SR 3.3.2.7	NA	NA
(2) Individual	1,2[(b)],3[(b)]	1 per line	G	SR 3.3.2.7	NA	NA
b. Automatic Actuation Logic and Actuation Relays	1,2[(b)],3[(b)]	2 trains	H	SR 3.3.2.2 SR 3.3.2.4 SR 3.3.2.6	NA	NA
c. Containment Pressure - High High	1,2[(b)], 3[(b)]	4	E	SR 3.3.2.1 SR 3.3.2.5 SR 3.3.2.8 SR 3.3.2.9	≤ 3.0 psig	2.9 psig
d. Steam Line Pressure						
(1) Low	1,2[(b)], 3[(a)(b)]	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.5 SR 3.3.2.8 SR 3.3.2.9	≥ 755 psig	775 psig

(continued)

(a) Above the P-11 (Pressurizer Pressure) interlock.
(b) Except when all MSIVs are closed and de-activated.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One train inoperable.	C.1 -------------NOTE-------------- One train may be bypassed for up to 4 hours for surveillance testing provided the other train is OPERABLE. -----------------------------------	
	Restore train to OPERABLE status.	24 hours
	OR	
	C.2.1 Be in MODE 3.	30 hours
	AND	
	C.2.2 Be in MODE 5.	60 hours
D. One channel inoperable.	D.1 -------------NOTE-------------- One channel may be bypassed for up to 12 hours for surveillance testing. -----------------------------------	
	Place channel in trip.	72 hours
	OR	
	D.2.1 Be in MODE 3.	78 hours
	AND	
	D.2.2 Be in MODE 4.	84 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One Containment Pressure channel inoperable.	E.1 -------------NOTE-------------- One additional channel may be bypassed for up to 12 hours for surveillance testing. -----------------------------------	
	Place channel in bypass.	72 hours
	OR	
	E.2.1 Be in MODE 3.	78 hours
	AND	
	E.2.2 Be in MODE 4.	84 hours
F. One channel or train inoperable.	F.1 Restore channel or train to OPERABLE status.	48 hours
	OR	
	F.2.1 Be in MODE 3.	54 hours
	AND	
	F.2.2 Be in MODE 4.	60 hours
G. One Steam Line Isolation Manual Initiation - individual channel inoperable.	G.1 Restore channel to OPERABLE status.	48 hours
	OR	
	G.2 Declare associated steam line isolation valve inoperable.	48 hours

(continued)

A

Given the following Unit 2 conditions:

- Containment Pressure Channel III has failed high

Following this malfunction, a High Containment Pressure Safety Injection signal will be generated if a MINIMUM of _____(1)_____ of the remaining channels exceed the setpoint of _____(2)_____ .

Which ONE of the following completes the statement above?

A. 1. one
   2. 1.2 psig

B. 1. one
   2. 3.0 psig

C. 1. two
   2. 1.2 psig

D. 1. two
   2. 3.0 psig

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EXAM BANK QUESTION: 7136 CNS **A**

General Discussion

The normal logic for High Containment Pressure SI is 2/3 (referencing Channels 2-4). With one channel failed high, the logic for actuation becomes 1 of 2. These same channels feed the Hi-Hi Containment Pressure logic along with Channel 1. The Hi-Hi Containment Pressure signal would be placed in bypass (per TS) following this malfunction, but High Containment Pressure SI is not.

The High Containment Pressure Safety Injection sepoint is 1.2 psig. The High-High Containment Pressure Phase B isolation sepoint is 3.0 psig.

Answer A Discussion

CORRECT. See explanation above.

Answer B Discussion

Part 1 is correct.

Part 2 is plausible because this is the High-High Containment Pressure Phase B isolation setpoint.

Answer C Discussion

Part 1 is plausible because the High-High Containment Pressure Phase B isolation signal would be placed in bypass for this malfunction.

Part 2 is correct.

Answer D Discussion

Part 1 is plausible because the High-High Containment Pressure Phase B isolation signal would be placed in bypass for this malfunction.

Part 2 is plausible because this is the High-High Containment Pressure Phase B isolation setpoint.

Basis for meeting the KA

The applicant is required to demonstrate knowledge of the effect of a detector malfunction upon an ESFAS actuation signal.

Basis for Hi Cog

The applicant is required to compare provided information with that recalled from memory (number of Cnt pressure channels which input SI and which channels input SI) in order to determine the coincidence required for actuation.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT-17 NRC Written Exam CNS NRC Examination

Development References
OP-CN-ECCS-ISE (Engineered Safety Features Actuation System LP), Rev. 102, Pgs 37, 42, & 95

Student References Provided

KA	KA_desc
SYS013 K6.01	Knowledge of the effect of a loss or malfunction on the following will have on the ESFAS: (CFR: 41.7 / 45.5 to 45.8)Sensors and detectors ....

Title:	**UPPER AND LOWER CONTAINMENT VENTILATION SYSTEM (VUL)**						
Number:	OP-MC-CNT-VUL		Revision: 33				Program: AO/AOCT/RO/SRO/LOCT
Time Required:	AO	AOCT	RO	SRO	LOCT		Prerequisites: None
	2.0	2.0	2.0	2.0	1.0	Hrs.	

Overview:

This lesson will describe the purpose, operation and a general description of the Upper and Lower Containment Ventilation Systems.

References:

1. Design Basis Specification - MCS-1576.VU-00-0001 Rev. 1.
2. MNS Flow diagrams MC-1576-1 and 2
3. MNS MCEE 156.01 - 156.02
4. MNS FSAR Section 9.4.5.2.
5. MNS Technical Specifications.
6. MNS Operating Procedures
   OP/1/A/6450/001, Containment Ventilation System

Operating Experience:
CNS Low Containment Temperature during S/U
NCR# 1633657 Changes in VL Line-up affect NC Leakage Calculation

Recommended Evaluation Method:
Written Exam

Commitments Tracking:
None

Training Aids:

Listing of classroom audio-visual resources needed to stage and conduct the training

- Classroom projector
- Smartboards (optional)

The normal power supply for these units is a 600VAC Essential Motor Control Center. Following a Blackout, all units will be sequenced on regardless of switch position. Under these conditions, these fans can not be stopped until the sequencer is reset. These units are shunt-tripped from the essential power system upon receipt of an S_S signal and the “ON-OFF” indication on the HVAC panel is lost.

2.2 Lower Containment Ventilation System (VL)

The VL system is regulatory-required per Technical Specification surveillance requirements and performs no safety-related functions. The VL system is designed to maintain a maximum temperature (120°F) inside the lower Containment compartment during normal operation and a minimum temperature (60°F) during shutdown.

The Lower Containment Weighted Average Temperature (LCWAT) is used by the operator to determine optimum VL/RV/RN operations. The LCWAT program calculates the LCWAT using only the operating VL units inputs (temperatures associated with idle fans are not used).

> **NOTE:** In normal operation 4 VL AHU’s operating in low speed is the preferred VL configuration.

The VL system consists of four (4) recirculating ventilation units and their associated cooling coils, fans, and associated ductwork. This equipment is located in the annular concrete chambers around the periphery of the lower Containment compartment (Fan Rooms). The temperature in the annulus between the reactor vessel and the primary shield may exceed the maximum average temperature of lower Containment (This temperature may be allowed to reach 135°F without detrimental effects to the installed instrumentation.)

Operator Fundamental Focus; Knowledge and Control
While discussing the VL system operation (above) and controls (below), ***explain*** *how changes in lower containment ambient air temperature have the potential to affect NIS indications. These changes may be seen as a Power Mismatch or Quadrant Power Tilt (OAC AFD Monitor). The critical time period to maintain containment ventilation configuration stable is during Rx Engineer performance of incore/excore determination procedures or during power escalation testing following replacement of a power range detector.*
*Emphasize how this information increases operator integrated plant knowledge (****knowledge fundamental****) and understanding of how system manipulations may result in undesirable consequences (****control fundamental****).*

Objective #8

Each VL AHU has an “OFF-LOW-HIGH” selector switch on the HVAC panel. The VL fan motors are overload protected and status indication is provided on the HVAC panel. Annunciators are provided to indicate mixed speed operation, transfer to emergency power, high speed start and high vibration. Bearing

motor shaft/winding torque reactions which would result from dynamic braking. **These VL units, along with the pipe tunnel booster fans, will all start and run in high speed or if already running will shift to high speed if containment pressure exceeds 0.5 psig, as sensed by 1NSPT5550.** If this causes containment pressure to drop back to 0.49 psig after the VL fans shift to high speed, they will all go back to their control switch selected mode of operations (off/hi/lo). There is no seal-in to keep fans on or in high speed and there is almost no dead band for operation.

The VL units are shunt-tripped from the essential power system upon receipt of an S_S signal. If station power is available, a transfer switch will automatically align to the emergency power source and start the VL units in high speed, regardless of HVAC panel "High" / "Low" speed switch position. Any VL units selected to "OFF" prior to the S_S will have both the green ("OFF") and the red ("HIGH" speed) indicating lights illuminated once the transfer is complete. "OFF-LOW-HIGH" HVAC panel controls are bypassed until the S_S and sequencer are reset and manual re-transfer to the normal source is completed.

Operation of the VL inlet dampers has no effect on the VL AHU (refer to Drawing 7.1). However, closing too many VL inlet dampers will affect VR flow and CRDM cooling. The power supply to the dampers comes from the VL fans, and loss of power to the fan will make the damper unavailable. Shutdown of the VL AHU will limit the VR system flow due to auto closure of the inlet dampers. (reference NCR# 1575306)

2.3 Control Rod Drive Ventilation System (VR)

The VR system performs no safety-related functions and is not regulatory-required. The purpose of this system is to provide cooling to the Control Rod Drive Mechanisms during normal plant operation. It is desirable for the VR system to operate during events such as a small isolable LOCA, main steam break inside Containment, blackout and LOOP to avoid a rise in Containment pressure such that Containment Spray is unnecessarily actuated. Provisions in the design were made such that CRDM return air fans are capable of receiving safety-related 1E power.

Objective #8

The VR system consists of four (4) recirculating fans and associated ductwork. The fans are located in the lower compartment outside the primary shield. The supply ducts are arranged so as to maintain the required flow of cooling air through the control rod drive mechanism shroud. **The "Start / STP" control switches for the CRD vent fans and the discharge damper indications are located on the main control board on section MC-1.**

The CRDM vent fans are shunt tripped from the essential power system upon receipt of an S_S signal. If station power is available, a transfer switch will automatically align to the emergency power source and all VR fans will start. All associated VR fan controls on MC-1 are bypassed until the S_S and the sequencer are reset and manual re-transfer to the normal source is completed. Following a Blackout, all VR fans will be sequenced on and controls on MC-1 are bypassed until the sequencer is reset.

SYS022 A3.01 - Containment Cooling System (CCS)

Ability to monitor automatic operation of the CCS, including: (CFR: 41.7 / 45.5)

Initiation of safeguards mode of operation ....

Given the following on Unit 2:

- A SBLOCA has occurred
- Containment pressure peaked at 1.3 PSIG and now is 0.9 PSIG and stable

Which ONE (1) of the following describes the operation of the Containment Cooling system fans based on these conditions?

COMPONENT LEGEND:

PTBF - PIPE TUNNEL BOOSTER FAN
VL AHU - LOWER CONTAINMENT VENTILATION AIR HANDLING UNIT

A. VL AHUs start and run in LOW speed; PTBFs start and run in LOW speed.

B. VL AHUs start and run in LOW speed; PTBFs are shunt tripped OFF.

C. VL AHUs start and run in HIGH speed; PTBFs start and run in LOW speed.

D. VL AHUs start and run in HIGH speed; PTBFs are shunt tripped OFF.

General Discussion

The VL units, VR units and VT units shunt trip off, swap to emergency power and start on an SS signal. The VL units start in HIGH speed. The VU units, Return Air Fans, and the Pipe Tunnel Booster Fans are shunt tripped off on the SS signal.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible since the VL units and the PTBFs both start in LOW speed on a blackout signal.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible since the VL units start in LOW speed on a blackout signal. PTBFs shunt tripping off is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible since the VL units starting in HIGH speed is correct and the PTBFs start in LOW speed on a blackout signal.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate the ability to monitor automatic operation of the Containment Cooling system by determining the status of the VL fans and the PTBFs after initiation of a safety injection.

Basis for Hi Cog

This question is a higher cognitive question because the applicant must analyze the conditions in the stem to determine which safeguards actuations have occurred due to containment pressure and then determine the status of the containment cooling system fans.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2015 MNS NRC Q13 (Bank 5923)

Development References

REFERENCES:
Lesson Plan OP-MC-CNT-VUL Rev 32, Section 3.2.2. (Safety Injection)

LEARNING OBJECTIVES:
OP-MC-CNT-VUL Objective 5

Student References Provided

SYS022 A3.01 - Containment Cooling System (CCS)
Ability to monitor automatic operation of the CCS, including: (CFR: 41.7 / 45.5)
Initiation of safeguards mode of operation ....

Remarks/Status

401-9 Review Comments: SAT
SYS022 A3.01

significantly modified IAW ES-401 D.2.f
Q SAT

Facility Response: NONE

Q14 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

A. **Purpose**

Provide actions for protecting the reactor core in the event of a LOCA that occurs during either Mode 3 with Cold Leg Accumulators isolated or Mode 4.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

B. Symptoms

- **Any of the following while in Mode 3 with Cold Leg Accumulators isolated, or in Mode 4:**
  - "ICE COND LOWER INLET DOORS OPEN" alarm
  - Pzr level - GOING DOWN IN AN UNCONTROLLED MANNER
  - NC subcooling - GOING DOWN IN AN UNCONTROLLED MANNER
  - Containment floor and equipment sump level(s) - GOING UP.

C. Operator Actions

__ 1. **Monitor Foldout page.**

2. **Check the following valves - OPEN:** — RNO: __ **GO TO Step 5.**
   - __ 1ND-1B (1C NC Loop to ND Pumps Isol)
   - __ 1ND-2AC (1C NC Loop To ND Pumps Cont Inside Isol).

3. **IF any of the following conditions exist, THEN GO TO AP/1/A/5500/19 (Loss Of ND Or ND System Leakage).**
   - __ LOCA is believed to be outside containment

     OR
   - __ Abnormal PRT conditions without indications of inputs from Pzr PORVs or safeties.

A. Purpose

This procedure covers operator actions for an ECCS actuation from initial plant conditions below P-11 (Safety Injection Block Permissive, less than 1955 psig).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

B. Symptoms

- **"MANUAL S/I RX TRIP" alarm**
- **"PZR LO PRESS S/I RX TRIP" alarm**
- **"HI CONT PRESS S/I RX TRIP" alarm**
- **"SAFETY INJECTION ACTUATED" Status Light**
- **"LOCA SEQ ACTUATED TRN A" Status Light**
- **"LOCA SEQ ACTUATED TRN B" Status Light**
- **"MONITOR LIGHT PANEL" alarms due to changing equipment status.**

<< Cooldown To 400 F (Control Room Activities) >>

3.0 INSTRUCTIONS (continued)

29. **WHEN** all the following conditions met,

- NC System temperature less than 425°F .... ☐
- NC System pressure less than 1000 psig .... ☐
- Reactor shutdown at least 2.5 hours (SAR Commitment) [8.7.11] .... ☐

THEN perform the following:.. ______

a. **Isolate** Cold Leg Accumulators as follows: .... ☐

(1) For 2A CLA, **perform** the following: .... ☐

(a) **Place** "2NI-54A Power Disconnect" in "ENABLE". .... ____/____ CV

(b) **Close** 2NI-54A (A CL Accum Disch Isol). .... ____/____ CV

(c) **WHEN** 5 seconds have elapsed, **THEN place** "2NI-54A Power Disconnect" in "DISCON". .... ____/____ CV

(2) For 2B CLA, **perform** the following: .... ☐

(a) **Place** "2NI-65B Power Disconnect" in "ENABLE". .... ____/____ CV

(b) **Close** 2NI-65B (B CL Accum Disch Isol). .... ____/____ CV

(c) **WHEN** 5 seconds have elapsed, **THEN place** "2NI-65B Power Disconnect" in "DISCON". .... ____/____ CV

3.6 CONTAINMENT SYSTEMS

3.6.12 Ice Bed

LCO 3.6.12 The ice bed shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Ice bed inoperable.	A.1 Restore ice bed to OPERABLE status.	48 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.12.1 Verify maximum ice bed temperature is $\leq$ 27°F.	In accordance with the Surveillance Frequency Control Program

(continued)

Annunciator Response For Panel 1AD-9

Nomenclature: **ICEBED RTD ABNORMAL TEMP**

Window: **B5**

	For points 1-48	**For points 51-58**
Setpoint:	• Lo: 5°F • Hi: 23°F • Hi/Hi: 25°F	Hi: 25°F Hi/Hi: 27°F

Origin: Temperature Scanner System monitoring Ice Bed temperature status using RTDs input to 1NPCR-5000:

Point	RTD	Point	RTD	Point	RTD
1	1NPRD-5000	20	1NPRD-5190	39	1NPRD-5380
2	1NPRD-5010	21	1NPRD-5200	40	1NPRD-5390
3	1NPRD-5020	22	1NPRD-5210	41	1NPRD-5400
4	1NPRD-5030	23	1NPRD-5220	42	1NPRD-5410
5	1NPRD-5040	24	1NPRD-5230	43	1NPRD-5420
6	1NPRD-5050	25	1NPRD-5240	44	1NPRD-5430
7	1NPRD-5060	26	1NPRD-5250	45	1NPRD-5440
8	1NPRD-5070	27	1NPRD-5260	46	1NPRD-5450
9	1NPRD-5080	28	1NPRD-5270	47	1NPRD-5460
10	1NPRD-5090	29	1NPRD-5280	48	1NPTE-7240
11	1NPRD-5100	30	1NPRD-5290	51	1NPRD-9840
12	1NPRD-5110	31	1NPRD-5300	52	1NPRD-9850
13	1NPRD-5120	32	1NPRD-5310	53	1NPRD-9860
14	1NPRD-5130	33	1NPRD-5320	54	1NPRD-9870
15	1NPRD-5140	34	1NPRD-5330	55	1NPRD-9880
16	1NPRD-5150	35	1NPRD-5340	56	1NPRD-9890
17	1NPRD-5160	36	1NPRD-5350	57	1NPRD-9900
18	1NPRD-5170	37	1NPRD-5360	58	1NPRD-9910
19	1NPRD-5180	38	1NPRD-5370		

Probable Cause:

- Loss of Floor Cooling
- Loss of Wall AHU
- RTD Malfunction
- Loss of Glycol Chillers

Automatic Action: None

Immediate Action:

1. Depress "ACK ALM" pushbutton on the Ice Condenser Temperature Recorder (1NPCR-5000).

2. Note RTD that is in alarm in 1NPCR-5000 (Points 1-48, 51-58).

Continue On Next Page

alarm in the Control Room is generated if two (2) or more cabinet doors are open ("PCS PROT CAB $^2/_4$ DOORS OPEN" on AD2). This alarm warns the operator that improper testing could be taking place. A "2 of 4" or "2 of 3" protection signal could be generated.

2.2 Solid State Protection System (SSPS)

2.2.1 The Solid State Protection System (SSPS) consists of two cabinets located in the Control Room designated Train 'A' and Train 'B'. Each cabinet has input, logic, and output bays. Each train receives digital (voltage/no voltage) inputs (from process channels) corresponding to normal/abnormal unit parameters. Inputs are compared with required logic and actuation signals are generated. Annunciator, status, and computer inputs are also provided for various trip/no trip functions.

2.3 Containment Pressure Control System (CPCS)

Objective # 4

2.3.1 The Containment Pressure Control System (CPCS) functions to prevent exceeding Containment design negative pressure of -1.5 psig. Eight (8) independent pressure transmitters/pressure switch circuits are used. A circuit is provided for the

- NS Pumps
- NS Pump Discharge Valves (NS-12B, 15B, 29A, 32A)
- VX Air Return Fans
- Hydrogen Skimmer Fans
- VX Air Return Dampers

Interlocks prohibit the operation of the Containment Spray pumps (NS) and the Hydrogen Skimmer and Containment Air Return (VX) if < 0.35 psig in Containment (inadvertent manual or automatic actuation). The system is designed so that a single failure will not prevent operation of safety systems (separate pressure transmitter for each safety system train). NS and Containment Air Return Fans will stop when containment pressure drops to < 0.35 psig. Following an auto start signal, the H_2 Skimmer Fans must be manually stopped.

If a transmitter fails during an accident, this could prevent actuation of its associated equipment. Therefore, a > 0.35 psig signal can be simulated via a test key switch and potentiometer. The key switches are located on the CPCS cabinets and the potentiometers are located in the CPCS cabinets. Train A CPCS cabinet (CPCC1) is located in Electrical Penetration Rm (750'). Train B CPCS cabinet (CPCC2) is located in Electrical Penetration Rm (733').

The NS pumps and NS discharge valves, VX return air fans/H_2 skimmer fans and Air Return damper circuits are interlocked such that if one is in test, the other test circuit is inhibited. This ensures NS and VX termination once containment

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. (Continued)	
NOTE A failure of NS with containment pressure greater than 3 PSIG will cause a containment orange path. The following step should be performed prior to implementing FR-Z.1.	
h. **IF AT ANY TIME** NS flow lost, **OR** RN is lost to operating train, **THEN** start available NS pump as follows:	
__ 1) Ensure affected NS pump is off.	
NOTE If the following steps clear the containment orange path, FR-Z.1 does not require performance as an orange path unless previously implemented.	
2) Check at least one of the following alarms - LIT: __ • "CONT SUMP LEVEL GREATER THAN 3 FT" on 2AD-14 - LIT OR __ • "CONT SUMP LEVEL GREATER THAN 3 FT" on 2AD-15 - LIT.	2) Perform the following: __ a) **WHEN** either 3 ft sump alarm is lit, **THEN** align and start other NS pump **PER** Steps 8.d through 8.g. __ b) **RETURN TO** procedure and step in effect.
__ 3) Check containment pressure - GREATER THAN 1 PSIG.	3) **IF** NS stopped due to pressure below CPCS interlock, **THEN** perform the following: __ a) **WHEN** containment pressure is greater than 1 PSIG, **THEN** align and start either NS pump **PER** Steps 8.d through 8.g. __ b) **RETURN TO** procedure and step in effect.
__ 4) Perform Steps 8.d through 8.g.	

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Given the following conditions on Unit 2:

- A Large Break LOCA has occurred
- One train of NS has been aligned per ES-1.3 (TRANSFER TO COLD LEG RECIRC)

When Containment pressure decreases to less than 0.35 PSIG, the NS Pump will___(1)___.

Subsequently, if Containment pressure increases to greater than 0.35 PSIG, the NS Pump ___(2)___.

Which ONE (1) of the following completes the statements above?

A. 1. stop automatically
   2. will start automatically

B. 1. stop automatically
   2. can be started manually

C. 1. be stopped manually
   2. will start automatically

D. 1. be stopped manually
   2. can be started manually

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EXAM BANK QUESTION: 5849 MNS **B**

General Discussion

The Containment Spray System will be started manually from the Control Room. For the manual start, CPCS must be at least 0.35 psig for the discharge valves to be manually opened or for the pumps to be manually started. Either of the train related discharge valves must also be open to allow a pump start. If the containment pressure decreases to < .35 psig (after the initial pump start) containment spray pumps are automatically turned off and the discharge valves are automatically closed. If the pressure increases above .35 psig after the NS pumps have stopped, the pump discharge valves must be manually opened. The NS Pump(s) will then need to be manually restarted.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct.

Second part is plausible because prior to the ECCS water management mod, when containment pressure increased back above 0.35 psig the NS pump discharge valves would open and the NS pumps would start automatically.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible because the ECCS water management mod resulted in no automatic starts for the NS pumps and the applicant could conclude that there are also no automatic stops.

Second part is plausible because prior to the ECCS water management mod, when containment pressure increased back above 0.35 psig the NS pump discharge valves would open and the NS pumps would start automatically.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible because the ECCS water management mod resulted in no automatic starts for the NS pumps and the applicant could conclude that there are also no automatic stops.

Second part is correct.

Basis for meeting the KA

The K/A is matched because the applicant must demonstrate the ability to monitor when NS pumps will automatically stop and the ability to manually open the NS pump discharge valves and start the NS pumps when required.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	ILT31 MNS Audit Examination

Development References

References:
E-2 (FAULTED STEAM GENERATOR ISOLATION)

Learning Objectives:
SXEOE14002

Student References Provided

KA	KA_desc
SYS026 A4.01	Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)CSS controls ....

Q17 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE

- Cooldown in subsequent steps may continue while TSC monitors shutdown margin per EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 30 (Evaluation of Plant Status During LOCAs by the TSC).
- After the Low Pressure Steamline Isolation signal is blocked, maintaining steam pressure negative rate less than 2 PSIG per second will prevent a Main Steam Isolation.

10. **Initiate NC System cooldown to Cold Shutdown as follows:**

__ a. **WHEN** "P-11 PRESSURIZER S/I BLOCK PERMISSIVE" status light (1SI-18) lit, **THEN** depress "BLOCK" on Low Pressure Steamline Isolation block switches.

__ b. Maintain cooldown rate based on NC T-Colds less than 100°F in an hour.

__ c. **IF** ND in RHR mode, **THEN** use ND for cooldown.

__ d. **REFER TO** Enclosure 4 (NC Cooldown Rate Monitoring).

Q17 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. (Continued)	
__ e. Check "C-9 COND AVAILABLE FOR STEAM DUMP" status light (1SI-18) - LIT.	e. Perform the following: 1) **IF** any S/G pressure less than 775 PSIG, **THEN** perform the following: __ a) Ensure NC System depressurized to less than 1955 PSIG using Pzr spray or PORV as required. __ b) Ensure Low Pressure Steamline Isolation is blocked. __ c) Maintain NC pressure less than 1955 PSIG. __ 2) Ensure Main Steam Isolation reset. __ 3) Ensure SM PORVs reset. __ 4) Dump steam using intact S/G SM PORVs while maintaining cooldown rate in NC T-Colds less than 100°F in an hour. __ 5) **GO TO** Step 11.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. (Continued)	
__ f. Check MSIVs on all intact S/Gs - OPEN.	f. Perform the following:
	1) **IF** any S/G pressure less than 775 PSIG, **THEN** perform the following:
	__ a) Ensure NC System depressurized to less than 1955 PSIG using Pzr spray or PORV as required.
	__ b) Ensure Low Pressure Steamline Isolation is blocked.
	__ c) Maintain NC pressure less than 1955 PSIG.
	2) Reset the following:
	__ a) Main Steam Isolation.
	__ b) SM PORVs.
	3) **IF** intact S/G MSIVs required closed to isolate a leak, **THEN** perform the following:
	__ a) Dump steam using intact S/G SM PORVs while maintaining cooldown rate in NC T-Colds less than 100°F in an hour.
	__ b) **GO TO** Step 11.
	4) **IF** any S/G is faulted, **THEN** perform the following:
	__ a) Dump steam using intact S/G SM PORVs while maintaining cooldown rate in NC T-Colds less than 100°F in an hour.
	__ b) **GO TO** Step 11.
	__ 5) Place "STM PRESS CONTROLLER" in manual.
	(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

10. (Continued)

__ 6) Adjust "STM PRESS CONTROLLER" output to 0%.

__ 7) Place "STEAM DUMP SELECT" in steam pressure mode.

__ 8) CLOSE 1AS-12 (U1 SM To AS Hdr Control Inlet Isol).

__ 9) Ensure manual loaders for all MSIV bypass valves set a 0%.

__ 10) Reset MSIV bypass valves.

__ 11) OPEN MSIV bypass valves on intact S/Gs to equalize pressure across MSIVs.

__ 12) While pressure is equalizing across MSIVs, use intact S/G SM PORVs to establish cooldown rate in NC T-Colds less than 100°F in an hour.

13) **WHEN** pressure equalized across MSIVs, **THEN** perform the following:

__ a) OPEN all MSIVs on intact S/Gs.

__ b) CLOSE all MSIV bypass valves.

__ c) **WHEN** "P-12 LO-LO TAVG" status light (1SI-18) lit, **THEN** place steam dumps in bypass interlock.

__ d) Dump steam to condenser from intact S/Gs while maintaining cooldown rate in NC T-Colds less than 100°F in an hour.

__ e) **WHEN** condenser dumps are established, **THEN** SM PORVs may be CLOSED.

__ 14) **GO TO** Step 11.

McGuire Nuclear Station

ILT 18-1 MNS RO Audit Examination

Question: 64
(1 point)

Given the following on Unit 1:

- A LOCA inside Containment is occurring
- Containment pressure is 3.2 PSIG and slowly rising

In accordance with ES-1.2 (POST LOCA COOLDOWN AND DEPRESSURIZATION), which ONE (1) of the following indicates the PREFERRED method to cooldown and depressurize the NC system?

A. Reset Main Steam Isolation Signal
Cooldown using condenser dumps
Depressurize using PZR PORV

B. Reset Main Steam Isolation Signal
Cooldown using SM PORV
Depressurize using normal PZR Spray

C. Cannot reset Main Steam Isolation Signal
Cooldown via manual operation of the condenser dumps
Depressurize using PZR PORV

D. Cannot reset Main Steam Isolation Signal
Cooldown via manual operation of the SM PORVs
Depressurize using normal PZR spray

MNS EP/1/A/5000/FR-H.2 **UNIT 1**	RESPONSE TO STEAM GENERATOR OVERPRESSURE	PAGE NO. 1 of 11 Rev. 3

A. Purpose

This procedure provides actions for an overpressure condition affecting any S/G where pressure has gone above the highest steamline safety valve setpoint.

B. Symptoms or Entry Conditions

This procedure is entered from EP/1/A/5000/F-0 (Critical Safety Function Status Trees) (Heat Sink), on a yellow condition.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
NOTE Throughout this procedure, "affected" refers to any S/G in which pressure is greater than 1225 PSIG.	
__ 1. **Check any S/G pressure - GREATER THAN 1225 PSIG.**	__ **RETURN TO procedure and step in effect.**
__ 2. **Check Feedwater Isolation status light (1SI-4) for affected S/G(s) - LIT.**	__ **Close valves on affected S/G PER Enclosure 1 (Feedwater Isolation Valves).**
__ 3. **Check affected S/G(s) N/R level - LESS THAN 92% (82% ACC).**	__ **GO TO EP/1/A/5000/FR-H.3 (Response To Steam Generator High Level).**
4. **Dump steam from the affected S/G(s) SM PORV:**	
__ a. Check affected S/G(s) SM PORV isolation valve - OPEN.	a. Perform the following: __ 1) Open affected S/G(s) SM PORV isolation valve. __ 2) **IF** affected S/G(s) SM PORV isolation valve can not be opened, **THEN GO TO** Step 5.

A. Purpose

This procedure provides actions to respond to a S/G high level condition and to address the S/G overfill concern.

B. Symptoms or Entry Conditions

This procedure is entered from:

- EP/1/A/5000/F-0 (Critical Safety Function Status Trees) (Heat Sink), on a yellow condition
- EP/1/A/5000/FR-H.2 (Response To Steam Generator Overpressure), Step 3, if the affected S/G N/R level is high.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
1. **IF AT ANY TIME S/G N/R level goes above OR has previously gone above 92% (82% ACC), THEN:**	
__ a. Notify station management to perform an evaluation for S/G overfill considerations.	
__ b. Steam should not be released from any S/G with N/R Level greater than 92% (82% ACC) prior to overfill evaluation.	
NOTE Throughout this procedure, "affected" refers to any S/G in which N/R level is greater than 83%.	
__ 2. **Check any S/G N/R level - GREATER THAN 83%.**	__ **RETURN TO procedure and step in effect.**
3. **Check Feedwater Isolation:**	
__ a. Both CF pumps - TRIPPED.	__ a. Trip CF pumps.
__ b. All Feedwater Isolation status lights (1SI-4) - LIT.	b. Perform the following: __ 1) Initiate Feedwater Isolation. __ 2) **IF** Feedwater Isolation status light(s) (1SI-4) still dark, **THEN** perform Enclosure 1 (Feedwater Isolation Valves) for S/G(s) with status light dark.

5.3.3 Establish Blowdown from the Affected S/G

If the affected S/G radiation levels are normal, blowdown is established to reduce the level in the affected S/G into the normal operating band.

5.4 Detailed Description of Procedural Steps

STEP 1 **IF AT ANY TIME S/G N/R level goes above OR has previously gone above 92% (82% ACC), THEN: (CONTINUOUS ACTION)**

PURPOSE: To alert the operator to the potential of overfilling the S/G to the point where water may have entered the steam lines.

BASIS: If the affected S/G N/R level has gone above 92% (82% ACC), the operator cannot be sure if the S/G is filled to the steamline. The objective of the status evaluation is to determine if water is in the steamline. Just lowering affected S/G N/R level below 92% (82% ACC) does not ensure that water does not remain in the affected S/G steamline. An evaluation of the steamline conditions should occur prior to releasing steam from any S/G with N/R level above 92% (82% ACC) to prevent potential damage to piping, valves, or turbines.

NOTE **Throughout this procedure, "affected" refers to any S/G in which N/R level is greater than 83%.**

PURPOSE: To define the terminology used in the procedure.

BASIS: The definition of the word "affected S/G" reduces descriptive requirements throughout the remainder of the procedure.

STEP 2 **Check any S/G N/R level - GREATER THAN 83%.**

PURPOSE: To identify the affected S/G.

BASIS: If the operator confirms that any S/G N/R level is above 83%, he has identified the affected S/G and continues in FR-H.3. If all S/G levels are less than this value, there is no affected S/G(s) and the operator is transferred to the procedure and step in effect. 83% S/G N/R level is selected for entry into FR-H.3 since S/G level should always be controlled below this value.

STEP 3 **Check Feedwater Isolation:**

PURPOSE: To confirm the automatic feedwater isolation actions.

BASIS: The operator should immediately confirm both CF pumps tripped and all feedwater isolation status lights lit. If the CF pumps have not tripped, the operator should manually trip them to remove the high pressure source of water to the affected S/G. If a feedwater isolation status light is dark, a manual feedwater isolation is initiated to try to restore proper valve positions. If feedwater isolation is still not effective in closing all feedwater isolation valves, an enclosure is provided listing all valves required to be closed.

B

Given the following:

- A Unit 1 reactor trip has occurred due to a secondary system malfunction
- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection) has been performed and a transition has been made to EP/1/A/5000/ES-0.1 (Reactor Trip Response)
- The crew has entered EP/1/A/5000/FR-H.2 (Response to Steam Generator Overpressure)
- The crew is preparing to dump steam from the affected S/G

FR-H.2 will only allow steam release from the affected S/G if NR level is less than a MAXIMUM of _____(1)_____ .

If the maximum level has been exceeded, an evaluation must be performed prior to release due to the potential effects of _____(2)_____ .

A.
1. 83%
2. steamline water hammer

B.
1. 92%
2. steamline water hammer

C.
1. 83%
2. condenser tube damage

D.
1. 92%
2. condenser tube damage

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EXAM BANK QUESTION: 6642 CNS

B

General Discussion

The procedure for S/G high pressure directs operators to enter the procedure for S/G high level if level is ≥ 92% in order to prevent a water hammer event if steam is released above this setpoint.

Following reduction of S/G level, an evaluation must be performed due to the potential for water intrusion into the steamline.

Answer A Discussion

Part 1 is plausible because this is the setpoint specified for FR-H.3 entry and the P-14 (Hi-Hi S/G Level Interlock).

Part 2 is correct.

Answer B Discussion

CORRECT. See explanation above.

Answer C Discussion

Part 1 is plausible because this is the setpoint specified for FR-H.3 entry and the P-14 (Hi-Hi S/G Level Interlock).

Part 2 is plausible because it could be reasoned that water entry into the condenser via steam dumps may cause tube damage.

Answer D Discussion

Part 1 is correct.

Part 2 is plausible because it could be reasoned that water entry into the condenser via steam dumps may cause tube damage.

Basis for meeting the KA

The applicant is required to determine the implication of high S/G water level as related to the potential for water hammer.

Basis for Hi Cog

This question requires more than one mental step. The applicant must analyze the given information, compare to knowledge recalled from memory, and then make a determination in order to correctly answer the question.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT15 CNS NRC Examination

Development References
EP/1/A/5000/F-0 (Critical Safety Function Status Trees), Rev. 009, Heat Sink EP/1/A/5000/FR-H.2 (Response to Steam Generator Overpressure), Rev. 08, Step 3 EP/1/A/5000/FR-H.3 (Response to Steam Generator High Level), Rev. 09, Step 1 EP/1/A/5000/FR-H.3 Background Document, Rev. 1, Step 1 OP-CN-STM-SM (Main Steam Lesson Plan), Rev. 101 Section 7.3

Student References Provided

KA	KA_desc
SYS039 K5.01	Knowledge of the operational implications of the following concepts as the apply to the MRSS: (CFR: 441.5 / 45.7)Definition and causes of steam/water hammer ....

Q19 references

- Solid State Protection Channel IV (Train A & B)
- Solid State Protection Train B Output Cabinet
- Auxiliary Safeguards Cabinet Train B

3.0 SYSTEM OPERATION

3.1 Normal Operation

Objective # 7

3.1.1 Safety Injection Actuation (S_S)

Actuation Signals and logic

Signal	Setpoint	Logic	Interlocks	Reason
Manual		**$^1/_2$ pushbuttons**		**Operator Judgment**
Lo-pressurizer pressure	**<1845 psig**	**$^2/_4$ channels**	**P-11**	**LOCA Protection**
Hi-containment pressure	**>1.0 psig**	**$^2/_3$ channels**		**LOCA and Steam Break Protection**

LOCA protection is provided by the Low Pressurizer Pressure (1845 psig) and the High Containment Pressure (1 psig) Safety Injection Signals.
Steam break protection is provided by the High Containment Pressure (1 psig) Safety Injection Signal.

Conduct of Operations Focus:
Explain *to the class that if degrading plant conditions are recognized in sufficient time, then crews are expected to take manual actions prior to reaching the automatic setpoint for prescribed ESF and RPS actuations, unless otherwise directed by site specific procedures.* ***Reinforce*** *the importance of knowing all safety system actuation setpoints so that if an automatic action does not occur the operators will be able to recognize the condition and take manual action to ensure the plant is maintained in a safe condition.*

Objective # 8

Safety Injection Signal (S_S) initiates the following functions:

- Reactor Trip (P4)
- D/G sequencer which in turn starts the following:
  1) Centrifugal Charging Pumps (NV)

Q19 references

2) Safety Injection Pumps (NI)

3) Residual Heat Removal Pumps (ND)

4) Idle train of Component Cooling Pumps (KC)

5) Idle train of Nuclear Service Water Pumps (RN)

6) Motor Driven Auxiliary Feedwater Pumps (CA)

7) Emergency Diesel Generator

8) Provides start signal to normally running auxiliary building filtered exhaust fans and trips non-filtered exhaust fans

- Sends open signal to normally open cold leg accumulator isolation valves
- Provides Phase "A" Containment Isolation (S_t)
- Starts ESS AHU's for ND, NS, and KF pumps
- Provides Main Feedwater (CF) Isolation
- Provides Containment Ventilation Isolation (S_H)
- Turbine Trip

Objective # 9 & 10

The Low Pressurizer Pressure Safety Injection signal can be manually blocked to allow cooldown and depressurization of the plant without causing a safety injection actuation.

Objective # 11

In order to block the Low Pressurizer Pressure Safety Injection signal, “2 of 3” pressurizer pressure channels must be less than 1955 psig (P-11). There are two BLOCK pushbuttons on the Control Board provided (1 for each train).

Objective # 13

The Safety Injection signal can be “Reset” by depressing two push-buttons (one for each train). The “Reset” permissives are:

- 1 minute time delay from actuation
- Reactor trip (P-4)

Once Safety Injection has initiated, a 60 second timer must time out to provide one input to the Safety Injection Reset Circuitry. If the Safety Injection signal is still present (high containment press or low pzr pressure) then a train related P-4 signal must also be present to allow resetting the Safety Injection signal by depressing the RESET momentary push-button. However if the Safety Injection signal has cleared (NO high containment pressure or low pzr pressure present) then no train related P-4 signal is required to allow resetting the Safety Injection signal by depressing the RESET momentary push-button. Safety Injection is now Reset and all Automatic Safety Injections are now blocked as indicated by status light SI-18, AUTO SI BLOCKED and

Q19 references

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
16. **Reset CF pump turbine that will be placed in service as follows:**	
NOTE It may take 3-5 seconds for reset light to light.	
__ A. Depress "RESET" and hold "RESET" 2-3 seconds after the "RST" light is lit on pump to be started.	
__ B. Check CF pump turbine to be started - RESET.	B. Perform the following: __ 1) **IF** other CF pump turbine is available to be reset, **THEN** depress "RESET" and hold "RESET" 2-3 seconds after "RST" light is lit on other CF pump. __ 2) **IF** CF pump turbine reset, **THEN** **GO TO** Step 17. 3) **IF** "RST" light dark, **THEN** dispatch operator to perform the following at the CF pump turbine to be reset: __ a) Establish communication with the Control Room. __ b) Depress and hold "RESET" plunger on Mechanical Overspeed Trip Block (under round plexiglass cover) until "RST" has been lit in control room for 2-3 seconds (hold for total of 5-8 seconds). __ 4) Do not continue until operator has attempted to locally reset CF pump turbine. __ 5) **IF** both CF pumps still tripped, **THEN** **GO TO** Step 15 in body of this procedure.

C

Given the following Unit 1 initial conditions:

- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection) was entered following a Small Break LOCA
- Both trains of Safety Injection automatically actuated
- 1B Reactor Trip Breaker (RTB) failed to open from the Control Room
- All CA pumps failed to start

Subsequently:

- The crew has entered EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink) and is attempting to align feed flow from 1A CFPT

In order to reset 1B ECCS, 1B RTB _____(1)_____ required to be locally opened.

1A CFPT will be reset _____(2)_____ .

Which ONE of the following completes the statements above?

A. 1. is
   2. locally

B. 1. is NOT
   2. locally

C. 1. is
   2. at 1MC-10

D. 1. is NOT
   2. at 1MC-10

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EXAM BANK QUESTION: 7143 CNS

C

General Discussion

A Safety Injection signal (either train) will trip both Main Feedwater Pumps (MFP). In order to reset either MFP both SI signals must be reset. In order to reset an automatic SI signal, the associated P-4 (Rx Trip & Bypass Breakers open) must be present.

Therefore, the 1B RTB must first be opened locally, both trains of ECCS are then reset, and the 1A CFPT is reset on the Main Control Board (1MC-10).

Answer A Discussion

Part 1 is correct.

Part 2 is plausible because local reset of the CAPT (Auxiliary Feedpump Turbine) is required for an overspeed condition.

Answer B Discussion

Part 1 is plausible because this would be the correct answer if Safety Injection was initiated manually.

Part 2 is plausible because local reset of the CAPT (Auxiliary Feedpump Turbine) is required for an overspeed condition.

Answer C Discussion

CORRECT. See explanation above.

Answer D Discussion

Part 1 is plausible because this would be the correct answer if Safety Injection was initiated manually.

Part 2 is correct.

Basis for meeting the KA

Local Auxiliary Operator Task during emergency related to Main Feedwater: Local trip of Rx Trip Breaker.

Resultant operational effects: Reset of ECCS which allows reset of Main Feedwater Pump (inherent to the question).

Basis for Hi Cog

The applicant must reason through multiple mental processes in order to determine the prerequisite conditions required to reset a Main Feed Pump with conditions provided.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT-17 NRC Written Exam CNS NRC Examination

Development References
OP-CN-ECCS-ISE (Engineered Safety Features Actuation System LP), Rev. 102, Pg. 22 & 82 OP-CN-CF-CA (Auxiliary Feedwater System LP), Rev. 110, Pg. 28

Student References Provided

KA	KA_desc
SYS059 2.4.35	SYS059 GENERICKnowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. (CFR: 41.10 / 43.5 / 45.13)

The turbine driven pump is rated at 3600 rpm but the Unit 1 turbine/pump's governor was modified to operate at 3500 rpm by minor mod MGMM-12950. This mod was performed due to high resonant vibration on the outboard pump bearing due to the installation of a new pump recirculation valve. In addition, a valve was added to the governor to automatically dump the control oil pressure as soon as the turbine is shutdown.

2.7 CA Pump Discharge Control Valves

The MD CA Pumps Discharge flow control valves are:

1(2)CA-60A, 1(2) A CA Pump Discharge To 1(2) A S/G Control

1(2)CA-56A, 1(2) A CA Pump Discharge To 1(2) B S/G Control

1(2)CA-44B, 1(2) B CA Pump Discharge To 1(2) C S/G Control

1(2)CA-40B, 1(2) B CA Pump Discharge To 1(2) D S/G Control

The TD CA Pump Discharge flow control valves are:

1(2)CA-64AB, U1(2) TD CA Pump Discharge To 1(2) A S/G Control

1(2)CA-52AB, U1(2) TD CA Pump Discharge To 1(2) B S/G Control

1(2)CA-48AB, U1(2) TD CA Pump Discharge To 1(2) C S/G Control

1(2)CA-36AB, U1(2) TD CA Pump Discharge To 1(2) D S/G Control

The discharge flow control valves for the CA Pumps are also referred to as the "CA Modulating Valves". During normal operation, the CA Pump Discharge Control valves can be positioned to throttle flow individually to their respective S/Gs using reverse-acting manual loaders on MC-10. This feature is used primarily during unit startup and shutdown operations to maintain S/Gs levels within desired bands.

However, the air supply to each valve is controlled by a modulating control valve circuit. To ensure that an adequate heat sink is maintained, in the event of any auto-start signal, the solenoids which supply air to the control valves de-energize and vent air off of the control valve positioner causing them to fail to their "safe" (full open) position. The CA Modulating Control Valve Circuit is discussed in detail in Section 2.9.1.

2.9.3 Auto-Start Isolations

On CA pump auto-start, the following valves isolate:

- *SG Blowdown valves BB-1 through BB-8. (Train A valves: BB-5 through BB-8, Train B valves: BB-1 through BB-4) and BB-123 through BB-126.*
- Nuclear Sampling System Steam Generator Containment Isolation valves.
- Nuclear Sampling System Radiation Monitor EMF 34 Inlet NM267.

The BB system does not isolate on Manual CA pump start, so the operation of the BB system is maintained during all normal modes of operation.

2.9.4 Modulating Control Valve Circuit (CA Pump Discharge Flow Control Valves)

Objective # 13

The CA pump discharge valves "fail open" upon the auto-start of the CA pumps. The Modulating Control Valve circuit has a mechanical latching relay which will maintain the CA Pump Discharge Flow Control valves in their safe position even after the auto-start signal is reset/cleared.

To regain control of these valves, the operator must depress the train-related modulating valve reset pushbutton on MC-10. If the operator has control of the discharge control valve(s) the indicating light is illuminated.

Upon receipt of an auto-start signal, the light will be off and the operator does not have control of the valves. Following reset of the latching relay, the light will illuminate indicating that operator control has been restored.

If an automatic initiation of CA has occurred, and the CA reset pushbuttons have been depressed to regain control of the discharge flow control valves (i.e. the reset pushbuttons have not been released from the depressed position), any subsequent automatic CA initiation will not reposition the discharge flow control valves. The operator has control of the discharge flow control valves as long as the reset pushbuttons remain depressed.

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EXAM BANK QUESTION: 5928 MNS **A**

Given the following initial conditions on Unit 1:

- The unit is at 98% RTP
- In preparation for a Unit 1 TDCA pump performance test the following flow control valves are positioned as follows:

  1CA-64AB (TD CA PUMP TO 1A S/G) -- CLOSED
  1CA-52AB (TD CA PUMP TO 1B S/G) -- CLOSED
  1CA-48AB (TD CA PUMP TO 1C S/G) -- OPEN
  1CA-36AB (TD CA PUMP TO 1D S/G) -- OPEN

Subsequently,

- An IAE technician inadvertently generates a U1 TDCA pump auto-start signal

After the inadvertent auto-start signal is initiated, ___(1)___ of the U1 TDCA Flow Control valves will be OPEN.

In accordance with the Control Room Crew Expectations Manual, the crew will CLOSE any OPEN U1 TDCA Flow Control valves ___(2)___.

Which ONE (1) of the following completes the statements above?

A. 1. all four
   2. as soon as practical

B. 1. all four
   2. when directed by OP/1/A/6250/002 (AUXILIARY FEEDWATER SYSTEM)

C. 1. only two
   2. as soon as practical

D. 1. only two
   2. when directed by OP/1/A/6250/002 (AUXILIARY FEEDWATER SYSTEM)

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EXAM BANK QUESTION: 5928 MNS A

General Discussion

The TDCA pump is capable of feeding all four S/G's via the four flow control valves listed, two of which are not in their normal full open alignment. During an auto start, these valves are designed to fail open providing full design flow to all S/G's. In this scenario, an auto start has occurred therefore the flow control valves would open.
Per the Control Room Crew Expectations Manual, the operator should take action to control CA flow as soon as practical without the use of a procedure.

Answer A Discussion

CORRECT: See explanation above

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct and therefore plausible.

Second part is plausible since the OP does contain the desired actions to close the flow control valves. However, due to the critical nature of getting these valves closed in a timely manner, the Crew Expectations manual provides guidance to prevent waiting on the OP.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible since this would be true if the TDCA pump start were due to inadvertent opening of steam supply valves SA-48ABC, SA-49AB. This would start the TDCA pump. However, since no "autostart" signal is generated, the flow control valves would not reposition.
Also plausible in that two of these valves are OPEN initially, actions to CLOSE these two valves or all four would be required to mitigate the consequences of the event.

Second part is correct and therefore plausible.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible since this would be true if the TDCA pump start were due to inadvertent opening of steam supply valves SA-48ABC, SA-49AB. This would start the TDCA pump. However, since no "autostart" signal is generated, the flow control valves would not reposition.

Second part is plausible since the OP does contain the desired actions to close the flow control valves. However, due to the critical nature of getting these valves closed in a timely manner, the Crew Expectations manual provides guidance to prevent waiting on the OP.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of the effect of a malfunction/mis-operation of the TDCA pump on the TDCA flow control valves that are positioned in an abnormal alignment.

Basis for Hi Cog

This question is higher cognitive since the applicant must evaluate the initial valve positions in the stem and determine if the inadvertent TDCA start would result in the associated flow control valves failing to their full open position. The applicant is given an abnormal alignment and required to predict an outcome.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT-31 MNS NRC Examination

Development References

References:
Lesson Plan OP-MC-CF-CA Section 3.2.2. (CA Pumps Discharge Control Valves)
Control Room Crew Expectations Manual

Learning Objectives:

Student References Provided

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EXAM BANK QUESTION: 5928 MNS A

KA	KA_desc
SYS061 K6.01	Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: (CFR: 41.7 / 45.7)Controllers and positioners ....

Should a Safety Injection signal occur at any time after the first time delay relay completes its cycle, the circuit will automatically initiate separation from the offsite power source and transfer to the emergency diesel generators.

Protection for a severe diesel-generator overload accompanied by a system voltage dip caused by events such as a Loss of Off-Site Power (LOOP) with the Diesel Generator operating in parallel with the grid is provided by the voltage-controlled overcurrent relay (51V). This relay consists of three single phase relays (51VX, 51VY, and 51VZ). The operation of any one of these phase relays will activate an annunciator alarm in the control room (AD-11, A-4 (D-4), D/G A (B) Overcurrent) to warn the operator of an overload condition (800 amps @ 3360 volts). Operation of any two of these overcurrent relays will result in operation of the diesel-generator lockout relay (86D). Diesel-generator lockout relay (86D) will trip and lockout the diesel-generator switchgear breaker and initiate a shutdown of the diesel-generator. This lockout must be reset by hand before the breaker can be reclosed.

3.3 Sequencer operation during a Blackout

Objective # 5

Sequencer operation during a Blackout with no safety injection signal and the under-voltage is not due to fault relay 86N, 86S or 86B.

If 2/3 LOV Relays sense a loss of voltage on their associated 4160V bus, the blackout relay will pick up and actuate a D/G start. If the UV condition still exists after 8.5 seconds, the blackout logic is sealed in. All 4160V breakers on the bus are then tripped open. When D/G speed is ≥ 95%, the output breaker will close. When bus voltage is ≥ 92.5% and D/G speed is ≥ 97%, the accelerated sequence is enabled. Blackout loads will be sequentially applied at intervals of approximately 2 seconds, as long as bus voltage remains ≥ 92.5% and frequency remains > 58.2 Hz. Complete loading of all blackout loads, via the accelerated sequence, could be done in as little as 25 seconds. If during the sequencing of blackout loads the Sequencer RESET pushbuttons are depressed, no additional sequencing will occur. This is because once the RESET pushbuttons are depressed, the blackout signal is removed and since there is power on the 4160V bus a blackout no longer exists. It would require another blackout signal or manual loading of the bus to complete the sequencing of loads.

Should the Accelerated Sequence Relay scheme fail to work, the Committed Sequence would be actuated approximately 10 seconds after the diesel receives its blackout start signal if load shed of the bus has been completed. The committed sequence may take up to 12 minutes to load all blackout loads. The committed sequence does not require any minimum voltage or minimum frequency to allow it to progress as does the Accelerated Sequence. The Committed Sequence is required by Technical Specifications.

NOTE 1 **In order for the accelerated sequence to begin or continue, the 127AX Special Relay must indicate >92.5% voltage. If voltage falls below this level, the accelerated sequence will stop until voltage is again above the setpoint.**

In addition, if 4160V bus frequency drops below 97% before or after the accelerated sequence begins, the accelerated sequence will stop until frequency is again above the setpoint.

NOTE 2 **The committed sequence looks at neither voltage nor frequency. When the time delay relay associated with a given load group's sequence timer has timed out, the committed sequence applies that load group regardless of voltage or frequency.**

3.4 Sequencer Operation during Safety Injection

Sequencer Operation during a Safety Injection actuation with no blackout signal.

Objective # 6

Upon receiving an SI signal, the SSPS energizes sequencer relays to:

1. **Start the diesel generator.**
2. **Lock out the blackout relay, trips blackout only loads.**
3. **Align logic relays to lockout non-SI loads and to load SI loads.**

Loading Criteria:

1. **If bus voltage is greater than 92.5%, the accelerated sequence logic immediately loads group #1. Bus frequency is no longer a permissive, since the diesel is not tied to the bus.**
2. **If bus voltage is between 76% and 92.5% the accelerated sequence will delay and wait for voltage to recover before loading the next group. However, under these conditions, the "early committed sequence" will load the first group after a 1 second time delay.**
3. **Loading is similar to that described for a blackout except that:**
   - **Only loads necessary during an SI are allowed to operate or be started in sequence.**
   - **SI loads previously in operation remain unchanged.**
   - **Additional timer for load group 3 (ND) is in the committed time circuit.**

To recover control after a Safety Injection actuation

1. **The actuating signal must be no longer present.**
2. **Reset SI using pushbuttons on MCB.**
3. **Reset Diesel Generator Sequencer using MCB or local reset pushbutton.**
4. **If the Diesel Generator Load Sequencer RESET Pushbuttons are depressed while the Accelerated Sequence is in progress, the time that it takes for the Accelerated and Committed Sequences to complete will be increased. This is because depressing the RESET Pushbuttons places the Safety Injection Sequence back to its ground state. If the Safety Injection RESET Pushbuttons on the Main Control Board have**

not been RESET, then the Safety Injection Signal is still present. This signal will again actuate the Safety Injection Sequence and start the process over again.

<u>NOTE 1</u> **Since normal power is available to the 4160V bus during an SI only event, a check for 4160V bus frequency is unnecessary. Prior to and during the accelerated sequence, if 4160V bus voltage drops below the 92.5% setpoint, the accelerated sequence is halted and remains halted until bus voltage is again above the setpoint.**

<u>NOTE 2</u> **The committed sequence looks at neither voltage nor frequency. When the time delay relay associated with a given load group's sequence timer has timed out, the committed sequence applies that load group regardless of voltage or frequency.**

3.5 Safety Injection Actuation during a Blackout

Initial conditions - Blackout has occurred with subsequent load sequencing in progress or the sequence is complete and the diesel generator loaded with blackout loads.

Objective # 7

1. **The 4160V is cleared of all non-SI loads, SI logic actuated.**
2. **SI loads previously running continue to operate.**
3. **Sequence timer for load group 3 (ND) is in the circuit with the other committed sequence timers.**
4. **If the blackout signal has <u>not</u> been reset, SI loads (groups 1-10) are sequenced on through the accelerated sequence at 2 second intervals, provided bus voltage remains >92.5% and frequency remains >97%.**

   If the blackout signal has been reset, bus frequency is no longer a permissive for loading. Loads would be sequenced on as if there were a Safety Injection signal, with no blackout.

<u>NOTE 1</u> **Since a blackout has occurred, the blackout loads are being carried by the diesel and both normal voltage and frequency are required to remain above setpoint (92.5% voltage, 97% frequency) in order for the accelerated sequence to begin or continue.**

Since the SI actuation will load shed all blackout only loads and load SI only loads during a reinitiation of the accelerated sequence, both voltage and frequency must be maintained above setpoint before the accelerated sequence will continue.

<u>NOTE 2</u> **The committed sequence looks at neither voltage nor frequency. When the time delay relay associated with a given load group's sequence timer has timed out, the committed sequence applies that load group regardless of voltage or frequency.**

3.6 Blackout occurs after a Safety Injection

Objective #8

Blackout occurs after a Safety Injection. <u>(SI not reset)</u>

Initial conditions: SI actuation has occurred with subsequent load sequencing in progress, normal power available and the diesel generator running unloaded or in the process of coming up to speed.

1. **2/3 LOV relays sense Blackout.**
2. **0.5 seconds later, the normal and standby bus feeder breakers are tripped open.**
3. **Once at least 8.5 seconds have elapsed since the SI signal was received, the load shed relays will open all bus breakers.**
4. **One second later the diesel generator breaker is closed in provided D/G speed (frequency) is > 95%.**
5. **SI loads are then sequenced on through the accelerated sequence at 2 second intervals, provided bus voltage remains > 92.5% and frequency remains > 97%.**

<u>NOTE 1</u> The onset of this event is an SI with normal power available. This means that only voltage must remain above its setpoint (92.5%) to permit or allow the accelerated sequence. Once a blackout occurs, the 4160V power will be from the diesel generator and the requirement for frequency >97% is needed to allow the accelerated sequence to begin or continue.

<u>NOTE 2</u> The committed sequence looks at neither voltage nor frequency. When the time delay relay associated with a given load group's sequence timer has timed out, the committed sequence applies that load group regardless of voltage or frequency.

Blackout occurs after a Safety Injection <u>(with SI reset)</u>

- **If a Blackout occurs after a safety injection and SI has already been reset then the sequencer will only load Blackout loads; i.e. previously running SI loads will not automatically be restarted.**

3.7 Sequencer Operation During a Blackout or Safety Injection While the DG is Paralleled to the Grid

Objective # 11

The following describes the sequencer operation during a blackout or safety injection while the DG is operating in parallel to the off-site power source (the incoming and emergency breakers are both closed).

3.7.1 NORMAL BREAKER OPENS WHILE OFFSITE POWER IS MAINTAINED

ILT-31 MNS SRO NRC Examination QUESTION 22 22 **C**

SYS064 A3.07 - Emergency Diesel Generator (ED/G) System
Ability to monitor automatic operation of the ED/G system, including: (CFR: 41.7 / 45.5)
Load sequencing ....

Given the following initial conditions on Unit 2:

- A loss of voltage has occurred on 2ETA
- Blackout loading is in progress

Subsequently:

- A Safety Injection signal is received before Blackout loading is completed on 2ETA

Based on the conditions above, the Blackout load sequence ___(1)___, 2ETA is cleared of ___(2)___ loads, and the SI load sequence is actuated.

Which ONE (1) of the following completes the statement above?

A. 1. stops
   2. all

B. 1. is completed
   2. all

C. 1. stops
   2. all non-SI

D. 1. is completed
   2. all non-SI

ILT-31 MNS SRO NRC Examination QUESTION 22 22 **C**

General Discussion

When a Blackout has occurred and load sequencing is in progress, if an SI signal is received, the Blackout sequence stops, the affected bus is cleared of non-SI loads, and the SI load sequence is actuated.
SI loads which were previously running continue to operate.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
The first part is correct and therefore plausible.

The second part is plausible since the applicant may conclude that all loads are cleared from the bus after the SI sequencer actuation, which does occur after a Blackout sequencer actuation.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if the applicant misunderstands the function of the Blackout sequencer and concludes that the Blackout sequence must be complete to ensure full restoration of power to the Emergency Bus.

The second part is plausible since the applicant may conclude that all loads are cleared from the bus after the SI sequencer actuation, which does occur after a Blackout sequencer actuation.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if the applicant misunderstands the function of the Blackout sequencer and concludes that the Blackout sequence must be complete to ensure full restoration of power to the Emergency Bus.

The second part is correct and therefore plausible.

Basis for meeting the KA

The K/A is matched because the candidate must possess the ability to monitor the automatic loading of safety-related equipment during all possible load sequence scenarios and determine that the sequencer has operated properly using Main Control Board indications for the various sequencer loads.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2009 MNS NRC SRO Examination NRC Q59 (Bank 3024)

Development References

REFERENCES:
Lesson Plan OP-MC-DG-EQB (Diesel Generator Load Sequencer) Section 3.5 (Safety Injection Actuation during a Blackout)

LEARNING OBJECTIVES:
OP-MC-DG-EQB, Objective 7

Student References Provided

SYS064 A3.07 - Emergency Diesel Generator (ED/G) System
Ability to monitor automatic operation of the ED/G system, including: (CFR: 41.7 / 45.5)
Load sequencing ....

2.3 Auxiliary Transformers (1ATA, 2ATA, 1ATB, 2ATB, 1ATC, 2ATC, 1ATD, 2ATD, 1ATE, 2ATE, SATA, and SATB)

Objectives # 15, 16, 18, 21, 22, 23, 30, & 31

Transformers 1ATA and 2ATA are the normal power supplies to 6.9 KV Busses 1TA, 1TC, 2TA, and 2TC and the alternate power supplies to 6.9 KV Busses 1TB, 1TD, 2TB, and 2TD. Transformers 1ATB and 2ATB are the normal power supplies to 6.9 KV Busses 1TB, 1TD, 2TB, and 2TD and the alternate power supplies to 6.9 KV Busses 1TA, 1TC, 2TA, and 2TC. The normal operating voltage on the high side of the transformers is 24 KV while the low side voltage is 6.9 KV for both Unit 1 and 2.

The primary windings of the independent full size three winding transformers 1ATA, 1ATB, 2ATA and 2ATB are connected between the main step-up transformers and the main generator breakers. The two secondary windings are normally connected to one 6900V bus and alternately connected to another 6.9 KV bus. Since two Unit Auxiliary Transformers are normally available for each Unit, the transformer normally operates at half capacity.

However, each auxiliary transformer 1ATA, 1ATB, 2ATA and 2ATB is sized to carry all the auxiliaries of one operating nuclear unit plus the safe shutdown loads of the other nuclear unit. The following explanation will describe such an alignment, based on utilization of either 1ATA or 1ATB, but reference to Training Drawing 7.11, Main Power Distribution Unit Auxiliary Transformer Output Scheme (including Safe Shutdown Loads) is recommended:

Each of the full-sized transformers have two secondary windings, with one winding normally energizing two 6900 V switchgear assemblies. However, each secondary winding can be connected to two 6900 V buses allowing one of the full-sized auxiliary transformers to supply all four 6900 V buses. Since the 6900 V buses supply both the normal and alternate power to Auxiliary Transformers SATA and SATB; 1TC could be aligned to feed SATA and 1TB could be aligned to feed SATB.

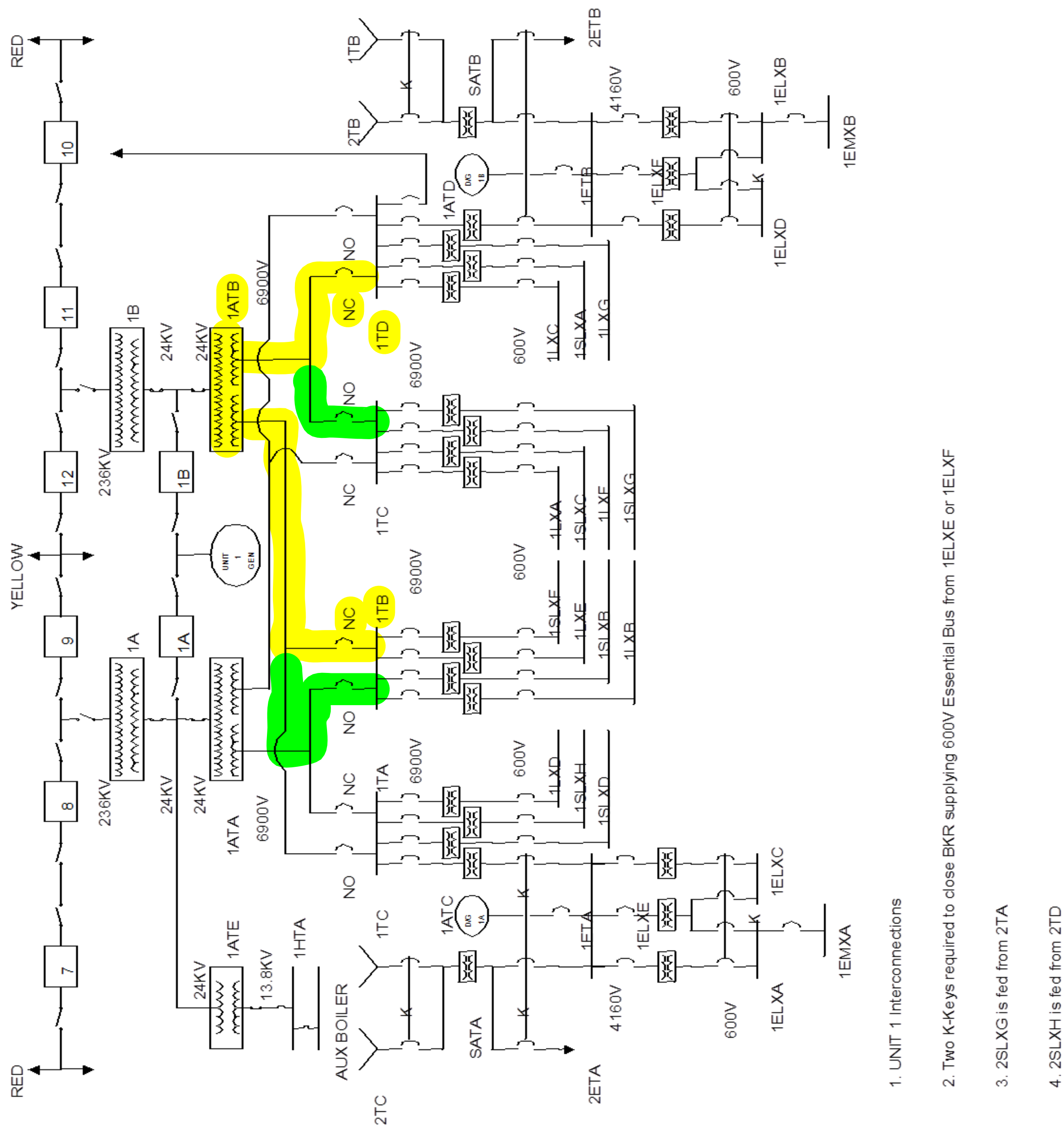
These transformers (SATA and SATB) can be aligned to supply 2ETA and 2ETB; with SATA supplying 2ETA and SATB supplying 2ETB. 1ETA would be supplied through Auxiliary Transformer 1ATC while 1ETB would be supplied through Auxiliary Transformer 1ATD. Such an arrangement would place all of the auxiliaries of Unit 1 plus the safety shutdown load of Unit 2 on either of the full-sized Auxiliary Transformers for Unit 1 (1ATA or 1ATB).

Transformers 1ATE and 2ATE are the normal power supplies to the Auxiliary Electric Boilers. The Primary windings of 1ATE and 2ATE are connected between the Main Step-Up Transformers 1A and 2A, the Generator Breakers 1A and 2A, and Auxiliary Transformers 1ATA and 2ATA. The secondary windings of transformers 1ATE and 2ATE are used to supply the 13.8 KV switchgear groups, 1HTA and 2HTA, which feed the auxiliary electric boilers. The normal operating voltage on the high side of these transformers is 24 KV while the low side voltage is 13.8 KV. Transformers (1ATE, and 2ATE) are designed to carry the load associated with its respective Auxiliary Electric Boiler.

Q22 References

7.0 DRAWINGS

7.1 Main Power Distribution Unit 1 Interconnections (05/11/00)



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EXAM BANK QUESTION: 2723 MNS **D**

Given the following:

- Unit 1 is shutdown in MODE 3
- Auxiliary Transformer 1ATA is tagged out for repairs
- All unit loads are being supplied by Auxiliary Transformer 1ATB

1. A Blackout will occur if _______ open.

2. The DG ______ Sequence is ONLY enabled if emergency bus minimum voltage and frequency setpoints are met.

Which ONE (1) of the following completes the statements above?

A. 1. PCBs 8 & 9
   2. Committed

B. 1. PCBs 11 & 12
   2. Committed

C. 1. PCBs 8 & 9
   2. Accelerated

D. 1. PCBs 11 & 12
   2. Accelerated

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EXAM BANK QUESTION: 2723 MNS **D**

General Discussion

Since one busline is already out, loss of the other busline which feeds 1ATB will result in a Blackout on both 4160V busses. The busline which feeds 1ATB is fed from the switchyard via PCB 11 & 12.

When bus voltage is greater than or equal to 92.5% and D/G speed is greater than or equal to 97%, the accelerated sequence is enabled. Blackout loads will be sequentially applied at intervals of approximately 2 seconds, as long as bus voltage remains greater than or equal to 92.5% and frequency remains > 58.2 Hz. Complete loading of all blackout loads, via the accelerated sequence, could be done in as little as 25 seconds.

Should the Accelerated Sequence Relay scheme fail to work, the Committed Sequence would be actuated approximately 10 seconds after the diesel receives its blackout start signal if load shed of the bus has been completed. The committed sequence may take up to 12 minutes to load all blackout loads. The committed sequence does not require any minimum voltage or minimum frequency to allow it to progress as does the Accelerated Sequence. The Committed Sequence is required by Technical Specifications.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE: Part 1 is plausible if the applicant does not recall which breakers feed which busline.

Part 2 is plausible if the applicant does not recall the difference between the .Accerated and Committed start sequences.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE: Part 1 is correct.

Part 2 is plausible if the applicant does not recall the difference between the .Accerated and Committed start sequences.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE: Part 1 is plausible if the applicant does not recall which breakers feed which busline.

Part 2 is correct.

Answer D Discussion

CORRECT. See explanation above.

Basis for meeting the KA

"Opening of the ring bus" equates to a loss of or malfunction in the switchyard. In this case the opening of the ring bus is the opening of Switchyard PCBs 11 & 12 which results in a Blackout on 1ETA and 1ETB. The ability to monitor portion of the KA related to opening of the ring bus and the Emergency Diesel Generator system is met by the applicant demonstrating a knowledge of how the EDGs operate under these conditions.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	

Development References
Lesson Plan OP-MC-DG-EQB Pg 2 (Rev 16) OP-MC-DG-DG OBJ. #5

Student References Provided

KA	KA_desc
SYS064 A4.08	Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)Opening of the ring bus ....

2.1.14 In the standby mode of operation EVCS will replace the out-of-service battery charger. During this mode of operation the out-of-service battery charger is disconnected from its distribution center with EVCS connected to the distribution center through one of the distribution center (EVDS) breakers, discussed above.

In addition, the tie breaker to the distribution center with the out-of-service battery charger must be closed.

Note: Training Drawing 7.2, Simplified 125 VDC / 120 VAC Vital Instrumentation and Control Power Drawing can be used to illustrate the lineup associated with an Equalizing Charge

During the "equalizing charge" mode the normal battery charger is disconnected from its distribution center and will be aligned in parallel with its respective battery. The normal battery charger will be placed in "Equalize" mode of operation. Battery charger (EVCS) will supply the distribution center with the tie breakers closed (cross-tied with its "sister" channel).

This same breaker alignment is utilized during normal charger maintenance and battery discharge testing. During these operations, the normal charger will be shut down and the battery removed from service and declared INOPERABLE.

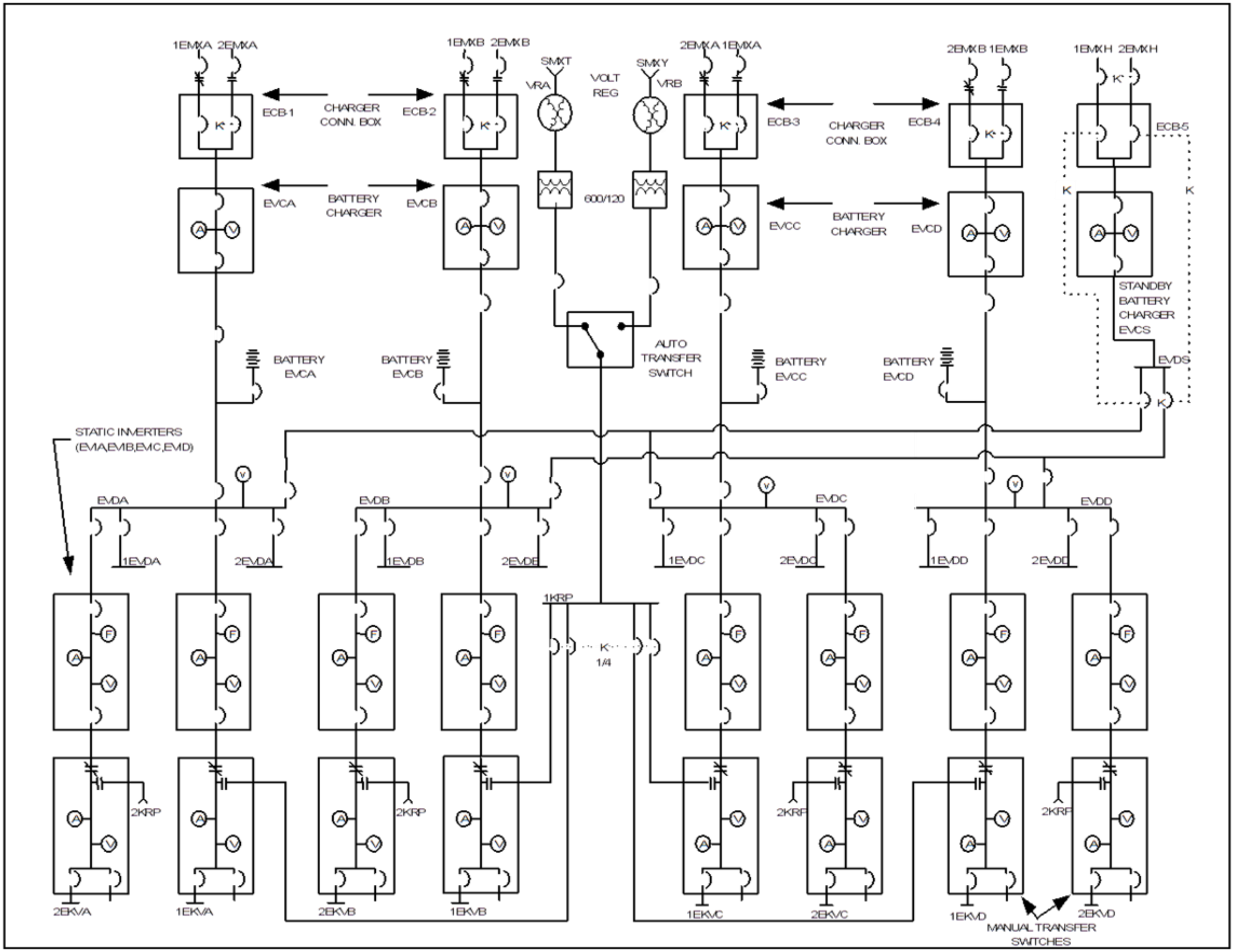
Objective # 9

As discussed above, the breakers, associated with standby battery charger EVCS are Kirk-Key Interlocked. Drawing 7.1, Composite Vital I/C Drawing, may help in your understanding of the interlocks described below:

- The breakers at distribution center EVDS are Kirk Key Interlocked with each other and their respective connection box (ECB5) such that:
    1) The A Train feeder breaker from 1EMXH in ECB5 cannot be closed unless the A Train supply breaker for EVDA or EVDC (located at distribution center EVDS) is closed. **This prevents the A Train source from supplying the B Train buses.**
    2) The B Train feeder breaker from 2EMXH in ECB5 cannot be closed unless the B Train supply breaker for EVDB or EVDD (located at distribution center EVDS) is closed. **This prevents the B Train source from supplying the A Train buses.**
    3) Only one breaker from EVDS can be closed at a time. **This prevents the standby charger from supplying both A Train and B Train buses.**
- In addition, the supply breakers to ECB5 (Connection Box) from 1 and 2 EMXH are Kirk-Key Interlocked to prevent closure of both breakers at the same time. **This interlock scheme in conjunction with 1 & 2 above prevent cross connection of A & B Train AC sources and minimizes mutual exposure of the two trains.**

Q23 References

7.1 125 VDC/120 VAC Vital I&C Power Composite Drawing (11-04-14)



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EXAM BANK QUESTION: **5251** **MNS** **B**

Given the following initial conditions:

- Both Units were operating at 100% RTP

Subsequently,

- A Loss of Offsite Power occurs on Unit 1
- 1A D/G starts and loads as designed, 1B D/G fails to start
- 45 minutes have passed since the Loss of Offsite Power occurred

Based on the above conditions, the current status of 125 VDC Distribution Center (EKVB) is ___(1)___.

AND

When performing a normal equalizing charge on vital battery EVCB, battery charger ___(2)___ will be used.

Which ONE (1) of the following completes the statements above?

A. 1. De-energized
   2. EVCB

B. 1. Energized from 125v DC Vital Battery (EVCB)
   2. EVCB

C. 1. De-energized
   2. EVCS

D. 1. Energized from 125v DC Vital Battery (EVCB)
   2. EVCS

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EXAM BANK QUESTION: 5251 MNS **B**

General Discussion

Since each battery is, electrically, in parallel with its battery charger, and the battery charger output voltage is slightly higher than the battery voltage during the floating charge, the battery charger actually supplies power to the respective DC loads during normal operation. However, the battery will automatically assume those DC loads, without interruption, upon loss of its respective battery charger or AC power source. Each battery is sized to supply the continuous emergency loads and momentary loads fed from its distribution center (two DC buses which includes the two inverters and their panelboards), plus supply the loads of its sister distribution center (two DC buses which includes the two inverters and their panelboards), if required, for a period of one hour.

During the equalizing charge mode the normal battery charger is disconnected from its distribution center and will be aligned in parallel with its respective battery. The normal battery charger will be placed in Equalize mode of operation. Battery charger (EVCS) will supply the distribution center with the tie breakers closed (cross-tied with its sister channel).

Answer A Discussion

INCORRECT: See explanation above

PLAUSIBLE:

First part is plausible if applicant mistakenly assumes Vital I&C battery duty requirements are 30 minutes. In this case, the battery charger has no bus supplying power and the battery would have exhausted its capacity therefore leaving bus EVDB de-energized.

Second part is correct and therefore plausible.

Answer B Discussion

CORRECT: See explanation above

Answer C Discussion

INCORRECT: See explanation above

PLAUSIBLE:

First part is plausible if applicant mistakenly assumes Vital I&C battery duty requirements are 30 minutes. In this case, the battery charger has no bus supplying power and the battery would have exhausted its capacity therefore leaving bus EVDB de-energized.

Second part is plausible since Aux I&C (240/120 VAC) electrical distribution system does use the standby charger in place of the normal charger to perform an equalize charge on the respective battery. EVCS is used during an equalize charge on a vital battery. It is aligned to the effected bus to replace the normal charger that is performing the battery charging.

Answer D Discussion

INCORRECT: See explanation above

PLAUSIBLE:

First part is correct and therefore plausible

Second part is plausible since Aux I&C (240/120 VAC) electrical distribution system does use the standby charger in place of the normal charger to perform an equalize charge on the respective battery. EVCS is used during an equalize charge on a vital battery. It is aligned to the effected bus to replace the normal charger that is performing the battery charging.

Basis for meeting the KA

K/A is matched because applicant must have knowledge of the physical connections in the 125VDC electrical distribution system required for a normal "equalizing" battery charge and alignments made when loss of power to the battery charger occurs.

Basis for Hi Cog

Question is higher cog since the applicant must analyze given plant conditions and determine the status of Bus 1ETB and then determine the effect of the loss of 1ETB on the 125 VDC electrical distribution system battery chargers.

Basis for SRO only

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EXAM BANK QUESTION: 5251 MNS

B

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT-30 MNS Audit Examination

Development References
References: Lesson Plan OP-MC-EL-EPJ (250 VDC Auxiliary Power System) Section 3.1 (Normal Operation) Learning Objectives: OP-MC-EL-EPJ Objective 5

Student References Provided

KA	KA_desc
SYS063 K1.03	Knowledge of the physical connections and/or cause-effect relationships between the DC electrical system and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)Battery charger and battery ....

Q24 References

There have been instances of the membrane dryer failing, requiring emergent replacement. In these instances, there were leaks in the system which caused excessive cycling of the compressor. Excessive compressor cycling leads to early failure of the membrane. As the membrane fails, it restricts normal air passage to the receiver and the failure mechanism of the dryer causes more air to blow from the air sweep ports on the sides of the dryer. This is difficult to detect as it is a very subtle difference between normal air being swept and excessive air blowing. The more pressure cycles the membrane experiences, the more it fails. Its failure grows exponentially rather than linearly. The membrane failure causes the compressor to run longer and longer to recharge the receiver.

If the compressor runs for ≥ 7 minutes to recharge the receiver, a Compressor Continuous Run Time Alarm is received on the OAC. The alarm response for the continuous run time alarm states the following:

> *If cause of extended run time is due to membrane air dryer excessive purging or other system leak, perform the following:*
>
> - *Declare associated VG compressor inoperable*
> - *Tagout associated VG compressor*
> - *Initiate WO to repair condition*
> - *Write a PIP to document condition*

If the guidance in the alarm response were not followed, and the compressor allowed to remain in service, the backpressure at the compressor from the dryer would continue to increase until eventually the compressor discharge relief valve would lift and not reseat. This would result in the compressor running unloaded continuously, and require extensive emergent maintenance to recover the subsystem to operable status.

It is important to understand that VG system leakage, if not repaired in a timely manner, will result in the inoperability of VG compressors. It is also important to understand that excessive VG compressor cycling (which can be observed by history trending of VG compressor motor current on the OAC) is an indication of VG system leaks; while excessive VG compressor cycle time (as indicated by VG compressor "Continuous Run Time" alarm on the OAC) is an indication that the membrane dryer is failing and approaching the end of its useful service life. (Ref. PIPs M-13-10223 & M-13-10892)

Each header has a receiver tank designed to store a sufficient volume of air (100 ft^3) to start the diesel without assistance. One air receiver at $\geq$ 210 psig will provide at least one fast start and five total starts.

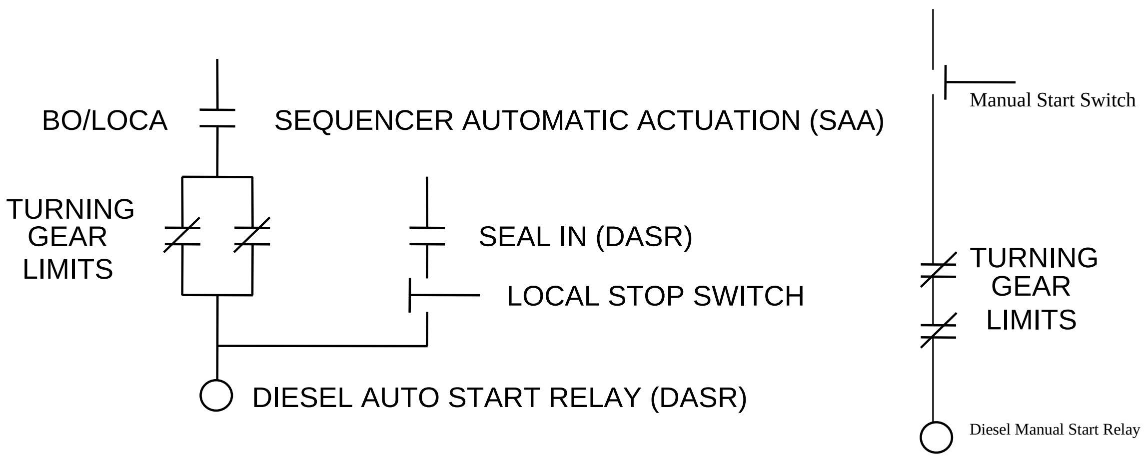
Line purifiers downstream of the receivers remove particulate from the air prior to engine entry. Purifiers and compressor intake filters are on a preventive maintenance programs for periodic replacement.

Q24 References

To **disengage** the turning gear, release the pressure of the drive gear against the flywheel, slowly remove the locking pin and then lower assembly to its resting-place.

Objective # 3

There are two limit switches associated with the turning gear that will prevent an automatic or manual start of the diesel if the turning gear is engaged. Both limit switches must be made to prevent an auto start. Only one switch must be made to prevent a manual start. A failure of either limit switch while the diesel operates will result in a manual mode trip. If both limit switches fail while operating in the auto mode, the diesel will not trip. If the diesel is prevented from automatically starting then it is inoperable.



2.2 Starting Air System

Objective # 4

The Starting Air System provides fast start capability by using high-pressure air to roll the diesel engine until it is firing on its own.

Objective # 5

Each air compressor is designed to maintain its associated header pressure at 225-235 psig. As header pressure decreases to 225 psig the compressor will automatically start. Once pressure increases to 235 psig, the compressor will automatically stop.

Each compressor inlet is filtered. This reduces/prevents damage to compressor components and also helps reduce the overall air system particulate contamination.

A relief valve is installed on each compressor outlet (set at 275 psig) to provide overpressure protection.

The VG Compressors are not safety related equipment and is therefore an unnecessary load during a Safety Injection event. Each compressor is equipped with a shunt trip device that will load shed the compressor on a Safety Injection actuation. This load shed does not occur during a Blackout.

3.0 SYSTEM OPERATION

3.1 Normal Operation

Objective #6

The Containment Purge System consists of two 50% capacity supply fans with matching exhaust fans and one 100% incore instrumentation room supply fan with a matching exhaust fan. Each supply fan is interlocked with its corresponding exhaust fan so that they will energize as a pair. Controls in the Control Room consist of a three position switch (OFF - 50% - 100%), which selects the number of fans to be used, a two position switch (FAN 1A - FAN 1B), which selects which fan is used in the 50% mode; push-button (START-STOP), for the incore instrumentation purge fans.

The normal mode of operation would be to have all fans operating. Fan status is indicated in the Control Room and on local panel RB-CP-1. Fans may be de-energized manually, by fire protection contacts, by motor overload, or by S_h (Containment Ventilation Isolation).

> ***Operator Fundamental Focus; Control***
>
> *While discussing containment ventilation isolation,* ***reinforce*** *the fundamental control principle of "take manual actions (in accordance with procedure direction, if available) when automatic actions do not occur.*
>
> ***Emphasize*** *the importance of knowing the conditions that require isolation of the containment and understanding the actions that must take place to successfully complete the evolution should automatic actions fail.*

Containment Ventilation Isolation (S_H) is initiated by any of the following:

- **Safety Injection (S_S)**
- **Manual Phase "A" (S_t)**
- **Manual Phase "B"**
- **Trip 2 alarm on EMF-38, 39, or 40**

Containment Ventilation Isolation (S_H) signal secures VQ and VP.
To "Reset" Containment Ventilation Isolation following a Safety Injection, Manual Phase "A", or Manual Phase "B", the Containment Ventilation (S_H) "Reset" Pushbuttons must be depressed (can reset without resetting the initiating signal).
To "Reset" Containment Ventilation following an EMF 38, 39, 40 Trip II, the EMF must be reset, then the Containment Ventilation "Reset" Pushbuttons must be depressed.
The Containment Purge Supply and Exhaust valves are required to be locked closed in modes 1, 2, 3 and 4. For the Lower containment valves, two position (OPEN - CLOSED) key switches are provided to perform this function. In the closed position, power to the valve solenoid is blocked so that air cannot be admitted to open the valves. The A Train switch blocks the operation of valves VP7A, 9A, 15A, 17A and 19A. The B Train switch blocks the operation of valves VP6B, 8B, 16B, 18B and 20B. When the switch is in the open position the dampers are allowed to operate. The Upper Containment valves are administratively controlled. Supply and Exhaust AHU breakers

decreases and D-5 opens to maintain flowrate for the operating supply fan(s). An air monitor mounted in the supply duct to the Containment furnishes air flow rate (cfm) read-out on RB-CP-1 indicating the rate (cfm) air is being supplied to the Containment.

For the exhaust air VPMPS-6 on RB-CP-1 control dampers RBPE-D-4 and 5 in the exhaust duct system. When this control is rotated in the clockwise position the discharge damper, RBPE-D-4 closes. As D-4 closes, exhaust air flow rate from the Containment decreases and D-5 opens to maintain flowrate for the operating exhaust fan(s). An air monitor mounted in the exhaust duct from the Containment furnishes air flow rate (cfm) read-out on RB-CP-1 indicating the rate (cfm) air is being exhausted from the Containment.

At times during refueling with no core alterations or movement of irradiated fuel, when the equipment hatch is opened, the containment is kept at a slightly negative pressure to ensure no unfiltered release paths from containment exist.

To startup the Incore Instrument Purge System open the isolation valves on control board and depress the "START" pushbutton and monitor the flow meters to insure proper operation of the fans.

To operate the Auxiliary Carbon Filters depress the fans "ON" pushbutton and monitor the filter DP until Containment activity is reduced to acceptable levels.

3.2 Abnormal and Emergency Operation

Objective #4

This system is not safety related and will not operate during a LOCA/Blackout. The VP supply/exhaust fans will automatically stop and the containment isolation valves and supply and exhaust dampers will close in the event of a Containment Ventilation Isolation (S_H) signal:

These close on a S_H signal from either train:

- VP-1B, 2A, 3B, 4A (VP Supply Isolation Valves to Upper Containment)
- VP-6B, 7A, 8B, 9A (VP Supply Isolation Valves to Lower Containment)
- VP-10A, 11B, 12A, 13B (VP Exhaust Isolation Valves From Upper Containment
- VP-15A, 16B (VP Exhaust Isolation Valves From Lower Containment)
- VP-17A, 18B (Incore Instrument Room Purge Supply Isolation Valves)
- VP-19A, 20B (Incore Instrument Room Purge Exhaust Isolation Valves)
- Containment Purge Supply “Supply Damper”
- Containment Purge Exhaust “Exhaust Damper”
- Incore Instrument Room “Supply Damper”
- Incore Instrument Room “Exhaust Damper”

These will shutdown on a S_H signal from either train:

- VP Supply Fans A & B

Q25 References

Nomenclature: **2EMF 38 CONTAINMENT PART HI RAD**

Window: **A1**

Setpoint: Trip 2

Origin: 2EMF-38 Beta Scintillation Detector (low range)

Probable Cause: Radioactive spill/leak inside Containment

Automatic Action:

1. Initiation of Containment Ventilation isolation through the SSPS.
2. Containment Floor and Equipment Sump Pumps and Incore Instrument Room Sump Pump trip.
3. Automatic closing of:
   - 2VQ-1A (Cont Air Rel Inside Isol)
   - 2VQ-2B (Cont Air Rel Outside Isol)
   - 2VQ-6A (Cont Air Add Inside Isol)
   - 2VQ-5B (Cont Air Add Outside Isol)

Immediate Action:

1. **IF** VP in operation, ensure isolation of Containment Purge System (VP).
2. Ensure VQ valves are closed to prevent possible release.

Continued On Next Page

Unit 2

Q25 References

Supplementary Action:

1. Notify RP to perform trending for source term identification and leak location.

2. **IF** VP in operation, shutdown VP per OP/2/A/6450/015 (Containment Purge System). {PIR 2-C89-0128}

3. **WHEN** informed by RP that Containment purge **OR** air release is permissible, perform the following:

   A. Ensure "2EMF 38 CONTAINMENT PART HI RAD" alarm is clear.

   B. Reset Containment Ventilation isolation.

   C. Startup VP per OP/2/A/6450/015 (Containment Purge System) or VQ per OP/2/A/6450/017 (Containment Air Release and Addition System), if desired.

4. **IF** Trip 2 alarm is valid, perform an NCS leakage calculation per PT/2/A/4150/001 B (NC Leakage Calculation) to verify NC System unidentified leakage is less than 1 gpm.

5. **IF** 2EMF-38 is declared Inoperable, perform PT/2/A/4200/040 (Reactor Coolant Leakage Detection) as required.

References:

- MC-2499-MI7 (Instrument Detail)
- PIR 2-C89-0128
- HP/0/B/1003/008 (Determination of Radiation Monitor Setpoints (EMFs))

End of Response

Unit 2

SYS029 2.1.31 - Containment Purge System (CPS)

SYS029 GENERIC

Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup. (CFR: 41.10 / 45.12)

Given the following initial conditions on Unit 2:

- Unit is in Mode 6
- VP (CONTAINMENT PURGE SYSTEM) is in service and refueling is in progress

Subsequently:

- A Trip 2 alarm on 2EMF-38(L) (CONTAINMENT PARTICULATE) is received

Based on the conditions above,

1) the VP Supply and Exhaust ________.

2) to regain control of VP components, 2EMF-38 must be reset and the Containment Ventilation (S_H) Reset push button located on ________ must be depressed.

Which ONE (1) of the following completes the statements above?

A. 1. fans will be "OFF" ONLY
   2. 2MC-11

B. 1. fans will be "OFF" ONLY
   2. Unit 2 HVAC panel

C. 1. fans will be "OFF" AND dampers will be CLOSED
   2. 2MC-11

D. 1. fans will be "OFF" AND dampers will be CLOSED
   2. Unit 2 HVAC panel

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ILT-32 MNS SRO Audit Examinatio QUESTION 35 35 **C**

General Discussion

These will shutdown on a SH signal from either train:
-VP Supply Fans A & B
-VP Exhaust Fans A & B
-Incore Instrument Room Fans

These close on a SH signal from either train:
-Containment Purge Supply Supply Damper
-Containment Purge Exhaust Exhaust Damper

To "Reset" Containment Ventilation following an EMF 38, 39, 40 Trip II, the EMF must be reset, then the Containment Ventilation "Reset" Pushbuttons must be depressed.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible since other ventilation streams, such as VA (Aux bldg ventilation), have EMF compensatory actions where only the supply and exhaust fans will trip on a Trip 2 condition.

Second part is correct and therefore plausible.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible since other ventilation streams, such as VA (Aux bldg ventilation), have EMF compensatory actions where only the supply and exhaust fans will trip on a Trip 2 condition.

Second part is plausible since all other ventilation system resets (VE, VX, etc.) are located on the respective unit's HVAC panel. Also, all VP components are manipulated from the respective unit's HVAC panel.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct and therefore plausible.

Second part is plausible since all other ventilation system resets (VE, VX, etc.) are located on the respective unit's HVAC panel. Also, all VP components are manipulated from the respective unit's HVAC panel.

Basis for meeting the K

The K/A is matched because the applicant must be able to locate the containment ventilation reset pushbutton and also be able to determine the position of containment purge system components following a containment ventilation isolation signal (EMF Trip2).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

REFERENCES:
Lesson Plan OP-MC-CNT-VP (Containment Purge System) Section 2.2 (Containment Purge Exhaust) and Section 3.1 (Normal Operation)

Student References Provided

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ILT-32 MNS SRO Audit Examinatio QUESTION 35 35 **C**

Sim Guide OP-MC-SF-C16 (Engineered Safeguards)

LEARNING OBJECTIVES:
OP-MC-CNT-VP Objective 4

SYS029 2.1.31 - Containment Purge System (CPS)
SYS029 GENERIC
Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup. (CFR: 41.10 / 45.12)

401-9 Comments:	Remarks/Status

Q26 References

2.6 Valves

Objective # 8

2.6.1 Blackout and Safety Injection Signals

Operator Fundamental Focus; Knowledge, Monitoring and Control
*While discussing the information presented below, **reinforce** the importance of operators **understanding** how the RN system will respond to BO or SI signals, where the indicators are to **monitor** for the expected response and the **controls** available to them (in Unit 1 and/or 2) to take manual control if automatic actions do not occur.*

The following is a listing of the various RN valves and how they respond to Safety Injection and/or Blackout signal(s). Valves which are shared between the units (0RN) can be powered and controlled from either unit. **(refer to Drawing 7.5)**

AUTO OPEN/CLOSE signals are train related (only the valves on the train with the Safety Injection and/or Blackout receive a signal to align).

The following valves receive auto close signals upon receipt of either Unit 1 or 2 blackout or safety injection:

- 0RN-2B (Train 1A & 2A RC Supply)
- 0RN-3A (Train 1A & 2A RC Supply)
- 0RN-7A (Train 1A & 2A SNSWP Supply)
- 0RN-149A (Train 1A & 2A Disch to SNSWP)
- 0RN-11B (Train 1B & 2B LLI Supply)
- 1RN-41B (Train 1B to Non-Ess Hdr Isol) Controlled only from Unit 1
- 1RN-43A (Train 1B to Non-Ess Hdr Isol) Controlled only from Unit 1
- 2RN-41B (Train 2B to Non-Ess Hdr Isol) Controlled only from Unit 2
- 2RN-43A (Train 2B to Non-Ess Hdr Isol) Controlled only from Unit 2
- 0RN-284B (Train 1B & 2B Disch to RC)

The following valves receive auto open signals upon receipt of either Unit 1 or Unit 2 blackout or safety injection:

- 0RN-9B (Train 1B & 2B SNSWP Supply)
- 0RN-152B (Train 1B & 2B Disch to SNSWP)
- 0RN-12AC (Train 1A & 2A LLI Supply)
- 0RN-13A (Train 1A & 2A LLI Supply)

The B train signal is not received since the blackout was on 2ETA

The following valves automatically close on an S_P (Phase "B") signal on respective unit.

- RN-40A (Train A to Non-Ess Hdr Isol)
- RN-252B (RB Non-ESS Supply Outside Isol)
- RN-253A (RB Non-ESS Supply Inside Isol)
- RN-276A (RB Non-ESS Return Inside Isol)
- RN-277B (RB Non-ESS Return Outside Isol)

The valves with the 0RN designator are located in the RN flowpath for both units. The pushbutton controls for these valves are located on both unit's main control board and can be operated from either unit. The valve motors for the Train "A" valves are powered from 1EMXH and the Train "B" valves from 2EMXH. Each unit has a separate power source for the control power for these valves which includes the valve position indicating lights on the control board pushbuttons. The Unit #1 control power for the Train "A" valves is EKA-2 and the Train "B" control power is from EKB-2. The Unit #2 control power for the Train "A" valves is from EKA-5 and the Train "B" is from EKB-5. If EKA were deenergized, all of the Train "A" valves with the 0RN designator could not be operated from either unit's control board and their associated pushbutton position indicating lights would also be out. If only EKA -2 breaker were to open, all the 0RN designated Train "A" valves could not be operated from the Unit #1 control board nor would the valve position indicating lights be lit. However, the Unit #2 control and indications for these valves would be fully functional. If only EKA-5 were to open, the situation would be reversed. The same logic would also apply for the 0RN designated Train "B" valves and EKB-2 and EKB-5.

The NV and NI pump cooling valves open on a S_S signal or anytime its associated pump starts.

Objective # 12

RN-42A (AB Non Ess Supply Isol) will close automatically on a S_S signal on respective unit, and a timing relay is energized to trip the PD pump 16 seconds following closure of valve. Tripping the PD pump protects the pump from running without cooling flow.

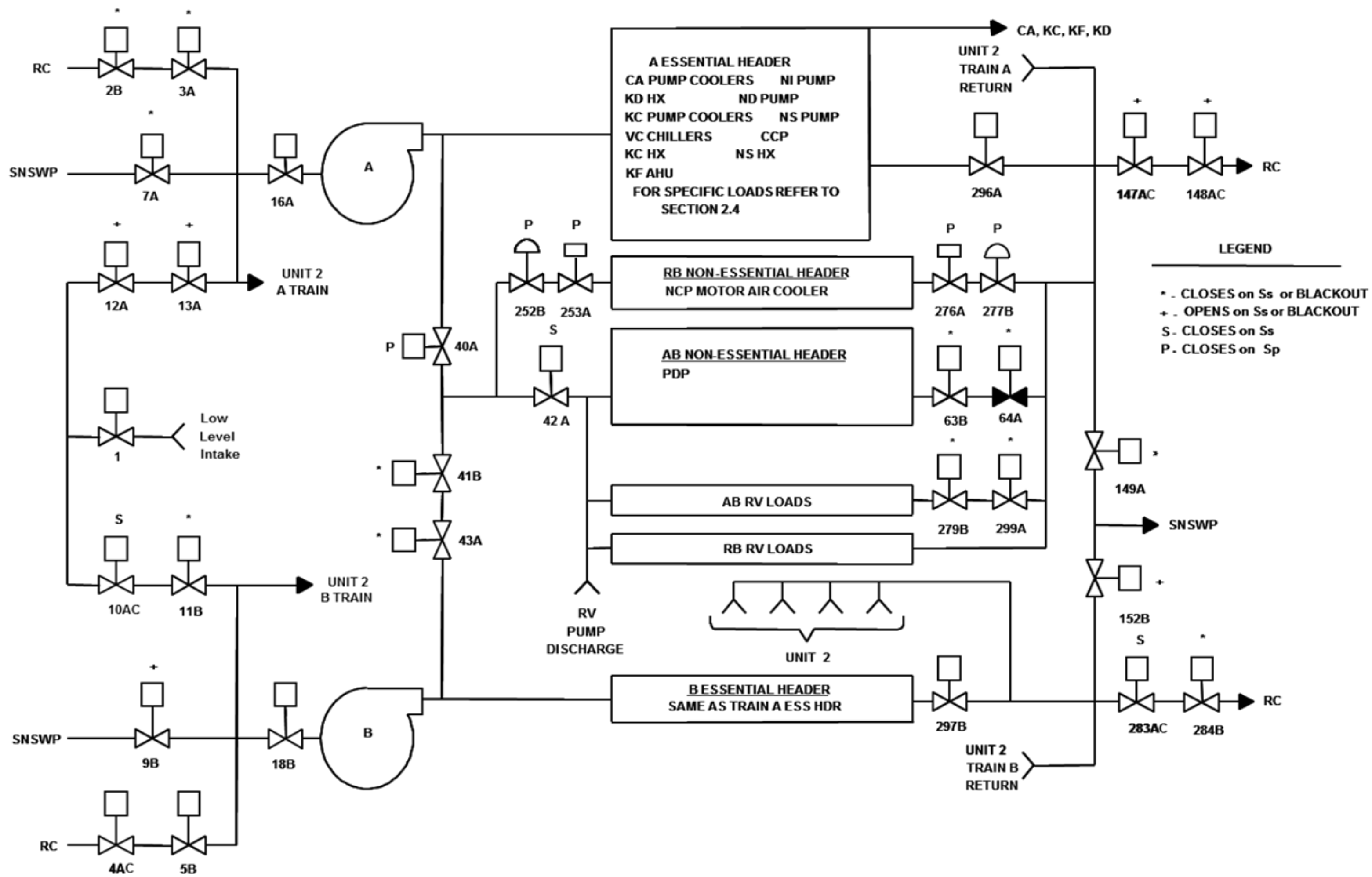
The ND, NS and KF essential safeguards (ES) AHU's cooling valves will automatically open on a S_S signal, Blackout or when the associated ES pump starts.

The Aux Feedwater Supply Valves RN69 and RN162 will automatically open on low "CA" pump suction pressure as follows:

- Unit 1A Train valves open on 7.0# for 3.5 sec + .5 sec.
- Unit 1B Train valves open on 7.0# for 3.5 sec + .5 sec.
- Unit 2A Train valves open on 8.0# for 3.5 sec + .5 sec.

Q26 References

7.7 RN System Simplified Diagram (10/6/15)



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EXAM BANK QUESTION: 4981 MNS

D

Given the following on Unit 1:

Initial Conditions:

- The Unit is at 100% power
- Both trains of KC and RN are in service

Subsequently:

- 1A RN pump TRIPS
- A B/O occurs on 2ETA

Based on the conditions above,: (Assuming no operator actions)

1) does 1A KC HX have RN cooling water flow?

2) does the 1B RN suction automatically swap to the Pond?

A. 1. Yes
2. Yes

B. 1. Yes
2. No

C. 1. No
2. Yes

D. 1. No
2. No

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EXAM BANK QUESTION: 4981 MNS

D

General Discussion

In the stem, the applicant is presented with a situation where both trains of RN and KC were placed in service on U-1. The 1A RN pump has tripped but initially the 1B RN will provide cooling to both trains of KC via normally open RN train cross connect valves. A B/O then occurs on U-2 ETA. This would result in the A Train of RN on both units aligning to LLI (normally aligned there so no change) and the B Train of RN on both units would be unaffected because the signal to realign is train related (NO B/O on B train). The signal would also result in train separation on both units (1 and 2 RN-41B would close) resulting in a loss of cooling to the 1A KC HX because the 1A RN pump is unavailable.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if the applicant fails to remember that the U-2 signal affects train separation on both Units and thus 1B RN would be supplying cooling water to the 1A KC HX (1,2 RN-41A will close).

The second part is plausible if the applicant assumes that any B/O signal on either unit will realign suction and discharge flowpaths. This is a valid assumption for other plant systems. However, the signal to realign RN is train related (NO B/O on B train).

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if the applicant fails to remember that the U-2 signal affects train separation on both Units and thus 1B RN would be supplying cooling water to the 1A KC HX (1,2 RN-41A will close).

The second part is correct and therefore plausible.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct and therefore plausible.

The second part is plausible if the applicant assumes that any B/O signal on either unit will realign suction and discharge flowpaths. This is a valid assumption for other plant systems. However, the signal to realign RN is train related (NO B/O on B train)..

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant must demonstrate knowledge of the effect on the 1A KC HX of an infrequent alignment, loss of 1A RN pump and the introduction of a B/O signal on the opposite unit. Which results in a loss of RN cooling to the 1A KC HX.

Basis for Hi Cog

The question is Hi cog because the applicant must analyze the initial conditions, evaluate their effect on the KC and RN systems and predict an outcome.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT31 MNS Audit Examination

Development References

References:
FR-S.1 (RESPONSE TO NUCLEAR GENERATION/ATWS)

Learning Objectives:
EPFRS003

Student References Provided

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EXAM BANK QUESTION: 4981 MNS D

KA	KA_desc
SYS076 K3.01	Knowledge of the effect that a loss or malfunction of the SWS will have on the following: (CFR: 41.7 / 45.6)Closed cooling water ....

KA	KA_desc
APE062 AK3.04	Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: (CFR 41.4, 41.8 / 45.7)Effect on the nuclear service water discharge flow header of a loss of CCW

> ***Operator Fundamental Focus; Knowledge***
>
> *Understand system and component purposes and design.*
>
> ***Discuss*** *the following: VG to VI solenoid isolation valves (VG-93 and VG-94) automatically open if certain interlocks are met; however, this flow path is normally isolated by manual valves due to the VI piping downstream not being seismically qualified.*
>
> ***Emphasize*** *that AP-22 (Loss of VI) provides guidance on how and when to align VG to VI, but this will only be performed as directed by the TSC. Additionally, an operator* ***must*** *remain in the DG room when VG is aligned to VI to ensure that DG starting air pressure remains above 220#.*

Objective # 7

The Starting Air System can be used as a backup air supply to the Auxiliary Building Instrument Air System. A solenoid valve (VG-93 or 94) is used to allow air flow from the Starting Air System to the Instrument Air System if, the diesel speed is ≥ 95%, a valid Blackout signal is present and a Safety Injection Signal is not present. VG-95 & 96 or VG-97 & 98, which must be manually unlocked and opened to tie to VI, normally isolate the solenoid valves.

These VG to VI Auxiliary Building Air Tank isolation valves will automatically open after a 30 second time delay when the three conditions mentioned below are met:

1. Blackout
2. No Safety Injection
3. D/G speed > 95%

Once the solenoid valves have automatically opened, air can be supplied to the Auxiliary Building Blackout Air Receiver Tanks. If a safety injection actuation occurs, the solenoids will not open or will close if already open. This is because valves, which receive a safety injection signal, fail to a safe position. On a subsequent diesel shutdown, these solenoid valves automatically close. There are manually operated locked closed valves used to isolate this header from the VI header. This is because the piping downstream of the solenoids is not seismically qualified and could fail during a seismic event in conjunction with an emergency. Operators are sent to locally open these valves and remain with the valves until no longer needed.

The "LOSS OF VI" Abnormal Procedure (AP/1or2/A/5500/22) directs the operator to open the manual valves used to isolate the VG to VI solenoids when VG is required to supply the VI header. This will aid the operator in shutting down the plant during a unit Blackout where the Station Instrument Air Compressors are lost.

The Loss of VI Abnormal Procedure provides two situations when an operator is dispatched to the Diesel Room to open the VG to VI solenoid isolation valves.

If a valid blackout exists with no safety injection and the Diesel Generator has automatically started and loaded, then if there is a desire to supply the VI header using the VG system, an AO will be sent to the Diesel Room to unlock and open these manual valves. This AO is required to remain in the diesel room standing by in the event these manual valves need to

Should a Safety Injection signal occur at any time after the first time delay relay completes its cycle, the circuit will automatically initiate separation from the offsite power source and transfer to the emergency diesel generators.

Protection for a severe diesel-generator overload accompanied by a system voltage dip caused by events such as a Loss of Off-Site Power (LOOP) with the Diesel Generator operating in parallel with the grid is provided by the voltage-controlled overcurrent relay (51V). This relay consists of three single phase relays (51VX, 51VY, and 51VZ). The operation of any one of these phase relays will activate an annunciator alarm in the control room (AD-11, A-4 (D-4), D/G A (B) Overcurrent) to warn the operator of an overload condition (800 amps @ 3360 volts). Operation of any two of these overcurrent relays will result in operation of the diesel-generator lockout relay (86D). Diesel-generator lockout relay (86D) will trip and lockout the diesel-generator switchgear breaker and initiate a shutdown of the diesel-generator. This lockout must be reset by hand before the breaker can be reclosed.

3.3 Sequencer operation during a Blackout

Objective # 5

Sequencer operation during a Blackout with no safety injection signal and the under-voltage is not due to fault relay 86N, 86S or 86B.

If 2/3 LOV Relays sense a loss of voltage on their associated 4160V bus, the blackout relay will pick up and actuate a D/G start. If the UV condition still exists after 8.5 seconds, the blackout logic is sealed in. All 4160V breakers on the bus are then tripped open. When D/G speed is ≥ 95%, the output breaker will close. When bus voltage is ≥ 92.5% and D/G speed is ≥ 97%, the accelerated sequence is enabled. Blackout loads will be sequentially applied at intervals of approximately 2 seconds, as long as bus voltage remains ≥ 92.5% and frequency remains > 58.2 Hz. Complete loading of all blackout loads, via the accelerated sequence, could be done in as little as 25 seconds. If during the sequencing of blackout loads the Sequencer RESET pushbuttons are depressed, no additional sequencing will occur. This is because once the RESET pushbuttons are depressed, the blackout signal is removed and since there is power on the 4160V bus a blackout no longer exists. It would require another blackout signal or manual loading of the bus to complete the sequencing of loads.

Should the Accelerated Sequence Relay scheme fail to work, the Committed Sequence would be actuated approximately 10 seconds after the diesel receives its blackout start signal if load shed of the bus has been completed. The committed sequence may take up to 12 minutes to load all blackout loads. The committed sequence does not require any minimum voltage or minimum frequency to allow it to progress as does the Accelerated Sequence. The Committed Sequence is required by Technical Specifications.

NOTE 1 **In order for the accelerated sequence to begin or continue, the 127AX Special Relay must indicate >92.5% voltage. If voltage falls below this level, the accelerated sequence will stop until voltage is again above the setpoint.**

A Red “INTERLOCK DEFEATED” light is provided for Pushbutton Station “C” to indicate the Auxiliary Building Side door Open interlocks are bypassed.

2.5.2 Personnel Air Lock Doors Mode Switch

This two position switch, located on 1MC-7, selects the alarm mode for both sets of PAL doors. In the Normal Mode, an alarm is received if any PAL door is Opened. The Alarm received will identify which door is actually Open. In the Bypass Mode, the alarm is received if both doors in a particular Air Lock are open simultaneously. The alarms will identify which set of PAL doors are open (upper or lower).

2.5.3 System Alarms

Alarm Panel AD-10

- Upper Cont Air Lock Aux Door Open (limit switch NOT closed or low pressure to either seal, < 60 psig)
- Upper Cont Airlock Rx Door Open
- Lower Cont Airlock Aux Door Open
- Lower Cont Airlock Rx Door Open

Alarm Panel AD-13

- VE Door Open (longer than two (2) minutes)

Local Annunciators

Re-flash Modules are located in a control panel in the Auxiliary Building. Readout of alarms is indicated by LED display on each re-flash module.

2.6 Interlocks

The Air Lock is designed such that under normal operation conditions, it will not be possible to have both doors unsealed at the same time unless the electrical interlock is defeated. As soon as any single door is actuated to open electrically, the interlocking system is actuated and the opposite door cannot be opened until both doors are closed and latched with seals inflated.

The Seals are interlocked such that they will not inflate until the associated door is Closed and latched.

2.6.1 Interlock Bypass

Objective # 5

The interlock bypass switch bypasses 3 relays: the seals pressure switches, the latch pin position and the door positioner circuit. The Bypass is provided for emergency entrance / exit of containment or infrequent operating modes (outages) requiring both inner and outer doors to be Open at the same time. Interlocks from Door 1 into the Door 2 circuit and from Door 2 into Door 1 circuit can be bypassed from the Pushbutton Station C (Door 2) or Pushbutton Station B (Door 1). The bypasses are made by a selector switch at the appropriate

3.9 REFUELING OPERATIONS

3.9.4 Containment Penetrations

LCO 3.9.4 The containment penetrations shall be in the following status:

a. The equipment hatch closed and held in place by a minimum of four bolts;

b. A minimum of one door in each air lock closed; and

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere either:

1. closed by a manual or automatic isolation valve, blind flange, or equivalent, or

2. exhausting through an OPERABLE Containment Purge Exhaust System HEPA filter and charcoal adsorber.

APPLICABILITY: During movement of recently irradiated fuel assemblies within containment.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more containment penetrations not in required status.	A.1 Suspend movement of recently irradiated fuel assemblies within containment.	Immediately

2.11 Interlock Blocks of Rod Withdrawal

Objective # 10

INTERLOCK	LOGIC	SETPOINT	ROD BLOCK
C1, Intermediate Range Rod Stop	1/2 Intermediate Range Channels	> 20% Power	AUTO & MANUAL
C2, Overpower Rod Stop	1/4 Power Range Channels	> 103%	AUTO & MANUAL
C3, OTΔT Rod Stop	2/4 OTΔT channels	2% below OTΔT Rx TRIP Setpoint	AUTO & MANUAL
C4, OPΔT Rod Stop	2/4 OPΔT channels	2% below OPΔT Rx TRIP Setpoint	AUTO & MANUAL
C5, Low Turbine Inlet Pressure Auto Rod Stop	Channel 1 Turbine Inlet Pressure	< 15%	AUTO ONLY
C11, Control Bank "D" Auto Rod Stop	Control Bank "D" Demand Position	> 200 steps	AUTO ONLY
Tavg/Tref Failure Rod Stop (DCS)	Manual Reject on 2/4 Median Selectors (Tavg) Manual Reject on 2/3 Median Selectors (Tref)		AUTO (NO auto rod movement - Withdrawal or Insertion)

Reactivity Management Focus:
One of the Licensed Operators responsibilities is:

Ensure all control rod movements are made in a deliberate, carefully controlled manner while constantly monitoring nuclear instrumentation and redundant indications of reactor power and neutron flux.

3.0 SYSTEM OPERATION

3.1 Normal Operation

Objective # 13

3.1.1 OP/1/A/6100/003, Controlling Procedure for Unit Operation Limits and Precautions

- When transferring CRD Select from "MANUAL" to "AUTO", T_{AVG} maximum deviation from T_{REF} is ±1°F.

  Basis: This will prevent a temperature related transient from occurring following the transfer.

- **<u>WHEN</u>** Turbine Generator paralleled to grid with Steam Dumps closed **<u>AND</u>** CRD Select in "MANUAL" , maximum Tavg deviation from Tref is ±2°F .

  Basis: The UFSAR Accident Analysis assumes a maximum deviation of <u>+</u> 4°F. This represents the actual maximum expected Tavg deviation from Tref, including measurement uncertainties and controller dead band. In general, for power operation with CRDs in MANUAL, the Tavg / Tref deviation should be <u>+</u> 2°F to be bounded by the UFSAR safety analyses. The "T-REF/TAVG Abnormal" annunciator comes in at <u>+</u> 3°F.

  - **<u>WHEN</u>** Turbine Generator **<u>NOT</u>** paralleled to grid **<u>AND</u>** CRD Select in "MANUAL" maximum Tavg deviation from Tref is ±2°F. {NCR 01684380} (Use Enclosure 4.14 "Reactor Power/Expected Tavg" to determine expected Tavg)

  Basis: Same as above.

3.1.2 OP/1/A/6150/008, ROD CONTROL (These L&P's apply to this lesson plan)

- If less than 15 percent Turbine power, **<u>THEN</u>** do **<u>NOT</u>** use automatic rod control.

  Basis: Automatic control rod withdrawal is blocked when turbine load is below the setpoint for control interlock circuit C-5.

- When control rods are being moved, observe the demand position and actual (digital) position to verify proper operation of the rod control system.

  Basis: This is done to ensure proper rod alignment. Bank demand position only tells us where the rods should be while digital rod position tells us where the rods are. Additionally, Tech Spec 3.1.4 (Rod Group Alignment Limits) requires that all rod indications are within 12 steps of the step counter demand position.

- When pushing or pulling rods, hold the "Rod Control" lever "IN" or "OUT" until rod(s) are in the desired position. After releasing the "Rod Control" lever, waiting at least 2 seconds prior to attempting to move rods again limits the possibility of inadvertently dropping a rod.

  Basis: Self-explanatory

3.1.3 Load Transients

Objective # 11

3.1.3.1 Increase Load Transient (Automatic/Slow)

- Turbine load increases, inlet pressure increases

- T_{REF} increases ($T_{REF} > T_{AVG}$)
- Temperature mismatch signal increases (negative TMM)
- Combined error signal causes rods to move out
- Combined error signal decreases to zero as T_{AVG} increases to T_{REF}
- Rods stop outward motion when T_{AVG} is within 1 °F of T_{REF}

3.1.3.2 Decrease Load Transient (Automatic/Slow)

- As load decreases, Inlet pressure decreases
- T_{REF} decreases ($T_{REF} < T_{AVG}$)
- Temperature mismatch signal increases (positive TMM)
- Combined error signal causes rods to move in
- Combined error signal decreases to zero as T_{AVG} decreases to T_{REF}
- Rods stop inward motion when T_{AVG} within 1 °F of T_{REF}

3.1.3.3 Fast Load Change Transient (Automatic)

- Power mismatch circuit senses rate of change between Turbine Inlet pressure and Nuclear Power (Median Selected 2nd Highest)
- Derivative circuit provides output signal proportional to <u>rate of change of input</u>
- Non-linear gain and Variable gain units amplify signal depending on power level and rate of Power Mismatch
- Power Mismatch modifies the combined error signal to move rods in proper direction
  - Increases rod movement response
  - Dominant part of combined error signal during the rate of change of power mismatch signal
  - Eventually the PMM may buck the TMM slowing rod movement thereby minimizing overshoot.

NOTE: The Power Mismatch circuit acts initially to start moving rods during a turbine runback transient. The Temperature Mismatch signal will eventually combine with the Power Mismatch to maintain rod movement until T_{AVG} is again equal to T_{REF}.

3.2 Abnormal and Emergency Operation

Objective # 12

3.2.1 Instrument Failures (<u>Refer to Drawing 7.11</u>)

Selected values of a parameter with multiple instrument inputs are determined using a process termed "MEDIAN SELECT". The Median Select algorithm uses

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EXAM BANK QUESTION: 6655 CNS A

Given the following:

- Unit 1 is at 50% RTP
- Control Rod Bank Select Switch is in “Auto”
- Control Bank “D” is at 195 steps withdrawn

Subsequently:

- STIP-1 (Selected Turbine Impulse Pressure Input to Reactor Control System) fails to the 100% value

Assuming no operator action, Control Bank “D” will __________ .

A. withdraw 5 steps

B. withdraw 36 steps

C. remain at 195 steps

D. withdraw until Reactor Power reaches 103%

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EXAM BANK QUESTION: 6655 CNS

A

General Discussion

With Control Rods in Automatic, the failure of Selected Impulse Pressure 1 (which determines the Tref setpoint) will result in a negative temperature error signal. This signal will cause control rods to withdraw. Once Control Bank "D" reaches 200 steps, all automatic rod motion will be stopped by Rod Stop Relay C-11.

Answer A Discussion

CORRECT. See explanation above.

Answer B Discussion

Plausible if the applicant is not aware of the C-11 Rod Stop Relay.

Answer C Discussion

Plausible if the applicant is unaware that Selected Turbine Impulse Pressure 1 inputs Reactor Control.

Answer D Discussion

Plausible if the applicant is unaware of the C-11 Rod Stop Relay.

Basis for meeting the KA

The applicant is required to predict and monitor (through knowledge of an interlock) changes associated with the Control Rod Drive System when T-ref input parameters are modified.

Basis for Hi Cog

The applicant must perform a calculation in order to arrive at the correct answer.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT15 CNS NRC Examination

Development References

OP-CN-IC-IRE (Rod Control System Lesson Plan), Rev. 102, Section 15
OP-CN-IC-IRX (Reactor Control System Lesson Plan), Rev. 101, Section 2.4

Student References Provided

KA	KA_desc
SYS001 A1.02	Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CRDS controls including: (CFR: 41.5/45.5)T-ref ....

To ensure DNBR is maintained above specified limits, Technical Specifications places limits on DNBR and the reactor coolant system parameters that directly affect CHF: temperature, pressure, flow rate and reactor power level. By controlling these parameters within strict limits the numerator of Equation 1 is maintained above a design base value and the value of DNBR can be maintained above the prescribed limit as long as the actual heat flux is also limited.

Objective 7E

Technical Specifications also provide operating limits for power distribution within the core, which limits the maximum actual heat flux at any point within the core. Pertinent to the prevention of DNB are the limits placed on axial flux distribution (AFD). Earlier it was stated that as power level increases, AHF increases and CHF decreases, both of which cause DNBR to decrease. The decreases in CHF and DNBR are due to a couple of effects. First, as just stated, the actual heat flux increases as power increases, the denominator of the DNBR equation. Along with the increase in actual heat flux the coolant temperature rise (core ΔT) increases. As the coolant temperature increases, CHF decreases which causes the DNBR to decrease.

DNBR is also affected by high **local** power densities. While the reactor core is designed with conservative values for power peaking, the bases for those conservative values must be based on some assumptions. One assumption is that AFD will be maintained within specified limits. By limiting power production in the upper portion of the core where the bulk coolant is hotter, the probability of DNB occurring in the upper regions of the core is also limited. AFD has both positive and negative limits to limit peak power in the core and to limit power in the upper portion of the core, where actual heat flux is closer to CHF due to the rise in coolant temperature as it passes through the coolant channel. As a rule, as AFD becomes more positive, DNBR will decrease.

NOTE:

The above statement that DNBR decreases as AFD becomes more positive applies when there is NO CONTROL ROD MOVEMENT. When power is maintained constant and control rods are moved out of the core, AFD become more positive as additional power is produced in the top of the core while power production in the lower portion of the core decreases. However, the effective power producing volume of the core is increasing which means the average linear power density is decreasing. In this case DNBR may actually increase or remain the same.

The following table summarizes how CHF, AHF and DNBR change as key plant parameters change:

Parameter Change	Effect of change on		
	CHF	**AHF**	**DNBR**
RCS Temperature Increase	decreases	no effect *	decreases
RCS Pressure Decrease	decreases	no effect	decreases
RCS Flow Rate Decrease	decreases	no effect	decreases
Reactor Power Increase	decreases	increases	decreases
AFD becomes more positive (no control rod motion)	no effect	increases power in top of core	decreases

***** With constant power, AHF does not change with temperature. AHF does vary within the core due to core ΔT and the effects of redistribution.

Table 2

D

Given the following Unit 1 conditions:

- The Unit is operating at 40% power.
- NCP 1C trips on overcurrent.

Assuming no operator action, which ONE of the following describes the effect on the Departure from Nucleate Boiling Ratio (DNBR) AND reactor thermal power?

A. DNBR will INCREASE.
Reactor power decreases and stabilizes at a new lower thermal power.

B. DNBR will DECREASE.
Reactor power decreases and stabilizes at a new lower thermal power.

C. DNBR will INCREASE.
Reactor power initially decreases and then returns to 40% thermal power.

D. DNBR will DECREASE.
Reactor power initially decreases and then returns to 40% thermal power.

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EXAM BANK QUESTION: 7327 CNS

D

General Discussion

The decrease in reactor coolant flow with reactor power, temperature (core delta-T), and pressure remaining the same causes a decrease in DNBR. In this case Actual Heat Flux (AHF) remains the same while the Critical Heat Flux (CHF) (amount of heat required to cause a departure from nucleate boiling) will decrease. Therefore DNBR (CHF/AHF) decreases. Since steam demand has not changed core thermal power (Q=mcpdelta-T) must remain the same steady-state to steady-state. However, reactor power initially decreases due to the immediate effect of the loss of flow (mass flow rate decreases) while core delta-T initially has not changed. After the initial decrease in reactor thermal power, the colder water returning to the reactor causes an increase in reactor power, core delta-T increases, and core thermal power returns to 40% thermal power based on steam demand. The increase in core delta-T results in the water at the core exit being closer to vaporization, and therefore CHF decreases causing an additional decrease in DNBR. The conclusion is that DNBR decreases and reactor power initially decrease and then return to 40% thermal power.

Answer A Discussion

Incorrect. The first part is plausible since the likelihood of an actual departure from nucleate boiling has increased. The second part is plausible if the student neglects to consider the long-term effect of the NC pump trip. Reactor power initially decreases due to the decrease in flow. However, power does not stabilize at the new lower power, but returns to 40% thermal power since steam demand has remained constant.

Answer B Discussion

Incorrect. The second part is plausible if the student neglects to consider the long-term effect of the NC pump trip. Reactor power initially decreases due to the decrease in flow. However, power does not stabilize at the new lower power but returns to 40% thermal power since steam demand has remained constant.

Answer C Discussion

Incorrect. The first part is plausible since the likelihood of an actual departure from nucleate boiling has increased.

Answer D Discussion

Basis for meeting the KA

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2012 CNS Audit CNS Audit Examination

Development References

Student References Provided

KA	KA_desc
SYS003 K3.01	Knowledge of the effect that a loss or malfunction of the RCPS will have on the following: (CFR: 41.7 / 45.6)RCS ....

- HIGHMON for High Pressure Deviation Control (Annunciator Only).
- Graphic on the DCS display.

These components are controlled by the master controller based strictly upon the error signal between actual pressure and setpoint. They are not directly affected by Pressurizer Pressure and may actuate at pressures well above or below what one might expect. For example, one may expect the PORV's (NC-32B, NC-34A, and NC-36B) to open at 2335 psig. Indeed, NC-32B and NC-36B will open at that pressure since they are controlled directly from Pressurizer Pressure Instruments via DCS, and are "hard" set at 100 psig above the nominal operating pressure of 2235 psig. However, NC-34A, which is controlled by the Pressurizer Pressure Master controller, will open whenever a pressure error signal of 100 psig is generated. If the setpoint for the Pressurizer Pressure Master controller is 2200 psig, NC-34A would open 2300 psig but recall that the integral and proportional features of the Pressurizer Pressure Master controller will boost any error signal, and NC-34 may actually open even before 2300 psig is reached. The lift setpoint for NC-32B and NC-36B will be unaffected by changes in the setpoint or output of the Pressurizer Pressure Master controller. Refer to Drawing 7.7, Pressure Master Controller Output vs Function.

2.3.3 Controller Operation

Objective #7

Automatic operation of the controller is as described above. With actual pressure equal to the reference setpoint, this controller is setup to have a 0 psig (Error) output, if no integral function has built in. As actual pressure goes high, the controller output will go up, and this will cause the control system to try to decrease pressure. So it follows that, in manual, depressing the raise pushbutton will cause pressure to go down, and vice versa.

Objective #6

In automatic, the controller output will vary if the setpoint setting is changed. Assume the setpoint is 2235 psig with actual pressurizer pressure at 2235 psig, the controller output would be 0 psig ERROR. If under these conditions the setpoint was changed to 2155 psig , then it would try to control at 2155, and the controller would see actual pressure as 80 psig too high, with a corresponding controller output of 80 psig ERROR, calling for sprays to be full open. Eventually, the pressure master controller would be controlling pressure at 2155 psig, with a controller output back at approximately 0 psig ERROR.

2.4 "C" Heater Group

"C" Heater Group is made up of 7 heater banks. The heater banks have variable power control. The capacity of the "C" Heaters totals 484 KW. There are two power sources available for the "C" Heaters, LXF (normal) and LXC (Alt.). The breakers are Kirk Key interlocked so that only one can supply at a time. The supply breaker auto trips on Low PZR Level <17% and also if charging flow lowers to <20 gpm for >20 seconds, to prevent heater damage if uncovered (due to the poor heat conduction into non-liquid surroundings). When level recovers to >17% or 15 seconds after the heaters are de-

energized due to low charging flow and PZR level is >17%, the supply breaker must be manually reclosed, using the MCB OPEN/CLOSED control switch for the supply breaker on MC10. With the supply breaker closed, the heaters might not be energized, unless the SCR power controller is turned on by the pressure control system.

Objective #4

"C" Heater Group control is always in Automatic. The SCR controller is controlled by the Pressure Master Controller. The length of time the "C" Heater group is energized is ramped linearly from 0% to 100% as the Pressure Master Controller output goes from -15 psig (Error) to +15psig (Error), regardless of system pressure. In the rare instance of starting from 0 psig (Error) output (2235 psig) steady state conditions (with no integral function built in), and having a rapid step decrease in pressure with no time for integral to build in, then when the controller got to -15 psig (Error), this would be equivalent to a system pressure of 2220 psig. The same would be true for a transient in the other direction for +15 psig (Error) and 2250 psig. There is only either 484 KW or 0 KW going to the "C" Heaters, with power being controlled by the percentage of time 484 KW is going to the heaters. With "C" Heaters 10% on, 10% of the time 484 KW is going to the heaters, and 90% of the time 0 KW is going to the heaters. There is a red indicating light on the MCB that lights during the time 484 KW is being sent to the heater. On the "NC-Pressurizer and PRT" DCS graphic, the "C" Group Heater amps will vary as the heater are energized and deenergized.

2.5 Backup Heaters

Refer to Drawing 7.8, Backup Heater Control. There are three Groups of backup heaters (A, B, & D). Groups A & B have 6 Banks each. Total worth for each Group is 416 KW. Group D has 7 Banks. Total worth is 484 KW. Groups A & B have safety related power supplies (ELXA & ELXB) and are required by Tech Specs. Group D has non-safety power supply (6 Banks from LXG, 1 Bank from SMXG at the SSF). All three Groups' supply breakers trip if PZR level <17% and also if charging flow lowers to <20 gpm for >20 seconds. When level recovers to >17% , the supply breakers can be manually reclosed. Likewise 15 seconds after the heaters are de-energized due to low charging flow and PZR level is >17% the supply breakers can be manually reclosed. Unlike the 'C' Group with its' supply breaker control on MCB 1MC10, the backup heaters have a different arrangement. The backup heater supply breaker controls are on the back vertical MCB MC-5. On the front MCB MC-10, they have ON/OFF control that controls the "M" contacts in the supply breaker to actually energize/de-energize the heater Groups. Groups A & B trip on a Blackout or S_S. This function is Train Related (A HTR Group trips on A Train Blackout or S_S signal, B HTR Group trips on B Train Blackout or S_S).On a Blackout, they can be manually reclosed after the associated load group is back on the buss. On a S_S, the sequencer must be reset before they can be manually (requires the Train related S_S to be reset) reclosed as they are not S_S loads.

The combined total capacity of all heaters is 1800 KW.

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EXAM BANK QUESTION: 5940 MNS **C**

Given the following conditions on Unit 1:

- A Loss of Offsite Power has occurred
- 1ETA and 1ETB are energized from their respective DGs

Based on the conditions above, power can be restored to Pressurizer Heater Group(s) ________.

Which ONE (1) of the following completes the statement above?

A. D ONLY

B. C ONLY

C. A and B ONLY

D. C and D ONLY

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EXAM BANK QUESTION: 5940 MNS **C**

General Discussion

Due to the Blackout and the ETA busses being energized from their respective DGs, Pressurizer heater groups A & B are the only groups that have power available. Groups A & B have safety related power supplies (ELXA & ELXB) and are required by Tech Specs.

The supply breakers on 1MC-5 would have been closed by procedure. However, due to the loss of offsite power, Group D heaters would have no power available. Group D has non-safety power supply (6 Banks from LXG, 1 Bank from SMXG at the SSF).

C Heater Group has variable power control. The capacity of the C Heaters totals 484 KW. There are two power sources available for the C Heaters, LXF (normal) and LXC (Alt.). The supply breakers on 1MC-10 would have been closed by procedure.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because a portion of group D heaters are powered from the SSF and the applicant could conclude that in a LOOP condition D heaters would be powered by the SSF D/G. Also, by procedure the heater breaker on 1MC-5 is closed which makes it plausible for the applicant to conclude that power is also available to Group D.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because Group C heaters are used by the Pressurizer Pressure Master for variable control of Pzr pressure, so the applicant may conclude that C heaters receive emergency power from the D/G's to allow for NCS pressure control. Also, by procedure the heater supply breaker on 1MC-10 is closed which makes it plausible for the applicant to conclude that power is also available to Group C.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Plausible because Group C heaters are use by the Pressurizer Pressure Master for variable control of Pzr pressure, so the applicant may conclude that C heaters receive emergency power from the D/G's to allow for NCS pressure control. Also, by procedure the heater supply breaker on 1MC-10 is closed which makes it plausible for the applicant to conclude that power is also available to Group C.
Plausible because a portion of group D heaters are powered from the SSF and the applicant could conclude that in a LOOP condition D heaters would be powered by the SSF D/G. Also, by procedure the heater breaker on 1MC-5 is closed which makes it plausible for the applicant to conclude that power is also available to Group D.

Basis for meeting the KA

The K/A is matched because it requires the applicant to know the power supplies to the pressurizer heaters as well as the conditions under which power may or may not be available.

Basis for Hi Cog

This question is higher cognitive because it requires more than one mental step. The applicant must first recall from memory the power supply to all of the Pressurizer heaters and then analyze the given conditions to determine which heaters have power.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT-31 MNS NRC Examination

Development References

REFERENCES:
Lesson Plan OP-MC-PS-IPE-DCS Section 2.4 and 2.5

LEARNING OBJECTIVES:
NONE

Student References Provided

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EXAM BANK QUESTION: 5940 MNS C

KA	KA_desc
SYS011 K2.02	Knowledge of bus power supplies to the following: (CFR: 41.7)PZR heaters ....

- *Do not press the ST test pushbutton in the back of the Reactor Trip breaker cabinet. This will result in the opening of the breaker.*

Basis: The reactor will trip when the ST relay de-energizes causing the Shunt Trip (SH TR) coil to energize.

- *When a Reactor Trip breaker is tripped from the control room, the Reactor Trip breaker cannot be closed locally at the breaker.*

Basis: If the green trip flag on Reactor Trip Switch in control room is visible a contact is open which will interrupt the 48 VDC supply to the breaker. Refer to Dwg 7.9.

3.1.2 Reactor Trips

Objective # 10

Operator Fundamental Focus; Control
One of the attributes for the Operator Fundamental Control is that Operators must be able to take manual actions (in accordance with procedure direction, if available) when automatic actions do not occur. Use the explanation of the Manual Reactor Trip function, below, to ***reinforce*** *this fundamental concept.*

Manual - Operator judgment is used for plant protection. Must be used if a valid trip setpoint is exceeded and the automatic trip fails. The reactor is manually tripped by either of the two hand switches on the control board.

Source Range NIS High (1/2 channels = 10^5 cps) - Provides protection against startup accidents and excessive power excursions caused by unexpected reactivity additions and high startup rates while in the source range. The trip can be Manually blocked when 1/2 IR channels > 10^{-5} % (P-6). The control board provides indication of the bistable block.

Intermediate Range NIS High (1/2 channels = 25%) - Protects against startup accidents while in the intermediate range and provides a rod withdrawal stop (C-1) at 1/2 channels = 20% power.

Objective # 10

Power Range NIS Low Setpoint (2/4 channels = 25%) - Protects against startup accidents. The trip can be manually blocked when 2/4 PR channels > 10% (P-10) by using the two control board switches, one per train. The control board provides indication of the bistable block. This trip is auto-reinstated when 3/4 PR channels < 10% (P-10).

Power Range NIS High setpoint (2/4 channels = 109%) - protects against an overpower condition which could lead to a DNB concern. This circuit also provides a rod withdrawal stop when 1/4 channels > 103% power (C-2).

Power Range Positive (+) Rate (2/4 channels + 5% in 2 sec) - protects against an ejected rod accident for DNB concerns.

A. Purpose

This procedure provides actions to check proper response of the automatic protection systems following manual or automatic actuation of a reactor trip or safety injection, to assess plant conditions, and to identify the appropriate recovery procedure.

B. Symptoms or Entry Conditions

1. **The following are symptoms that require a reactor trip, if one has not occurred:**
   - Any valid alarm on Reactor trip first out panel
   - 1/2 S/R channels - 10^5 CPS (below P6)
   - 1/2 I/R channels - 25% Power (below P10)
   - 2/4 P/R channels - 25% Power (below P10)
   - 2/4 P/R channels - 109% Power
   - 2/4 P/R channels - +5%/2 seconds
   - 2/4 Pzr Press channels - 2385 PSIG
   - 2/4 Pzr Press channels - 1945 PSIG (above P7)
   - 2/3 Pzr Level channels - 92% (above P7)
   - 2/4 NC Pump buses - 74% of normal voltage (5082 V) (above P7)
   - 2/4 NC Pump buses - 56 Hz (above P7)
   - 2/3 NC flow channels in 2/4 loops - 88% (above P7)
   - 2/3 NC flow channels in 1/4 loops - 88% (above P8)
   - 2/4 Loop Delta Ts - greater than OTDT setpoint (variable)
   - 2/4 Loop Delta Ts - greater than OPDT setpoint (variable)
   - 2/3 Auto -stop oil press channels - 45 PSIG (above P8)
   - 4/4 Turbine Throttle valves - Closed (above P8)
   - 2/4 S/G Level channels in any S/G - Lo-Lo (17%)
   - 1/2 Trains S/I - Actuated
   - 2/2 SSPS Trains - General Warning alarm.

2. **The following are symptoms of a reactor trip:**
   - Any reactor trip annunciator - LIT
   - Rod bottom lights - LIT
   - Neutron flux - RAPIDLY GOING DOWN.

3. **The following are symptoms that require a reactor trip and safety injection, if one has not occurred:**
   - 2/4 Pzr pressure channels less than 1845 PSIG
   - 2/3 Containment pressure channels greater than 1 PSIG.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
__ 1. **Monitor Foldout page.**	
2. **Check Reactor Trip:**	**Perform the following:**
__ • All rod bottom lights - LIT	__ a. Trip reactor.
__ • Reactor trip and bypass breakers - OPEN	b. **IF** reactor will not trip, **THEN** perform the following:
__ • I/R power - GOING DOWN.	__ • Implement EP/2/A/5000/F-0 (Critical Safety Function Status Trees).
	__ • **GO TO** EP/2/A/5000/FR-S.1 (Response to Nuclear Power Generation/ATWS).
3. **Check Turbine Trip:**	**Perform the following:**
__ • All throttle valves - CLOSED.	__ a. Trip turbine.
	b. **IF** turbine will not trip, **THEN** perform the following:
	__ 1) Place turbine in manual.
	__ 2) CLOSE governor valves in fast action.
	3) **IF** governor valves will not close, **THEN** CLOSE the following valves:
	__ • All MSIVs
	__ • All MSIV Bypass Valves.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
16. **Check reactor subcritical as follows:**	**Perform the following:**
__ • P/R channels - LESS THAN 5%	__ a. Continue to borate.
__ • I/R channels - LESS THAN 5%	__ b. **IF** boration is not available, **THEN** allow NC System to heat up.
__ • W/R Neutron Flux - LESS THAN 5%	__ c. Perform actions of any other Critical Safety Function procedures that apply or are in effect that do not cool down NC System or add positive reactivity to the core.
__ • I/R SUR - NEGATIVE.	__ d. **RETURN TO** Step 5.

17. **Ensure adequate shutdown margin as follows:**

__ a. Obtain current NC boron concentration from Primary Chemistry.

__ b. **WHEN** current NC boron concentration is obtained, **THEN** perform shutdown margin calculation **PER** OP/0/A/6100/006 (Reactivity Balance Calculation).

c. **WHEN** following conditions satisfied, **THEN** NC System boration may be stopped:

__ • Adequate shutdown margin is obtained

__ • Uncontrolled cooldown has been stopped.

18. **Ensure the following have been implemented:**

__ • RP/0/A/5700/000 (Classification of Emergency)

__ • RP/0/A/5700/010 (NRC Immediate Notification Requirements).

2013A MNS SRO Audit Examination QUESTION 39 39 **D**

EPE007 2.4.49 - Reactor Trip

EPE007 GENERIC

Ability to perform without reference to procedures those actions that require immediate operation of system components and controls. (CFR: 41.10 / 43.2 / 45.6)

A Reactor trip has occurred on Unit 1.

In accordance with the Immediate Actions of E-0 (Reactor Trip or Safety Injection):

One indication listed in the procedure that is used to verify that the reactor is tripped is ___(1)____.

If the turbine does not trip automatically and will not trip manually, the procedure will NEXT direct the operator to ___(2)____.

Which ONE (1) of the following completes the statements above?

A. 1. IR SUR - ZERO OR NEGATIVE
   2. close the MSIVs AND MSIV bypasses

B. 1. IR AMPS - GOING DOWN
   2. close the MSIVs AND MSIV bypasses

C. 1. IR SUR - ZERO OR NEGATIVE
   2. place the turbine in MANUAL AND close the governor valves in fast action

D. 1. IR AMPS - GOING DOWN
   2. place the turbine in MANUAL AND close the governor valves in fast action

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General Discussion

In accordance with the immediate actions of E-0 (Reactor Trip or Safety Injection) on Unit 1, one of the indications used to verify that a Reactor trip has occurred is "IR AMPS - GOING DOWN".

Also in accordance with E-0 immediate actions if the turbine does not automatically trip and cannot be tripped manually, the next action taken by the operators it to place the turbine in manual and close the governor valves in fast action.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

The first part is plausible because this is an action that is performed later in the EOPs to determine if the Reactor is subcritical.

The second part is plausible because this action is part of the immediate actions and would be performed if placing the turbine in MANUAL and closing the governor valves was unsuccessful.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

The first part is correct.

The second part is plausible because this action is part of the immediate actions and would be performed if placing the turbine in MANUAL and closing the governor valves was unsuccessful.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

The first part is plausible because this is an action that is performed later in the EOPs to determine if the Reactor is subcritical.

The second part is plausible because this action is part of the immediate actions and would be performed if placing the turbine in MANUAL and closing the governor valves was unsuccessful.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the K

The KA is matched because the applicant must have knowledge of actions related to a Reactor Trip (i.e. immediate actions committed to memory) that require immediate operation of system controls.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	

Development References

References:
FR-S.1 (Response to Nuclear Power Generation / ATWS)

Learning Objectives:
OP-MC-EP-FRS Objective 6

Student References Provided

EPE007 2.4.49 - Reactor Trip
EPE007 GENERIC

To access a graphics window open the Ovation Applications folder and then double click on the Graphics Icon. After a few moments a Graphics window will appear on the screen.

Depending upon how the OWS is configured, you may have a Graphics Icon available directly on the Desktop or in the Quick Launch area of the Taskbar.

The graphics window will automatically display the default “top level” diagram in the system.

The DCS graphics include a user friendly set of hexagonal navigation buttons located on the bottom of each graphic display. To navigate to a specific graphic simply select the appropriate navigation button.

An alternative method for navigating and accessing displays is the use of the Favorites menu option. A selection of Favorites can be saved by operators and quickly accessed whenever desired.

Graphics can also be recalled using the Recall feature of the graphics windows. By selecting the Recall icon the window will go back to the previous graphic that was displayed in that window. The “depth” of the recall feature can be programmed at each OWS.

Objective # 8

There is a corresponding Graphic "SOFT CONTROL" for each process that has a SLIMs. The process can be controlled from the Graphic or the SLIMs but only one can be in control at a given time. When the component control is in AUTO or MANUAL, the Soft Control or the SLIMs can control the process. When place in "L"MANUAL at the SLIMs, only the SLIMs can control the process and as long as the SLIMs is in "L"MANUAL the Soft Control will have no effect on the process.

3.2 Control Operations

The selection process of signals used are a functional part of the Ovation DCS software and will be determined according to the number of input channels available for control. The control selector processes are: Median Signal Selector, Median Select 2nd Highest, Two Channels with Arbitrator, Two Channels No Arbitrator, 2X Select & Single channel.

Objective # 9

3.2.1 Median Signal Selector

One means of control function is determined using a process termed "MEDIAN SELECT". The Median Select algorithm uses three (3) inputs. The Middle Input Value will be the output of the Median Select Algorithm.

If one of the three inputs fail, the Median Select algorithm will average the remaining two inputs and use the average as the output value.

3.2.2 Median Select 2nd Highest Selector

Where 4 Inputs are used, a process termed "Median Select 2nd Highest" is used.

Using the 4 inputs, there are four (4) combinations of the input signals, processed using the "MEDIAN SELECT" Algorithms.

If one of the three inputs fail, the Median Select algorithm will average the remaining two inputs and use the average as the output value. Each input signal is used in three (3) Median Select algorithms, therefore the output signal from three (3) of the Median Select algorithms will have an average value as the output signal.

The output of each Median Select Algorithm inputs into a "HIGH SELECT" Algorithm, which selects the Highest of the 4 Median select Inputs, in turn providing an output of the 2nd Highest of the original input signals for control.

Objective # 9, 10

3.2.3 Two Channels with Arbitrator

Where two (2) redundant Inputs of a process variable are available for control (and an arbitration signal is available), arbitration is used in the event of a signal failure as indicated by BAD signal quality as well as a deviation in the measurement signals by more than a fixed amount.

The output of the two-signal selector will be one of three choices, depending on how the selector is set up. The output will be either the average of the two inputs, or the higher of the two inputs, or the lower of the two inputs.

In the event that a signal failure is detected, an appropriate arbitration signal shall be used to decide which signal is to be retained for control; this decision will be based on whichever input signal has GOOD quality or, if both are GOOD, whichever is closer to the arbitration signal.

Default actions shall result for those potential situations in which neither process measurement appears to be valid as indicated by BAD quality or by excessive deviation between the two signals, and in the event of an appeal to arbitration when the arbitration signal itself has failed.

3.2.4 Two Channels with NO Arbitrator

Where two (2) redundant measurements of a process variable are available for control (and no arbitration signal is available), an alternate two-signal selector is used. As shown above, the output of the two-signal selector will be one of four choices: the average of the two inputs, the higher of the two inputs, the lower of the two inputs, or a designated input signal used as the output.

In the first three examples if a signal failure is detected with bad signal quality on one input signal, the remaining signal with good signal quality shall be used for control. In the last example where a designated input signal is used as the output, a manual process on the Graphic Display is used to swap to the remaining good input.

If the two signals deviate by more than a specified amount and both signals have GOOD quality, the algorithm shall incorporate a rate of change check to determine if either signal has increased at a rate which is greater than a predetermined amount. If

With Unit 1 at 100% power, the values of the four (4) channels of Pressurizer pressure control are as follows:

Channel I	2239 psig
Channel II	2226 psig
Channel III	2235 psig
Channel IV	2230 psig

Channel I then experiences a loss of power.

Which ONE of the following completes the following statement?

PRIOR to the Channel I failure, SELECTED Pressurizer pressure value was _____(1)_____;
AFTER the Channel I failure, SELECTED Pressurizer pressure value is _____(2)_____.

A. (1) 2235 psig
(2) 2230 psig

B. (1) 2235 psig
(2) 2235 psig

C. (1) 2230 psig
(2) 2230 psig

D. (1) 2239 psig
(2) 2235 psig

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EXAM BANK QUESTION: 7333 CNS **A**

General Discussion

. The second highest available value is used as the controlling input. Of the four values given, 2235 psig is the second highest, with 2239 psig (Channel I) the highest value. When this channel fails, Channel III becomes the highest available value (2235 psig), and the controlling input channel then becomes the second highest of the remaining three available; i.e., 2230 psig.

Answer A Discussion

Answer B Discussion

Incorrect. Selecting 2235 psig as the controlling input value AFTER the failure is plausible, since the 2235 psig channel did not fail, and this is the normal value of PZR pressure. Control is always the median selected value (the second highest of available values).

Answer C Discussion

Incorrect. Plausible, if student reverses the median selected value as not the second highest of available channel values, but as the second lowest of available channel values. In this case 2230 psig (Channel IV) would be correct. And it is also plausible that since Channel IV has not experienced a failure, it would continue to be the controlling channel; i.e., at 2230 psig.

Answer D Discussion

Incorrect. It is plausible to believe that 2239 psig (Channel I) is the controlling channel value, since it is the highest value and provides the greatest amount of subcooling, yet is still within the accepted range. When it fails, as given in the stem conditions, it is further plausible to conclude that the new controlling input value is the next value that is closest to the 2239 psig value: i.e., 2235 psig.

Basis for meeting the KA

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2012 CNS Audit CNS Audit Examination

Development References
OP-CN-DCS, Lesson Plan for DCS, Rev. 100

Student References Provided

KA	KA_desc
SYS010 K6.02	Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: (CFR: 41.7 / 45.7)PZR ....

SPENT FUEL COOLING SYSTEM

1. Purpose

To provide instructions for operation of the Spent Fuel Cooling System.

2. Limits and Precautions

2.1 Maximum Spent Fuel Pool Skimmer filter DP is 20 psid.

2.2 Maximum Spent Fuel Pool Purification Prefilter and Postfilter DP is 40 psid.

2.3 COLR specifies minimum Spent Fuel Pool Boron concentration.

2.4 Maximum pool temperature is 140°F.

2.5 Maximum SFP level is 8" above "0".

2.6 Maximum KC System flow through KF HX is 2600 gpm.

2.7 Spent Fuel Pool boron concentration will decrease when placing demineralizer in service after sluicing.

2.8 Maximum KF Pump flow is 2900 gpm (pump runout).

2.9 Maximum Spent Fuel Pool Skimmer Pump Discharge Pressure is 30 psig.

2.10 Maximize VF availability to ensure worker exposure to airborne Tritium concentrations from SFP evaporation is maintained As Low As Reasonably Achievable (ALARA). {NCR 01542208}

3. Procedure

See Section 4.

Q34 References

NOTE: It is desired to maintain Spent Fuel Pool temperature less than 90°F to help minimize unit vent airborne tritium releases due to Spent Fuel Pool evaporation. {NCR 01596419}

☐ 3.8.8 Maintain desired Spent Fuel Pool temperature by adjusting 1KC-149 (A KF HX Outlet Flow).

CAUTION: Exercise caution to prevent confusing 1KF-156 (1B KF HX Outlet Throttle) and 1KC-156 (B KF HX Outlet Flow) in the next steps.

_____ 3.8.9 **IF** KF Pump B in service,
THEN perform the following:

_____ 3.8.9.1 Adjust 1KF-156 (1B KF HX Outlet Throttle) to maintain KF flow 2200 - 2450 gpm per 1KFFS5110 (1B KF Hx Outlet Flow).

NOTE: It is desired to maintain Spent Fuel Pool temperature less than 90°F to help minimize unit vent airborne tritium releases due to Spent Fuel Pool evaporation. {NCR 01596419}

_____ 3.8.9.2 Maintain desired Spent Fuel Pool temperature by adjusting 1KC-156 (B KF HX Outlet Flow).

_____ 3.8.10 **IF** required to place second KC Train in service,
THEN perform OP/1/A/6400/005 (Component Cooling Water System).

_____ 3.8.11 **IF** desired to place KF System in purification,
THEN perform the following:

_____ 3.8.11.1 **IF** in Modes 2 through 6 or No Mode,
THEN perform Enclosure 4.14 (FW/KF Systems Composite) of OP/1/A/6200/014 (Refueling Water System). {NCR 01902003}

☐ 3.8.11.2 Perform Enclosure 4.2 (Spent Fuel Pool Purification Loop Operation).

are two train related AHUs per room and receive power from their respective train's 600V Essential Motor Control Center, 1(2) EMXA or 1(2) EMXB.

2.2.6 Controls for the AHUs are located on the Control Room HVAC Panel and consist of the following (Drawing 7.4) :

- AUTO / ON Control Switch
  - Two-position rotary switch for MANUAL (ON) or AUTO operation of the AHU.
  - Placing the switch into the ON position will manually “start” the KF AHU.
  - Placing the switch into the AUTO allows automatic operation and will start the AHU upon the following:
    1. Respective KF Pump START
    2. Safety Injection Signal
- ON / OFF (Red / Green) Indicating Lights

2.2.7 Controls for the RN supply valves to the AHUs, 1(2)RN-140 and 1(2)RN-240 [1(2)A KF AHU and / 1(2)B KF AHU], are located on MC-11 and consist of the following:

- AUTO / OPEN Control Switch
  - OPENs the valve or places the valve under AUTO control, as desired.
  - Normally aligned for AUTO operation.
    1. In AUTO the associated valve will open on a START of the KF AHU and close when its associated KF AHU is STOPPED.
    2. Locks in to position when the AUTO section is depressed.
  - Depressing OPEN releases the AUTO section of the switch and opens the RN valve regardless of AHU status.
- OPEN / CLOSE (Red / Green) Indicating Lights

Nuclear Safety Focus::
Note: *When performing the Defense In Depth Assessment for a Spent Fuel Pool Cooling train all Spent Pool Cooling support systems being used to support that train must have an AVAILABLE emergency diesel generator. This means that if the Spent Fuel Pool Cooling Train and all its support equipment are on the same train only the diesel generator for that train is required to be AVAILABLE. However, if cross train support equipment is being relied upon the diesel generator for both trains must be AVAILABLE. (AR 01644369)*

2.3 Spent Fuel Pool Cooling Heat Exchangers

Objective # 7 & 9

2.3.1 Two fuel pool cooling heat exchangers are provided for cooling of the SFP water, thus removing the heat generated from decay heat of the spent fuel. The heat exchangers are straight tube type heat exchangers with SFP water flowing through the tubes and Component Cooling Water (KC) flowing through the shell.

KC flow is adjusted to maintain the desired SFP temperature. Adjustment of KC flow is normally performed on MC-11 using the controllers for KC-149 and KC-156, A and B KF Heat Exchanger Outlet Flow respectively.

2.4 Spent Fuel Pool Cooling Pump Strainers

2.4.1 Basket type strainers located within the SFP prevent debris and trash from entering the suction lines of the KF Pumps. Pump flow fluctuations are an indication a strainer may be clogged.

2.5 Spent Fuel Pool Cooling Pre-Filter

2.5.1 A disposable filter cartridge type pre-filter at the inlet of the SFP Cooling Demineralizer collects suspended particles and prohibits them from fouling the demineralizer. The cartridge removes 100 percent of all particles 70 microns and larger. The cartridge is replaced upon high differential pressure or high radiation.

2.6 Spent Fuel Pool Cooling Demineralizer

2.6.1 A demineralizer containing mixed-bed type resin (H+ and OH-) is provided for the removal of corrosion and fission product ionic contaminants.

2.7 Spent Fuel Pool Cooling Post-Filter

2.7.1 Resin fines escaping the demineralizer are collected in the post-filter. A disposable filter cartridge removes 100 percent of all particles 20 microns and larger. The cartridge is replaced upon high differential pressure or high radiation.

2.8 Purification Loop Isolation Valve (KF-12)

Objective # 10

2.8.1 KF-12 is the only electrically operated valve in the KF System. It receives its power from station bus 1(2) MXJ and is operated from the Spent Fuel Pool Cooling Control Panel (SFPCCP), located in the Auxiliary Building just outside the KF Pump Room.

2.8.2 The controls and indications located on the SFPCCP consist of the following:

- OPEN / CLOSE Pushbutton
- OPEN / CLOSE (Red / Green) Indicating Lights

2.9 Spent Fuel Pool Skimmer Trough

2.9.1 The skimmer trough (also called the skimmer pipe) collects water from the surface of the SFP and provides the suction for the Spent Fuel Pool Skimmer Pump. Surface skimming is optimized by trough adjustment or by raising SFP level (filling). Pump flow fluctuations are an indication that the trough may need adjustment or may be clogged.

Given the following Unit 1 initial conditions:

- 1A1 KC Pump is in service
- 1A KF Pump is in service

Subsequently:

- 1KC-50A (Aux Bldg Non-Ess Hdr Isol) has spuriously closed

1KC-149 (KF Hx 1A Cool Wtr Otlt) _____(1)_____ AUTOMATICALLY reposition in order to maintain Spent Fuel Pool temperature.

If 1AD-13, E/1 "SPENT FUEL POOL TEMP HI" alarms, entry into the actions of SLC 16.7-9 (Standby Shutdown System) _____(2)_____ be required.

Which ONE of the following completes the statements above?

A. 1. will
   2. will

B. 1. will
   2. will NOT

C. 1. will NOT
   2. will

D. 1. will NOT
   2. will NOT

EXAM BANK QUESTION: 7157 CNS C

General Discussion

The temperature of the Spent Fuel Pool is maintained by control of CCW flow through the KF heat exchangers. This flow is adjusted via a manual loader located on the Main Control Boards. There is no automatic function of this valve.

Per the KF OP:
With fuel pool temperature greater than/equal to 125 deg F (setpoint for 1AD-13, E/1 "SPENT FUEL POOL TEMP HI"), the SSF is non-functional per the associated Annunciator Response.

Although the suction source is required to be less than 135 deg, measured locally, a conservative requirement has been instituted (125 deg on CR gauge) to ensure the initial temperature is within the assumptions for an SSF event.

Answer A Discussion

Part 1 is plausible because this valve does maintain KF system temperature, is manipulated from the control room, and is rarely adjusted. It is reasonable to assume it functions automatically.

Part 2 is correct.

Answer B Discussion

Part 1 is plausible because this valve does maintain KF system temperature, is manipulated from the control room, and is rarely adjusted. It is reasonable to assume it functions automatically.

Part 2 is plausible because the SFP has multiple other TSs & SLCs (i.e. SFP water level, boron concentration, assembly storage, level instrumentation) which require analysis following an undesired condition. The relationship between the SSF and SFP are not inherently obvious. Also, the DBD states that temperature must be less than 135 deg, by local measurement, which is above the conservative requirement of the CR gauge.

Answer C Discussion

CORRECT. See explanation above.

Answer D Discussion

Part 1 is correct.

Part 2 is plausible because the SFP has multiple other TSs & SLCs (i.e. SFP water level, boron concentration, assembly storage, level instrumentation) which require analysis following an undesired condition. The relationship between the SSF and SFP are not inherently obvious. Also, the DBD states that temperature must be less than 135 deg, by local measurement, which is above the conservative requirement of the CR gauge.

Basis for meeting the KA

CE NOTE: This K/A was discussed on 01/19/17 due to the lack of automatic SFP temperature control at CNS. CE agreed to accept question related to manual control of cooling water in order to maintain SFP within temperature limits.

This question requires the applicant to demonstrate the ability to monitor operation of SFP cooling through knowledge of the method of operation of the associated controls and knowledge of SFP temperature limits through SLC required actions.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	ILT-17 NRC Written Exam CNS NRC Examination

Development References
OP-CN-FH-KF (Spent Fuel Pool Cooling System LP), Rev. 103, Sect. 2.3 OP/1/A/6200/005 (Spent Fuel Cooling System), Rev. 95, L&P 2.16 OP-CN-CP-AD (Standby Shutdown Facility LP), Rev. 107, Sect. 3.1.1

Student References Provided

KA	KA_desc
SYS033 A3.01	Ability to monitor automatic operation of the Spent Fuel Pool Cooling System including: (CFR: 41.7 / 45.5)Temperature control valves ....

2.1.7 Spent Fuel Building Ventilation Monitor

1(2) EMF 42 - Unit 1(2) Fuel Building Ventilation is used to monitor the Spent Fuel Building via the ventilation system.

Objective # 2

Its function is to monitor the gaseous activity levels released to the Unit Vent by the ventilation fans exhausting from the spent fuel area.

Objective # 2, 3

A Trip 2 high radiation alarm on 1EMF 42 will divert ventilation from U-1 spent fuel pool area through filter unit FPFU-1 (filter bypass will be terminated). Dampers 1FPX-D-3 and 1FPX-D-4 will be opened while 1FPX-D-5 will be closed. A high radiation alarm on 2EMF 42 will divert ventilation from the U-2 spent fuel pool area through filter unit FPFU-2. Dampers 2FPX-D-3 and 2FPX-D-4 will be opened while 2FPX-D-5 will be closed.

The purpose of the auto actions is to minimize any Unit Vent release originating in the SFP by placing the VF filters in service.

This channel uses a single range beta gas (Plastic Scint.) detector.

2.1.8 Control Room Ventilation Monitor

Channels 0EMF 43A - Control Room Air Intake A and 0EMF 43B - Control Room Air Intake B are use to monitor the Control Room atmosphere via the Control Room Ventilation System.

Objective # 2

These channels monitor the activity level of the air intake to the Control Room Ventilation System.

Operator Fundamental Focus; Monitoring and Control
Describe *that, unlike other radiation monitors in the plant, the Control Room Ventilation monitors do not result in automatic actions or isolations. It is the responsibility of the operator to identify if this parameter is degrading and then take actions, using the applicable operating guidance (alarm response procedures for example) to isolate the Control Room Ventilation intake valves if needed.* ***Explain*** *that these two behaviors are attributes of the Operator Fundamentals Monitoring and Control.*

High radiation alarms in the Control Room require manual operator action to isolate the Control Room Ventilation intake valves if needed.

These channels use a single range beta gas (Plastic Scint.) detector.

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ILT-30 MNS SRO NRC Examination QUESTION 33 33 **A**

SYS034 K6.02 - Fuel Handling Equipment System (FHES)
Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System : (CFR: 41.7 / 45.7)
Radiation monitoring systems ....

Given the following conditions on Unit 2:

- The unit is at 100% RTP
- The VF (Fuel Handling Building Ventilation) system is in its normal alignment for current plant conditions

Subsequently:

- A loss of power to 2EMF-42 (Fuel Building Ventilation Radiation Monitor) occurs

Which ONE (1) of the following describes the AUTOMATIC response of the VF system to the conditions above?

1) The Exhaust Filter Bypass Damper (D-5) will close
2) The Outside Air Damper (D-1) will close
3) The Supply and Exhaust Fans will stop

A. 1 ONLY

B. 3 ONLY

C. 1 AND 2 ONLY

D. 2 AND 3 ONLY

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ILT-30 MNS SRO NRC Examination QUESTION 33

33

A

General Discussion

At MNS, the Radiation Monitoring System does not have a direct effect on any Fuel Handling System Equipment (unlike many other plants). The only equipment associated with fuel handling that is effected by the Radiation Monitoring system is the Fuel Handling Building Ventilation system. Since the Fuel Handling Building Ventilation system must be in service during fuel movement in the Spent Fuel Pool (and since fuel movement must be stopped if it is unavailable), MNS has in the past, tested knowledge of the effects of the Radiation Monitoring System on the Fuel Handling Building Ventilation (VF) system to meet this specific KA and several other KAs related to Fuel Handling Equipment. Discussed this with the Chief Examiner and he is okay with testing this particular K/A in this fashion.

In accordance with the VF lesson plan, Normal system operation will bypass the Filter Train Unit and direct exhaust flow, via both Fuel Pool Exhaust Fans, to the Unit Vent.

In accordance with the WE-EMF lesson plan, on a loss of power to any RP-86A module (EMF-42 uses an RP-86A module) a Trip 1 and Trip 2 alarm will occur.

On a Trip 2 alarm EMF-42 intiates an automatic closure of the VF system filter bypass damper (D-5) placing the filters in service.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because with no radiation monitoring of VF flow, the potential exists for an unmonitored release. Also, the Supply and Exhaust fans are interlocked such that at least one Exhaust fan must be running for the Supply fan to remain in operation.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBE:
This answer is plausible because it is correct that the Exhaust Filter Bypass Damper closes and it is plausible for the applicant to conclude that the Outside Air Damper close could prevent an unmonitored release.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because these actions would prevent an unmonitored release to the atmosphere via the VF system.

Basis for meeting the K

The K/A is matched because a failure of the VF system process monitor has occurred and the applicant must determine the automatic actions that occur as a result.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

References:
Lesson Plan OP-MC-WE-EMF
Lesson Plan OP-MC-FH-VF

Learning Objectives:
OP-MC-FH-VF Objectives 4 & 8

Student References Provided

SYS034 K6.02 - Fuel Handling Equipment System (FHES)
Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System : (CFR: 41.7 / 45.7)

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ILT-30 MNS SRO NRC Examination QUESTION 33

33

A

Radiation monitoring systems ....

401-9 Comments:	Remarks/Status
	401-9 COMMENT: UNSAT 034K6.02, NEW, Memory, 1.KA appears to NOT match. I am not sure that Fuel Handling Equipment System (FHES) is same as Fuel Handling Building Ventilation. The KA states loss of the radiation monitor will have on the Fuel Handling System. Not the ventilation system. 2.Unit 2 3.This question has to be replaced with something that is associated with the actions on loss of the radiation monitor and its effects on the Fuel Handling System. RESPONSE: Agree with the comment 100%. Unfortunately, McGuire does not have any interlocks between the radiation monitoring system and fuel handling equipment like many other plants. For example, at our sister plant Catawba, if the SFP Refueling Bridge monitor reaches Trip 2, an interlock disables the new fuel elevator. MNS does not have that interlock. At MNS, we have always used the SFP Ventilation system to meet this particular K/A because it's the closest we can come to meeting it. If the Chief Examiner believes that match is unacceptable, we'll need a replacement K/A. After an okay by the Chief Examiner, added more information to the discussion to explain why we had to test this particular K/A in this manner and the CE has now accepted using this question to test this K/A. HCF 07/07/14

- S/G blowdown blowoff tank effluent may be directed to either the condensate system or the turbine building sump, isolating blowdown will prevent contaminating these systems via the blowdown pathway.
- Conventional sampling effluent may be directed to the CST or turbine building sump, isolating conventional sampling will prevent contaminating these systems via this pathway.

These channels use dual range gamma liquid assembly. The low range uses a gamma liquid (Nal Scint) while the high range uses a GM detector.

2.1.4 Unit Vent Airborne Monitor

The following channels are used to monitor the unit vent:

- 1(2) EMF 35 (L) Unit 1(2) Unit Vent Particulate (Low Range)
- 1(2) EMF 36 (L) Unit 1(2) Unit Vent Gas (Low Range)
- 1(2) EMF 36 (H) Unit 1(2) Unit Vent Gas (High Range)
- 1(2) EMF 37 Unit 1(2) Unit Vent Iodine

Objective # 2

These EMFs monitor the Unit Vent for particulate, gaseous, and iodine activity levels released to the atmosphere from the combined ventilation systems within the station. A sample pump draws a single gas stream in series through a particulate paper filter, an iodine cartridge, and a gas chamber.

Atmosphere from the Containment Purge, Containment Annulus Ventilation, Auxiliary Building Ventilation, Condenser Air Ejector, Fuel Pool Ventilation and other potentially radioactive systems are discharged through the Unit Vent.

Objective # 2, 3

The automatic actions for these EMFs are as follows:

- A Trip 2 high radiation alarm on 1EMF 35 (L), 1EMF 37, 2EMF 35 (L), or 2EMF 37 will stop Auxiliary Building Unfiltered Exhaust Fans (1ABUXF-1A, 1ABUXF-1B, 2ABUXF-1A, and 2ABUXF-2B).
- A Trip 2 high radiation alarm on 1EMF 36 (L) will close 1WG160 to terminate waste gas discharge.
- 1EMF 36 (L) will also alarm and indicate at the Waste Gas Processing Panel.

The purpose of auto actions are:

Activity being released via the Unit Vent could have several sources, (i.e., VP, VE, VQ, VF, WG, VA, CSAE) most of these are monitored by other EMF's or are filtered.

Stopping the unfiltered exhaust fans should terminate a release originating from the unfiltered exhaust.

WG discharges are normally monitored and if release rate limits are exceeded, terminated by 0EMF50. 1EMF36 will duplicate 0EMF50 actions.

Operator Fundamental Focus; Monitoring and Teamwork
Reinforce *the fundamental attribute for the CRS to track degraded and inoperable technical specification equipment.* ***Relate*** *this fundamental behavior to the fact that it is preferable to not make a release with either 1EMF-36 or 0EMF-50 inoperable. Controlling EMF operability (1EMF-36 or 0EMF-50), and any necessary inoperable actions, is a responsibility of the entire crew and communicating problems to the CRS, so that the appropriate Tech Spec actions can be taken, support the Operator Fundamental Teamwork.*

EMF35, 36, 37 use a particulate-iodine-gas assembly. The Gas channel has a high and low range. The low range uses a plastic Scint detector while the high range uses a GM detector. The iodine portion uses a NaI Scint.

There are Loss of Sample Flow annunciators associated with both the EMF vacuum pump and the RP Composite Sampler. However, the actions required by SLC 16.11-7 are different for each. Loss of the Unit Vent Composite Sampler requires RP to estimate flow once per four hours. (Ref. NCR# 1705224)

2.1.5 Containment Airborne Monitor

The containment air is sampled by the following channels:

- 1(2) EMF 38 (L) - Unit 1 (2) Containment Particulate (Low Range)
- 1(2) EMF 39 (L) - Unit 1(2) Containment Gas (Low Range)
- 1(2) EMF 39 (H) - Unit 1(2) Containment Gas (High Range)
- 1(2) EMF 40 - Unit 1(2) Containment Iodine

Objective # 2

The above channels monitor the particulate, iodine and gaseous activity levels in the:

- Containment atmosphere during normal unit operation.
- Containment purge exhaust flow during containment purge operations.

These channels monitor containment to warn personnel if containment atmospheric activity exceeds preset limits and to secure liquid and atmospheric releases from containment.

Objective # 4

Three sample points, selected from the control console, provide coverage of the containment. Sample points are located in:

- Upper Containment

- Lower Containment
- Incore Instrumentation Room

The three sample points are monitored by a single Particulate-Iodine-Gas detector assembly. Selection of the point to be sampled is made using the toggle switches on the sample flow select module on the control cabinet (refer to Drawing 7.1). To prevent damage to the sample pump, at least one flow path must be opened. The sample air is returned to the containment.

According to the basis of T.S. 3.4.15 (RCS Leakage Detection Instrumentation), a sample from the lower containment region is required for NC leakage detection. The reason is that the NC system is physically located within the lower containment region. The incore area and lower containment samples are both obtained from the lower containment region. Applicable RP and Operations procedures reflect this requirement. For example, the Semi-Daily PT has a note to alert the operators that EMF-38 is inoperable if the sample pump is selected to Upper Containment only for greater than 15 minutes.

Objective # 3

A Trip 2 high radiation alarm on EMF-38(L), EMF-40(L), or EMF-39(L) channels will stop the CFAES pumps and the Incore Sump pump. Also, trip 2 will initiate a Containment Ventilation isolation signal (S_H) through the Solid State Protection System. This S_H signal will:

- Secure VQ
- Secure VP

A high alarm on the EMF-39(L) (gaseous) channel will also sound the Containment Evacuation Alarm unless both source range high flux trips are blocked.

The purpose of the auto actions are to:

- terminate a release originating in containment which is discharging to the Unit Vent if the release limits are exceeded.
- Stop the containment sump pumps to prevent pumping potentially highly contaminated water into the Aux. Building (i.e., FDT or WEFT).
- Sound the containment evacuation alarm to inform personnel to leave the containment due to the potential for high airborne concentration existing in containment.

The Gas channel has a high and low range. The low range uses a plastic Scint detector while the high range uses a GM detector. The iodine portion uses a NaI Scint.

2.1.6 Auxiliary Building Ventilation Monitor

The Auxiliary Building is monitored by 0EMF 41 - Aux Building Ventilation.

Objective # 2, 5

EMF-41 uses a scanner capable of monitoring 12 points within the Auxiliary Building ventilation ducts. These points are located to provide maximum coverage of Auxiliary Building rooms. (refer to Drawing 7.2 and 7.3)

NOTE: Sample point 6 has been deleted, so only 11 points are currently monitored.

A timed sample system is used to control the solenoid valves (refer to Drawing 7.4). Each sample point takes about 2.5 minutes, 1.5 minutes to purge and 1 minute to sample. Thus, each point will be sampled twice per hour. The flow rate for each sample line is 1 scfm. This 1 scfm from the sampled line is routed through the detector. A SCAN/STOP switch is provided to control EMF 41 operation mode: (refer to Drawing 7.4)

- Scan Mode - provides automatic sequential sampling of 11 Aux. Bldg areas. PT/1/A/4600/03B requires the toggle switch to be in the scan position.
- Stop - provides continuous sampling of one area.

A ready light - illuminates while EMF is sampling and off while purging. A STEP switch allows manual selection of desired sample point. This option is available in the SCAN mode only. A point window provides an LED readout that displays selected sample point. When the scanner is selected to a single point, remote readout to the OAC and Pi database is disabled. Only the local Control Room module readout is available**.**

Objective # 2, 3

On a Trip 2 high radiation alarm, Aux. Building Ventilation will be passed through filter units ABFU-1 and ABFU-2 (filter bypass will be terminated). The following dampers will open:

- 1ABF-D-4A 2ABF-D-4A
- 1ABF-D-4B 2ABF-D-4B
- 1ABF-D-5A 2ABF-D-5A
- 1ABF-D-5B 2ABF-D-5B

The following dampers will close:

- 1ABF-D-3
- 2ABF-D-3
- 1ABF-D-6
- 2ABF-D-6

The purpose of the auto actions is to place the VA filters in service. Any Unit Vent release originating in the VA filtered exhaust system will be minimized.

This channel utilizes a single range beta gas (Plastic Scint.) detector.

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ILT31 MNS SRO Audit Examination QUESTION 62 62 **A**

APE060 AK3.02 - Accidental Gaseous-Waste Release

Knowledge of the reasons for the following responses as they apply to the Accidental Gaseous Radwaste: (CFR 41.5,41.10 / 45.6 / 45.13)

Isolation of the auxiliary building ventilation ....

Given the following on Unit 1:

- The Unit is at 100% RTP
- A minimally decayed Waste Gas Decay Tank is being released
- A significant packing leak starts on isolation valve 1WG-160 (WG DECAY TANK OUTLET TO UNIT VENT CONTROL)

1) Based on the conditions above, _______automatically stops the Aux Building ventilation unfiltered exhaust fans.

2) This alignment is required to prevent exceeding the limits of _______.

Which ONE (1) of the following completes the statements above?

COMPONENT LEGEND:

1EMF-35 (UNIT VENT PART HI RAD)
1EMF-41 (AUX BLDG VENT HI RAD)

A. 1. 1EMF-35
2. 10 CFR 100

B. 1. 1EMF-41
2. 10 CFR 100

C. 1. 1EMF-35
2. 10 CFR 20

D. 1. 1EMF-41
2. 10 CFR 20

ILT31 MNS SRO Audit Examination QUESTION 62 62 **A**

General Discussion

The release of radioactive gas into the Auxiliary Building will be picked up by the Auxiliary Building Ventilation System which discharges to the plant vent. The Unit 1 Low Range Particulate Vent Monitor (EMF 35) should alarm which will automatically stop the Auxiliary Building Unfiltered Exhaust Fans.

A Trip 2 high radiation alarm on 1EMF 35 (L), 1EMF 37, 2EMF 35 (L), or 2EMF 37 will stop Auxiliary Building Unfiltered Exhaust Fans 1ABFXF-1A, 1ABFXF-1B, 2ABFXF-1A, and 2ABFXF-2B.

The Auxiliary Building Ventilation Monitor (EMF 41) should also alarm which will place the Auxiliary Building Ventilation Filter system in service.

One purpose of the Auxiliary Building Ventilation System (VA) is to:

- Provide purging of the building to the unit vent, monitored and filtered so that the limits of 10CFR100 and Tech. Specs. Are not exceeded.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if the applicant recognizes EMF-41 Trip 2 will cause automatic actions to occur in the Aux bldg. ventilation system. However, it will not stop the unfiltered exhaust fans.

Second part is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct.

Second part is plausible because the basis for the radioactive liquid effluent releases are to prevent exceeding 10 CFR 20 limits.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if the applicant recognizes EMF-41 Trip 2 will cause automatic actions to occur in the Aux bldg. ventilation system. However, it will not stop the unfiltered exhaust fans.

Second part is plausible because the basis for the radioactive liquid effluent releases are to prevent exceeding 10 CFR 20 limits.

Basis for meeting the K

KA is matched because the applicant must determine the specific location where effects of the release will be seen to predict the effects on the aux building ventilation system and have knowledge of the reasons for the effects.

Basis for Hi Cog

This is a higher cognitive level because the applicant must comprehend the physical location of the leak and based on that location analyze the given answers to determine which automatic actions will mitigate the consequences of the leak.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2009 MNS NRC SRO Examination NRC Q49 (Bank 3043)

Development References

References:
Lesson Plan OP-MC-AP-22

Student References Provided

2.2 Area Monitors Functional Description

2.2.1 Area Radiation Monitors - Low Range

Objective #2

Detectors are situated to monitor the following areas for radiation hazards to personnel.

- Auxiliary Building Corridors: 1EMF 1, 2, 3, 4, 6, 7, 8, 10, 23; 2EMF 9
- Sample Rooms: 1EMF 5; 2EMF 1
- Control Room: 1EMF 12
- Hot Machine Shop: 1EMF 15
- Laboratory (RP Shift Office) 1EMF 13
- Waste Drumming and Shipping Area: 1EMF 11 & 14
- Rx Bldg and SFP Refueling Bridge: 1EMF 16 and 17; 2EMF 3 and 4
- Incore Instrumentation Rooms: 1EMF 9; 2EMF 2
- New Fuel Buildings: 1EMF 20 & 21; 2EMF 7 & 8
- Diesel Generator Rooms: 1EMF 28; 2EMF 14
- Technical Support Center: EMF 22
- QA Radiographic Shooting Vault: EMF 29

Objective #3

No control actions are performed by these channels with the exception of 1EMF-16 and 2EMF-3 (Containment Refueling Bridge). On a Trip 2 High Radiation Alarm, the respective EMF (1EMF-16 and 2EMF-3) will actuate the Containment Evacuation alarm. This alarm is blocked when both Source Range high flux trips are blocked.

These channels use a Geiger-Mueller detector. The instrument range is 0.1 to 10^4 mr/hr.

Keys to Life
Stay focused. Stay safe.

Hazardous Energy Isolation:
Fully identifying and isolating high temperature/pressure fluids) as well as the various electrical support/control systems should never be taken for granted.Always verify any assumptions, and use good peer checking while researching any clearance/tagging tasks.

7.14 Process Monitor Detector Summary (Page 1) (7-17-06)

DETECTOR ASSEMBLIES	EMFs	DETECTOR TYPE	MODULE RANGE	CHECK SOURCE
DUAL RANGE GAMMA LIQUID	1&2 EMF 34 1&2 EMF 44 1&2 EMF 45A/B 0EMF 49	(L) LOW RANGE: GAMMA SCINT. DETECTOR (NaI) (H) HIGH RANGE GM	10 TO 10E7 CPM 10 TO 10E6 CPM	CS-137 NONE
SINGLE RANGE GAMMA LIQUID	1&2 EMF 31 1&2 EMF 33 1&2 EMF 46A/B 0EMF 47	LOW RANGE: GAMMA SCINT. DETECTOR (NaI)	10 TO 10E7 CPM	CS-137
REACTOR COOLANT GAMMA LIQUID	1&2 EMF 48	LOW RANGE: GAMMA SCINT. DETECTOR (NaI)	10 TO 10E7 CPM	CS-137
DUAL RANGE BETA GAS	0EMF 50	(L) LOW RANGE BETA SCINT. DETECTOR (PLASTIC) (H) HIGH RANGE: GM	10 TO 10E7 CPM 10 TO 10E6 CPM	PULSED LED NONE
IONIZATION DETECTOR	1&2 EMF 36(HH) 1&2 EMF 51A/B	IONIZATION CHAMBER	1 TO 10E8 R/HR	NONE

Nomenclature: **S/R HI FLUX ALM BLOCKED**

Window: **D2**

Setpoint: "High Flux at Shutdown" switch in "Block" position

NOTE:	"S/R Hi Flux Alm Blocked" annunciator is automatically defeated by permissive P-10.

Origin: "High Flux at Shutdown" switch on either Source Range drawer in "Block" position

Probable Cause: Switches placed in "Block" position during Reactor startup per OP/1/A/6100/003 (Controlling Procedure For Unit Operation).

Automatic Action: None

Immediate Action: None

Supplementary Action: None

References:

- Drawing MCM-1399.04-6
- MCM-1399.04-92
- WCAP-7669
- NSM MG-12126

End of Response

The SigniFire IP™ Camera, installed as part of the new Fireworks Fire Detection System, utilizes imbedded algorithms on the network camera to analyze the image for the following:

- Flaming Fires- Looks for a specific fire pattern consisting of a bright core of the flame and a flickering corona
- Reflected Fire Light- Detects the presence of the flickering component of fire light reflected off of surfaces facing the camera
- Smoke Plumes- Identifies the anomalies that are caused by smoke and analyzes the progression over a period of time to identify a growing smoke plume
- Ambient smoke- Monitors the light diffusion from light sources and bright objects to detect the pattern consistent with the slow accumulation of smoke

2.2. Data Gathering Control Panel (DGPs)

Objective #2 & 3

All fire detectors are wired to collecting points called Data Gathering Panels. If the detector senses a fire, a signal is sent to the associated DGP by way of zone modules. The DGP then transmits the signal to the Central Processing Unit (CPU) which processes the information and generates either a Fire Detection System Alert or Fire Detection Trouble Alarm depending on the information received. The DGPs can receive commands from an event initiated program or commands either manually or from the Operators Terminal. Initiators may be time, alarm of a detector loop or specific condition. In addition, it can be programmed to command external actions such as provide control outputs for the local alarm bells and/or mechanical equipment as required. The Data Gathering Panels are four zone or 60 zone monitoring panels used in conjunction with the CPU to monitor local zones. Each zone provides standard detector loops for up to 25 ionization detectors and any number of fixed temperature or rate of rise detectors. Zones 45, 46 and 47 have local annunciators and separate power supplies for the detectors in the subzones. The zone assignments for the DGP can be found in Procedure OP/0/A/6400/02C enclosure 4.2. Procedure OP/0/A/6400/02C enclosure 4.3 provides the location of each DGP.

Power for all Data Gathering Panels is obtained from local lighting panels located throughout the plant. Most DGP's are supplied with standby power from its own battery and battery charger assembly. DGP's 34 through 39 and 42 (Unit 2 containment annulus DGP's) share a common backup battery located inside the "EFAPCC" cabinet.

2.3. Fire Detection Processing Control Center (EFAPCC)

Objective #2 & 4

The EFAPCC consist of a Graphic Operating Interface System, complete with a Pentium PC, a 20" VGA Color Monitor, and printer, along with ten (10) available DC transmission channels with two loops per channel. Each channel can monitor a maximum of 46 DGPs. The EFAPCC cabinets, printer, CPU and monitor are located on the Unit #1 side of the control room. This system provides the fire detection for both units. The "Fire Detection System Alert" annunciator is located in Unit #1 side of the Control Room on panel 1AD13, E-3. There is a reset for this annunicator located on the front of the EFAPCC cabinet (Drawing 7.7). Depressing this pushbutton ensures that

subsequent EFA alarms will be received at the control room annunciator panel. The "Fire Detection System CPU Power Failure" alarm is located on 1AD13 at location F-3.

The Graphic Operator Interface (GOI) is the man-machine interface with the CPU. The interface has two general functions; to generate and transmit data to the CPU and receive and display data from the CPU. Through the interface the operator can:

* acknowledge alarms
* monitor and respond to system operations
* gain access to the CPU memory to enter and modify the data when necessary.
* reset zones
* view floor plans of specific areas.

2.4. Fireworks EFA Computer

The Fireworks EFA Computer runs the Fireworks software, a Windows-based Graphical User interface. This interface allows the display of ALARM, SUPERVISORY or TROUBLE events, in order of priority, and allows the operator to view, acknowledge, and reset these events.

3.0 SYSTEM OPERATION

3.1. Normal Operation

3.1.1. Limits and Precautions

There are no Limits and Precautions in OP/0/A/6400/002 C or OP/0/A/6400/002 F.

3.2. Abnormal and Emergency Operation

Objectives # 4, 5

Core Four Focus - Procedure Use and Adherence
While discussing the response to the Fire Detection system annunciators below, ***emphasize*** *the following two points related to PU & A:*

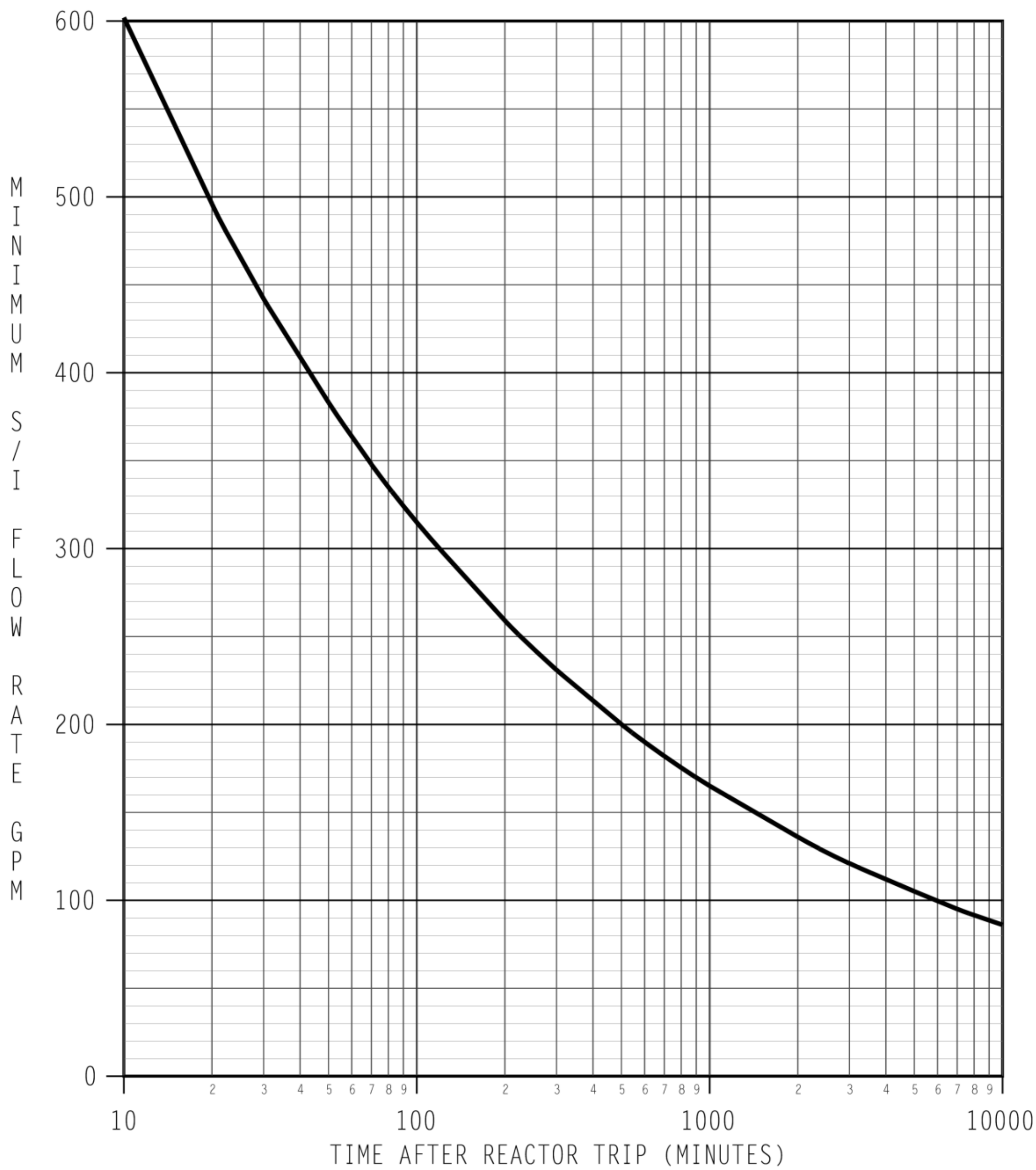
- *If an alarm is received, whether it is due to an actual event or a failed detector, Operators must refer to the ARP and then the respective procedure to respond to the event. This is consistent with the fundamental principle of operating equipment with approved procedures, clearances, or other documents as appropriate to maintain proper configuration control and reduce the potential for operational events.*
- *If a real fire has occurred, the crew will enter the Plant Fires AP. During this time, the responsibility for coordinating the crew's actions to implement the AP falls on the CRS. This is consistent with the CRS attribute to provide direction for implementation of normal and emergency operating procedures.*

There are two annunciators in the Control Room horse shoe area associated with the EFA System. Both of these alarms are on the unit #1 side on panel 1AD13. The first alarm is the "FIRE DET SYS CPU PWR FAILURE", located at F-3. Several immediate and supplementary actions are required to be performed if this annunciator comes in.

Q39 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. **Check if S/I can be terminated:**	
a. Check RVLIS indication: __ • **IF** all NC pumps off, **THEN** check "REACTOR VESSEL LR LEVEL" - GREATER THAN 60%. OR __ • **IF** at least one NC pump on, **THEN** check "REACTOR VESSEL D/P" - GREATER THAN REQUIRED DELTA P FROM Enclosure 7 (Minimum Dynamic RVLIS Indication).	__ a. Observe Caution prior to Step 23 and **GO TO** Step 23.
__ b. NC subcooling based on core exit T/Cs - GREATER THAN 50°F.	b. Perform the following: __ 1) Determine minimum S/I flow required **PER** Enclosure 9 (Flow Required to Match Decay Heat). __ 2) Minimize S/I flow by stopping one or more S/I pumps while maintaining greater than or equal to flow required by Enclosure 9 (Flow Required to Match Decay Heat). __ 3) Observe Caution prior to Step 23 and **GO TO** Step 23.
18. **Reset the following:** __ • Phase A Isolation __ • Phase B Isolation.	

MNS EP/1/A/5000/ECA-1.1 **UNIT 1**	LOSS OF EMERGENCY COOLANT RECIRC Enclosure 9 - Page 1 of 1 **Flow Required to Match Decay Heat**	PAGE NO. 84 of 113 Rev. 17



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B

ILT-16-1 MNS SRO NRC Examination **QUESTION 39** 39

EPE007 EK1.05 - Reactor Trip

Knowledge of the operational implications of the following concepts as they apply to the reactor trip: (CFR 41.8 / 41.10 / 45.3)

Decay power as a function of time ....

Given the following sequence of events on Unit 1:

- 0210 – reactor tripped due to a LOCA
- 0300 – crew enters ECA-1.2, (LOCA Outside Containment)
- 0330 – crew enters ECA-1.1, (Loss of Emergency Coolant Recirc)
- 0350 – The crew is at step 18.b of ECA-1.1

Current conditions at time 0350:

- 1A NI pump is running, indicating 145 GPM
- 1B NI pump is running, indicating 185 GPM
- Both NV pumps are running, indicating 340 GPM (Consider that the NV pumps have equal capacity)
- Subcooling is +35°F

Based on the conditions above, at time 0350:

1) the MINIMUM flow from the ECCS pumps which will match the decay heat removal requirements of ECA-1.1 is ________.

AND

2) to meet the ECCS requirements of ECA-1.1, the crew will ________.

Which ONE (1) of the following completes the statements above?

REFERENCE PROVIDED

A. 1. 310 GPM
2. stop both NI pumps

B. 1. 310 GPM
2. stop the 1B NI pump AND one NV pump

C. 1. 330 GPM
2. stop both NV pumps

D. 1. 330 GPM
2. stop the 1A NI pump AND one NV pump

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ILT-16-1 MNS SRO NRC Examination **QUESTION 39** 39 **B**

General Discussion

Time after trip is 100 minutes, which makes the required flow 310 GPM.

Since the minimum flow required is 310 gpm per Enclosure 9 of ECA-1.1.

If both NI pumps are stopped, the ECCS flow would be 340 GPM which meets the minimum 310 GPM required for decay heat removal.

If the 1A NI pump and ONE NV pump (either pump) is stopped, the ECCS flow would be 315 GPM. This also meets the minumum 310 GPM required for decay heat removal.

However, Step 18.b RNO requires the crew to minimize S/I flow by stopping pumps while maintaining flow greater than that required by Enclosure 9 for decay heat removal. Therefore, the correct action is to stop the 1B NI pump and one NV pump

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is correct.

Part 2 is plausible in that stopping the NI pumps would still meet the flow requirements of Enclosure 9. Additionally, since ECA-1.1 directs stopping S/I pumps to minimize ECCS flow, the applicant could conclude that only the NI pumps could be stopped and not the NV pumps.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant determines uses time from the trip to ECA-1.1 entry for determining the required decay heat removal flow. If so, 330 GPM would be correct.

Part 2 is plausible because stopping both NV pumps would minimize S/I flow and still meet the 330 GPM minimum flow that they determined in Part 1.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant determines uses time from the trip to ECA-1.1 entry for determining the required decay heat removal flow. If so, 330 GPM would be correct.

Part 2 is plausible because stopping the 1A NI pump and one of the NV pumps would meet the 330 GPM minimum flow that they determined in Part 1.

Basis for meeting the KA

The KA is matched because the applicant must determine that the reason for the pump combination chosen is based on both maintaining the minimum required flow required by Enclosure 9 of ECA-1.1 (calculation and reading of graph) while at the same time minimizing S/I flow (following the requirements of the procedure step).

Basis for Hi Cog

This is an analysis question as the applicant must interpret the graph from Enclosure 9 and then determine the correct combination of pumps based on maintaining the minimum required flow while minimizing S/I flow.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2012 MNS NRC Exam Q44 (Bank 5737) MODIFIED

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ILT-16-1 MNS SRO NRC Examination **QUESTION 39** 39 **B**

Development References
REFERENCES: ECA-1.1 Rev 16, Step 18 and Encl 9 - PROVIDED LEARNING OBJECTIVES: OP-MC-EP-EP2 Objective 29

Student References Provided
ECA-1.1 (Step 18) ECA-1.1 (Enclosure 9)

EPE007 EK1.05 - Reactor Trip

Knowledge of the operational implications of the following concepts as they apply to the reactor trip: (CFR 41.8 / 41.10 / 45.3)

Decay power as a function of time ....

Remarks/Status
401-9 Comments: SAT EPE007 EK1.05 K/A is met. drl 2/9/16 Facility Response: NONE

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.11 Pressurizer Power Operated Relief Valves (PORVs)

LCO 3.4.11 Each PORV and associated block valve shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each PORV.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more PORVs inoperable and capable of being manually cycled.	A.1 Close and maintain power to associated block valve.	1 hour
B. One or two PORVs inoperable and not capable of being manually cycled.	------------------NOTE------------------ Required Actions B.1 and B.2 are not applicable to a PORV made inoperable by Required Action C.2. --	
	B.1 Close associated block valves.	1 hour
	AND	
	B.2 Remove power from associated block valves.	1 hour
	AND	

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.3 Restore one PORV to OPERABLE status if two PORVs are inoperable.	72 hours
C. One block valve inoperable.	C.1 Place associated PORV switch in closed position and verify PORV closed. <u>AND</u> C.2 Remove power from associated PORV.	1 hour 1 hour
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. <u>AND</u> D.2 Be in MODE 4.	6 hours 12 hours
E. Three PORVs inoperable and not capable of being manually cycled.	E.1 Close associated block valves. <u>AND</u> E.2 Remove power from associated block valves. <u>AND</u> E.3 Be in MODE 3. <u>AND</u> E.4 Be in MODE 4.	1 hour 1 hour 6 hours 12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Two block valves inoperable.	F.1 Place associated PORV switches in closed position and verify PORVs closed. <u>AND</u> F.2 Restore one block valve to OPERABLE status.	1 hour 72 hours
G. Three block valves inoperable.	G.1 Place associated PORV switches in closed position and verify PORVs closed. <u>AND</u> G.2 Restore one block valve to OPERABLE status.	1 hour 2 hours
H. Required Action and associated Completion Time of Condition F or G not met.	H.1 Be in MODE 3. <u>AND</u> H.2 Be in MODE 4.	6 hours 12 hours

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Pressurizer Safety Valves

LCO 3.4.10 Three pressurizer safety valves shall be OPERABLE with lift settings $\geq$ 2435 psig and $\leq$ 2559 psig.

APPLICABILITY: MODES 1, 2, and 3,
MODE 4 with all RCS cold leg temperatures > 300°F.

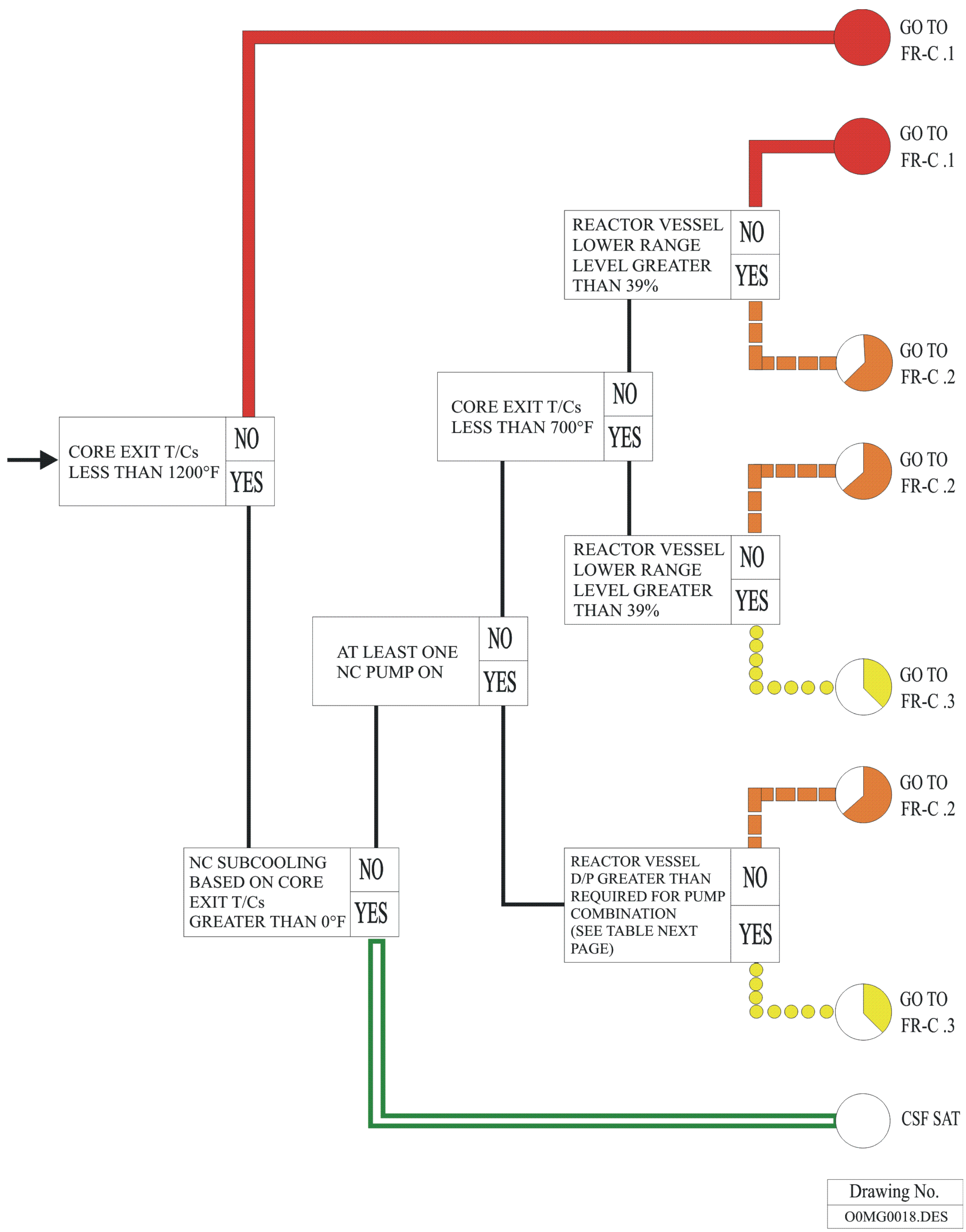
-----------------------------------NOTE-----------------------------------
The lift settings are not required to be within the LCO limits during MODES 3 and 4 for the purpose of setting the pressurizer safety valves under ambient (hot) conditions. This exception is allowed for 54 hours following entry into MODE 3 provided a preliminary cold setting was made prior to heatup.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One pressurizer safety valve inoperable.	A.1 Restore valve to OPERABLE status.	15 minutes
B. Required Action and associated Completion Time not met. OR Two or more pressurizer safety valves inoperable.	B.1 Be in MODE 3. AND B.2 Be in MODE 4 with any RCS cold leg temperatures $\leq$ 300°F.	6 hours 24 hours

Question 41 References

MNS EP/2/A/5000/F-0 **UNIT 2**	CRITICAL SAFETY FUNCTION STATUS TREES Core Cooling - Page 1 of 2	PAGE NO. 4 of 11 Rev. 7



7.16.2 CSF Monitoring

The STA monitors the CSFs and otherwise ensures Core Safety through monitoring of activities and parameters.

- **IF** any single CSF is other than green, the STA will check whether the CSF non-green status is valid or being caused by an invalid input. **IF** the non-green CSF is invalid, the STA will notify the operating crew of the invalidity.
- For Red or Orange path procedures, the STA will immediately notify the operating crew that the condition exists and give the associated functional restoration procedure to the crew to implement as the controlling procedure.
- For Yellow path procedures, the STA will pull the functional restoration procedure and evaluate whether to implement the procedure, with the SM concurrence, as time allows. This evaluation should consider whether the Optimal Recovery procedure is properly addressing the current plant conditions in as timely a manner as the functional restoration procedure.

Once status tree monitoring is initiated, the STA should monitor status trees continuously if an orange or red condition is found to exist. **IF** no condition more serious than yellow is found, monitoring frequency may be reduced to 10-15 minutes, unless some significant change in plant status occurs. Status tree monitoring may be performed using OAC SPDS display or EP/1,2/A/5000/F-0 (Critical Safety Function Status Trees).

IF the STA is **NOT** available, the SM shall assume the STA responsibilities or delegate the STA responsibilities to another licensed operator.

IF the STA and SM are **NOT** available, the CRS, OATC, and BOP share the STA's responsibilities until the responsibilities can be delegated to another licensed operator.

7.16.2.1 SPDS

Normally, the condition of the status trees is continuously monitored and displayed by the OAC. The OAC can be used to check any off-normal alarm and to determine which EP to implement. The entire Control Room crew is responsible for monitoring the SPDS.

The SPDS indication in alarm must be validated using reliable control board indicators prior to implementing CSF procedure.

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EXAM BANK QUESTION: 7357 CNS **D**

A Reactor Trip and Safety Injection have occurred on Unit 1 due to a Loss of Coolant Accident (LOCA).

The following conditions exist:

- Containment pressure is 10 psig and slowly decreasing.
- All NC pumps have been secured.
- NC system subcooling is (-) 50°F (negative value).
- CETs indicate 750°F and increasing.
- Reactor Vessel Lower Range Level (RVLIS) is currently 34% and slowly decreasing.

Which ONE of the following completes the statement below?

The status of Core Cooling is currently.....

A. ORANGE, and will remain ORANGE <u>even if</u> RVLIS increased by 10%.

B. ORANGE, but will be YELLOW <u>if</u> CETs decreased by 100°F.

C. RED, and will remain RED <u>even if</u> CETs decreased by 100°F.

D. RED, but will be ORANGE <u>if</u> RVLIS stabilized at 10% higher.

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EXAM BANK QUESTION: 7357 CNS

D

General Discussion

Per F-0, the Core Cooling Status Tree is currently in Red Path conditions, with RVLIS at its current level (34%). However, if RVLIS were to increase by 10% to 44%, this would be above the decision point (41%) which would constitute an Orange Path condition.

Answer A Discussion

Incorrect. Plausible, if applicant has an incomplete understanding of the parameters involved for Core Cooling Status Tree. In this case, the applicant has placed an incorrect amount of significance on RVLIS, and failed to recognize that the CET temperature given (750°) indicates a Red Path condition initially, not an Orange Path.

Answer B Discussion

Incorrect. Plausible, if applicant has an incomplete understanding of the parameters involved for Core Cooling Status Tree. With CETs at 750°F, and if the temperature decreased by 100°, it may at first appear that the path would change from Orange to Yellow; however, the applicant fails to recognize (or remember the significance of) the RVLIS level at 34%. This level of 34% is the parameter which requires the path to remain Orange, and not change to Yellow.

Answer C Discussion

Incorrect. Plausible, if applicant has an incomplete understanding of the parameters involved for Core Cooling Status Tree. With CETs at 750°F and increasing, the applicant misapplies the guidance in the F-0 and makes an incorrect conclusion that the Red Path will remain Red.

Answer D Discussion

Basis for meeting the KA

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2012 CNS Audit CNS Audit Examination

Development References
F-0, (Critical Safety Function Status Trees), Rev. 8

Student References Provided

KA	KA_desc
SYS017 A2.02	Ability to (a) predict the impacts of the following malfunctions or operations on the ITM system; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)Core damage ....

7.0 ES-1.4, TRANSFER TO HOT LEG RECIRCULATION

7.1 Purpose

This procedure provides the necessary instructions for transferring the safety injection system from cold leg recirculation mode to hot leg recirculation mode. The primary entry into ES-1.4 is from E-1, when 6 hours after event initiation has elapsed. In this case a break in the NC has occurred which is large enough to reduce the NC pressure to less than the shutoff head pressure of the ND pumps. Other entries could come by management directive in the case of smaller breaks or LOCAs complicated by SGTRs. After transfer to hot leg recirc has been completed the operator returns to E-1.

If the break in the NC is small enough such that the NC pressure remains greater than the ND pump shutoff head, a step in E-1 would transfer the operator to ES-1.2. When in ES-1.2, the FWST level could reach the cold leg recirculation switchover setpoint. After performing the switchover to cold leg recirculation, the operator may eventually have to transfer to ES-1.4 when the time for transferring to hot leg recirculation is reached. However, if the plant is on cold leg recirculation and subcooling is restored, there is no need to transfer to ES-1.4. With these NC conditions there would be no significant boiloff from the core or boron buildup in the core. If the plant is on cold leg recirculation and subcooling is less than 0° F, transfer to ES-1.4 at the appropriate time may be necessary. Since this is a long term action, plant management would have to make this evaluation as specified in TSC procedures. After the transfer to hot leg recirculation has been completed, the operator should return to the appropriate step in the procedure, which was being performed when the transition to ES-1.4 was made.

7.2 Symptoms/Entry Conditions

Operator Fundamental Focus; Knowledge and Control
Reinforce *the explanation of* ***why*** *long term core cooling flow is swapped from cold leg recirc to hot leg recirc and how this supports a solid understanding of plant and system design. Emphasize the following principles:*

1. *Done 6 hours after the initiating event.*
2. *Performed to terminate boiling in the core and prevent boron precipitation in the core.*
3. *This action prevents plateout on the fuel cladding which could reduce heat transfer from the fuel to the NC*

ES-1.4 is typically entered from a step in E-1, when the specified time for implementing Hot Leg Recirc has elapsed. This is done six (6) hours after the initiating event. It can also be enetered as directed by station management (TSC) from other procedures after transfer to cold leg recirc has been completed and it is determined that transfer to Hot Leg Recirc is required. Hot leg recirculation is implemented to terminate boiling in the core and to prevent boron precipitation in the core. Following a large cold leg break in the NC, conservative analyses have shown that the boric acid concentration limit established by the NRC (the boric acid solubility limit of 27.53% minus 4% for

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. (Continued)	
__ h. Check steam dumps - IN STEAM PRESSURE MODE.	h. Place steam dumps in steam pressure mode as follows: __ 1) Place "STM PRESS CONTROLLER" in manual. __ 2) Adjust "STM PRESS CONTROLLER" output to equal "STEAM DUMP DEMAND" signal. __ 3) Place "STEAM DUMP SELECT" in steam pressure mode.
__ i. **WHEN** "P-12 LO-LO TAVG" status light (1SI-18) lit, **THEN** place steam dumps in bypass interlock.	
__ j. Dump steam from intact S/G(s) to condenser until S/G pressure(s) are less than NC pressure.	__ j. Dump steam using intact S/G(s) SM PORVs until S/G pressure(s) are less than NC pressure.
__ 18. **Consult with station management to determine if reactor vessel head should be vented.**	
19. **WHEN 4 hours after event initiation has elapsed, THEN dispatch operator to CLOSE breakers for the following valves in preparation for Hot Leg Recirc:** __ • 1NI-121A (Train A NI To B & C Hot Leg) __ • 1NI-162A (NI Pumps Cold Leg Isol) __ • 1NI-152B (Train B NI To A & D Hot Leg) __ • 1NI-173A (1A ND to A & B Cold Legs Cont Outside Isol) __ • 1NI-178B (1B ND to C & D Cold Legs Cont Outside Isol) __ • 1NI-183B (U1 ND to B & C Hot Leg Cont Outside Isol).	

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EXAM BANK QUESTION: 3164 MNS **C**

Unit 1 has experienced a Large Break LOCA.

Which ONE (1) of the following correctly completes the statement below?

The operator should transition to ES-1.4 (Hot Leg Recirculation) ____1____ hours after the event initiation in order to ____2____.

A. (1) 4
(2) terminate core boiling and prevent boron precipitation

B. (1) 4
(2) ensure core cooling if the Containment Sump screens have failed

C. (1) 6
(2) terminate core boiling and prevent boron precipitation

D. (1) 6
(2) ensure core cooling if the Containment Sump screens have failed

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EXAM BANK QUESTION: 3164 MNS **C**

General Discussion

Answer A Discussion

Incorrect. 1st part wrong, 2nd part correct. This is plausible because the operator may incorrectly believe that ES-1.4 is entered four hours after the event initiation, rather than 6 hours.

Answer B Discussion

Incorrect. 1st part wrong, 2nd part wrong. This is plausible because the operator may incorrectly believe that ES-1.4 is entered four hours after the event initiation, rather than 6 hours. Additionally, according to a note at the beginning of the Enclosure 14, of EP/1/A/5000/ECA-1.3 (p103-107; Rev 1), if containment sump screens have failed, fuel assembly bottom nozzles may get blocked, degrading core cooling. If core cooling cannot be maintained, injecting into Hot Legs may be desired. However, Hot Leg injection is different from Hot Leg Recirculation. According to Enclosure 14, both the discharge of the NI and ND Pumps are aligned to the Hot Leg. In Hot leg Recirculation, According to EP/1/A/5000/ES-1.4 (Rev 2), the ND Pumps continue to be aligned to the Cold Legs, While the discharge of the NI Pumps is aligned to the Hot Legs. This plausible because the operator may confuse the concepts of Hot Leg Recirculation and Hot Leg Injection.

Answer C Discussion

Correct. 1st part correct, 2nd part correct. According to EP-E1 (p182; Rev 18), provides the necessary instructions for transferring the safety injection system from cold leg recirculation mode to hot leg recirculation mode. The primary entry into ES-1.4 is from E-1, when 6 hours after event initiation has elapsed. Additionally, according to EP-E1 (p182-184; Rev 18), the purpose of Hot Leg Recirculation is to terminate boiling in the core and to prevent boron precipitation in the core. Following a large cold leg break in the NCS, conservative analyses have shown that the boric acid concentration limit established by the NRC (the boric acid solubility limit of 27.53% minus 4% for conservatism) would be exceeded if cold leg recirculation is maintained for an extended period. The calculation of boric acid concentration in the reactor vessel considers a cold leg break of the reactor coolant system in which steam is generated in the core from decay heat while the boron associated with the boric acid solution is completely separated from the steam and remains in the effective vessel volume. The cold leg safety injection flow is not effective in counteracting this boil off from the core since for larger breaks the downcomer level is low and the injection flow is primarily refilling the downcomer as opposed to the core, and no flushing of the core occurs. If the plant is transferred from cold leg to hot leg recirculation prior to the time the boric acid concentration limit is reached in the reactor vessel, the hot leg safety injection flow will dilute the vessel boron concentration by passing relatively dilute boron solution from the hot leg through the vessel to the cold leg break location and will terminate boil off form the core. This will prevent boron precipitation in the core along with any resultant plate out on the fuel cladding which could reduce heat transfer from the fuel to the reactor coolant.

Answer D Discussion

Incorrect. 1st part correct, 2nd part wrong. According to a note at the beginning of the Enclosure 14, of EP/1/A/5000/ECA-1.3 (p103-107; Rev 1), if containment sump screens have failed, fuel assembly bottom nozzles may get blocked, degrading core cooling. If core cooling cannot be maintained, injecting into Hot Legs may be desired. However, Hot Leg injection is different from Hot Leg Recirculation. According to Enclosure 14, both the discharge of the NI and ND Pumps are aligned to the Hot Leg. In Hot leg Recirculation, According to EP/1/A/5000/ES-1.4 (Rev 2), the ND Pumps continue to be aligned to the Cold Legs, While the discharge of the NI Pumps is aligned to the Hot Legs. This plausible because the operator may confuse the concepts of Hot Leg Recirculation and Hot Leg Injection.

Basis for meeting the KA

The KA is matched because the operator must demonstrate knowledge of the reasons of Hot Leg recirculation (Terminate boil off and Boron concentration/plate out in the core), as it applies to the Large Break LOCA.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	

Development References	Student References Provided

KA	KA_desc
EPE011 EK3.13	Knowledge of the reasons for the following responses as the apply to the Large Break LOCA: (CFR 41.5 / 41.10 / 45.6 / 45.13)Hot-leg injection/recirculation ....

position push-button control switch on the Main Control Board. Motor current indication (amps) is provided just above the control switch.

Reference drawings 7.4 and 7.12. The rotor and stator are of standard construction and cooled by air. Air is drawn in from the surrounding environment, circulated through the windings, and the heated air exiting the motors is passed through air coolers (supplied by Nuclear Service Water System (RN)) before returning to the Containment Building atmosphere. Six resistance temperature detectors (RTDs) are located throughout the stator to sense the winding temperature. One of the six RTDs provides input to Operator Aid Computer (OAC).

Each NCP motor has a space heater installed for keeping the motor warm when not in operation, preventing moisture from collecting inside the motor. The motor heaters are powered from KM and KN.

Reference drawings 7.1 and 7.12. The motors have three oil cooled bearings; upper and lower radial guide bearings maintain motor radial alignment and a double acting Kingsbury Thrust Bearing to accommodate axial thrust in both the upward and downward directions.

Reference drawings 7.1, 7.11, and 7.12. The Upper Bearing Assembly consists of the thrust bearing and a radial guide bearing within a 250 gallon oil reservoir. The thrust bearing has a set of pivoting pads above and below a common runner attached to the motor shaft making it double acting. The lower section of the thrust bearing assumes the weight of all the rotating components of the motor and pump while the NCP is stationary and downward axial thrust during pump operation. The upper section of the thrust bearing will assume upward axial thrust when the pump is started and during pump operation. The outer periphery of the thrust-bearing runner is designed such that centrifugal force during rotation circulates oil through an external oil cooler. The oil is circulated through the external oil cooler and back to the bearings. Oil from the external cooler outlet is sprayed across the upper bearing assembly for cooling and lubrication and then accumulates in the upper bearing assembly reservoir.

The Lower Bearing Assembly consists of a radial guide bearing. The entire bearing assembly is located in the lower oil reservoir (25-gallon capacity).

Reference drawing 7.4. Both the upper bearing external oil cooler and the lower oil reservoir are cooled by the Component Cooling Water System (KC). Cooling water supply to both the upper and lower bearings are provided with high and low flow alarms to alert the operator of abnormal conditions. The upper oil cooler is a double tube-double tube sheet design to prevent water leakage into the oil.

The NCP Oil Level Monitoring System provides a means to remotely monitor the upper and lower reservoir oil levels for each pump. Linear Variable Differential Transformers (LVDTs) are used as level sensors. The LVDTs produce an analog signal used to display actual oil level on an OAC Graphic as well as high and low level alarms. Oil level instrumentation is not safety related.

Reference drawings 7.1 and 7.12. A Flywheel with an anti-reverse rotation device is attached to the shaft above the motor. The primary purpose of the Flywheel (approximately 15,000 lbs) is to provide additional inertia to extend pump coastdown

Q43 References

Nomenclature:	A NC PUMP UPPER MTR BRG LO KC FLO	Window:	B1

Setpoint: 124 gpm decreasing

Origin: 1KCPS5950 (RCP A Motor Upper Brg Outlet Flow)

Probable Cause:
- Instrument failure
- Inadequate KC flow/pressure

Automatic Action: None

Immediate Action:

1. **IF** loss of KC, go to AP/1/A/5500/021 (Loss of KC or KC System Leak).
2. Check open:
   - 1KC-338B (NC Pump Sup Hdr Cont Outside Isol)
   - 1KC-424B (NC Pumps Ret Hdr Cont Inside Isol)
   - 1KC-425A (NC Pumps Ret Hdr Cont Outside Isol)
3. **IF** KC flow inadequate:

   A. Ensure adequate number of KC Pumps running.

   B. Adjust KC flow/pressure.

   C. **IF** low flow still exists, go to AP/1/A/5500/008 (Malfunction of NC Pump).

Supplementary Action: **IF** flow instrument failure:

1. Trend 1A NCP motor bearing temperatures to ensure flow.
2. Refer to Tech Specs.

References:
- MCFD-1573
- Equipment Database
- NSM MG-1-2126
- MGMM-8365

End Of Response

Unit 1

INTRODUCTION

This procedure gives guidance on the actions required in the event of a loss of KC, or leakage on the KC System.

OVERVIEW OF AP/21

AP-21 is written for scenarios involving a loss of KC (like KC pump trips, etc.) and for scenarios involving KC leakage. For either case, the AP first addresses some immediate concerns, like isolating letdown if no KC pumps, making plant page, and securing any dilution.

For scenarios involving a loss of KC not due to leakage, the AP quickly attempts starting the standby KC train (Step 9). It is time critical to restore KC cooling to NC pumps (approx 10 minutes). If cooling is not restored, NC pumps and a reactor trip will be required.

The AP next addresses scenarios involving KC leakage. If KC leakage is small (within design basis of 50 gpm) when makeup is initiated, it should keep up with the leak and avoid the process of header isolations. If the leak is too big for makeup, then the AP goes through a process of header isolations in a preferred order. In any case, the AP ends up with an essential header in operation, and intact non-ess headers in service.

ENTRY CONDITIONS

This procedure can be entered any time the listed symptoms are encountered.

The VCT also provides a means of degasification to the Waste Gas system via 1WG-3 (Unit 1) and 1WG-14 (Unit 2). WG-3 / WG-14 will automatically close upon a low VCT pressure sensed by NVPT 5500 at 14.1 psig. The degasification line also provides for purging the VCT of fission gases by opening WG-3 / WG-14 and the hydrogen supply to the VCT. The fission gasses dissolved in the NC System come out of solution in the VCT and are thus swept to the WG System.

Two (2) level channels monitor the VCT level. If a high level exists in the VCT, letdown may be automatically or manually diverted to RHT. Each Level channel inputs to two (2) 2X Select algorithms. Selected VCT Level 1 signal uses the signal from NVLT-5760 as its normal output. Selected VCT Level 1 signal is the process variable that inputs to the controller for NV-137A. The NV-137A controller setpoint is 66%, and upon Selected VCT level 1 reaching 66% level, NV-137A will begin to modulate to divert letdown flow to the RHT. NV-137A will continue to modulate open until the Selected VCT Level 1 signal reaches 96% at which time the valve should be in the full divert position. The second VCT Level signal (Selected VCT Level 2) which uses the signal from NVLT-5761 as its normal output will send a signal to align NV-137A to full divert on high level (96%). This controller works as a direct acting controller where, as the selected level increases above 66% the output of the controller begins to increase causing NV-137A to divert letdown flow to the RHT. This works directly opposite of the replaced VCT level controller which was an inversely controlled instrument. During normal operation the VCT level is controlled by the Auto Makeup System (matches boron of NCS). Auto makeup is initiated at 41% and is secured at 54% as sensed by Selected VCT Level 1 (the same signal that controls NV-137A modulation). Emergency Low Level (Selected VCT Level 1 and Selected VCT Level 2 - 2/2 transmitters @ 4%) will open FWST supply valves (NV 221A and NV-222B) and close the VCT suction to Charging Pump Valves (NV-141A & NV-142B). First the FWST suction valves start to open, then when the train related FWST suction valve leaves its closed limit the corresponding VCT suction will begin to close. If a deviation of 6% or more exists between the 2 selected levels indications then both will divert to the last known valid indication and will not change. This will prevent any of the automatic actions described above from occurring unless it is already in progress (in this case it would continue). There is an alarm response procedure that will block the failed or invalid instrument and reinstate these actions to be control by the remaining valid instrument.

VCT Temperature is normally controlled by the KC system, which cools the water in the Letdown heat exchanger (KC-132), and the water through the seal water heat exchanger. If KC-132 does not control the temperature of the Letdown heat exchanger, it would be appropriate to open its bypass control valve KC-134. Caution must be exercised to prevent excessive cooling of letdown, which could result in excessive removal of boron by the demineralizer. In the event that the KC system is isolated or not controlled for the seal water heat exchanger, the following would occur: (1) The VCT would approach the Letdown heat exchanger outlet temperature of ≈ 106°F (normally) with letdown flow of ≈ 75 gpm. (2) NC pump seal return and NV pump heat returned will continue to heatup the VCT. Since the mini-flow is not cooled, it will tend to increase the VCT above the letdown temperature until equilibrium is reached between the cooler letdown temperature and the hotter seal return/mini-flow.

This is important for the operator to know to help in diagnosing NCP seal failures or assessing No. 1 seal condition.

Chart Recorders

Boric Acid Flow – Total Blender

AD-7 Annunciator Alarms

VCT Hi Temperature	116°F
VCT Abnormal Pressure	14.1 psig / 65 psig
VCT Abnormal Level	16% / 96%
Charging Line Demand Low Flow	38 gpm
Charging Line Abnormal Flow	58 gpm / 150 gpm
Excess Letdown HX Hi Flow (KC)	275 gpm
Letdown HX Outlet Hi Flow	130 gpm
Letdown HX Outlet Hi Pressure	506 psig
Letdown HX Outlet Hi Temperature	120°F
Excess Letdown HX Hi Temperature	176°F
Regen HX Letdown Hi Temperature	395°F
Boric Acid Flow Deviation	0.8 gpm deviation Hi/Lo (for > 20 sec)
Letdown Relief Hi Temperature	140°F
NC Pump Seal Injection Low Flow	7 gpm
BABT Hi Temperature	120°F
BAT Abnormal Temperature	70°F / 145°F
BAT Empty	13%
BAT Abnormal Level	49% / 96%
BAT Low-Low Level	38%
Seal Water Injection Filter Hi D/P	40 psid

SI-8 Status Indication

NV Pump A Speed Reducer & Brg Oil Cooler Lo Flow

NV Pump B Speed Reducer & Brg Oil Cooler Lo Flow

NV Pump A Aux Lube Oil Pump Running

NV Pump B Aux Lube Oil Pump Running

Manual Loaders

NV-26B, Excess Letdown Heat Exchanger Outlet Press Control

NV-241, Seal Injection Flow Control

selected, the process is started by actuating the "NC System Makeup" switch. Following is a discussion of each of the makeup control modes.

Automatic Makeup

Objective # 5

The automatic makeup mode of operation provides dilute boric acid solution, preset to match the boron concentration in the NC System. Automatic makeup compensates for minor leakage of reactor coolant without causing significant changes in the coolant boron concentration. It operates on a demand signals from Selected VCT Level 1.

With the M/U Controller switch set to "Automatic Makeup", the BA Flow Control NV-267A (on the DCS Graphic - NVMU Boric Acid Blender or its SLIMs station) and the Rx M/U Water Flow Control NV-252A (on the DCS Graphic - NVMU Boric Acid Blender or its SLIMs station) are set to give the same concentration of borated water as contained in the NC System. Actuation of the makeup start switch will arm the automatic makeup mode.

A preset low level signal (41%) from Selected VCT Level 1 causes the automatic makeup control process to start a selected Reactor Makeup Water Pump (RMWP) and start a Boric Acid Transfer Pump (BATP). At the same time as this is occurring, the makeup stop valve NV-175A, BA Flow Control valve NV-267A, and Rx M/U Water Flow Control valve NV-252A will start to open. The BA Flow Control and the Rx M/U Water Flow Control are normally set to ensure makeup water to the VCT is at the same boron concentration as the NC system at the time of makeup. The total flow rate in automatic is the combination of the flow setpoints for the BA Flow Control and the Rx M/U Water Flow Control and should be set so that the sum is equal to 90 gpm. Actual flow is the combination of BA Flow from NV-252A and Rx M/U Water Flow from NV-267A. The operator can select manual and increase the total flow.

Auto makeup addition increases the water level in the VCT. At a preset high level setpoint (54%), the RMWP and the BATP stop and valves NV-252A, NV-267A, and NV-175A close. The automatic makeup operation may be terminated at any time by actuating the makeup "STOP" switch.

Flow Counters

The quantities of boric acid and blended makeup water (boric acid plus primary reactor makeup water) injected are totalized and displayed by Flow Counters located on 1MC10. These Totalizers are driven by flow transmitters NVFT5450 and NVFT-8410 respectively. When the counters reach preset values on the Totalizers, the boric acid and/or the reactor water makeup operation is automatically secured. (NOTE: When "NC Sys M/U Controller" is in "Auto", the integrator counters are bypassed, preventing automatic makeup termination.) Deviation alarms for both boric acid (0.8 gpm) and reactor makeup water (8.0 gpm) are provided if flow rates deviate from setpoints (AD7, I3 and AD6, F13 respectively).

Dilute

Objective # 5

The dilute mode of operation permits the addition of a preselected quantity of reactor makeup water at a preselected flow rate to the NC System.

With the M/U Controller switch set to "DILUTE", the "Reactor Makeup Water Flow Control" (NV-252A) setpoint is adjusted on the SLIMs station or the DCS Graphic "NVMU- Boric Acid Blender" graphic page. After selecting the page and clicking on the NV-252A Icon, the popup of "Rx M/U Water Control" will come up on the screen. The setpoint is then adjusted to the desired flow rate and the Total Makeup Flow Counter is set to the desired quantity. Actuation of the makeup start switch will then initiate the dilute mode. A selected RMWP starts, the makeup stop valve NV-171A and Rx M/U Water Control valve NV-252A open. The makeup water is injected through the spray nozzle into the VCT, which supplies to the NV Pump suction header. Excessive rise of the VCT water level is prevented by automatic actuation of three-way diversion valve NV-137A (by the VCT level controller, which gets a signal from Selected VCT Level 1). Actuation of NV-137A diverts the reactor coolant letdown flow to the recycle holdup tanks.

When the preset quantity of reactor makeup water has been added, the Total Makeup Flow Counter signal will cause the RMWP to stop and the NV-171A and NV-252A valves to close. The dilute mode of operation may be terminated at any time by actuating the makeup "STOP" selector switch.

Alternate Dilute

Objective # 5

The alternate dilute mode is similar to the dilute mode except that a portion of the dilution water flows directly to the NV Pump suction header and the remainder sprays into the VCT. With the M/U Controller switch set to "ALTERNATE DILUTE", "Rx M/U Water Flow" (NV-252A) setpoint is adjusted on the SLIMs station or the DCS Graphic "NVMU- Boric Acid Blender" graphic page. After selecting the page and clicking on the NV-252A Icon, the popup of "Rx M/U Water Control" will come up on the screen. The setpoint is then adjusted to the desired flow rate and the Total Makeup Flow Counter is set to the desired quantity. Actuation of the makeup start switch will initiate the alternate dilute mode. A selected RMWP starts, makeup stop valve NV-171A, blender discharge to VCT outlet valve NV-175A, and "Rx M/U Water Control" NV-252A open. VCT level is controlled by diversion as described in the Dilute section above.

When the preset quantity of reactor makeup water has been added, the Total Makeup Flow Counter signal will cause the RMWP to stop and the NV-171A, NV-175A and NV-252A valves to close. The alternate dilute mode of operation may be terminated at any time by actuating the makeup "STOP" selector switch.

Borate

Nomenclature: **VCT ABNORMAL LVL** Window: **D3**

Setpoint:
- High: 96%
- Low: 16%

Origin: Redundant level sensors monitoring VCT level (1NVLT-5760 or 1NVLT-5761) via DCS digital outputs as follows:

- VCT Level Select 1 (NVDJ 5761 (HI) and NVDJ 5760 (LO))
- VCT Level Select 2 (NVDJ 5766 (HI) and NVDJ 5765 (LO))

Probable Cause:

High: 1NV-137A (NC Filters Otlt 3-Way Cntrl) malfunction and continuous operation of Reactor Coolant Makeup System

Low:
- Makeup system **NOT** operating properly **AND** 1NV-137A (NC Filters Otlt 3-Way Cntrl) malfunction
- NC System Leak

Automatic Action:

1. Automatic makeup controlled between 41-54%
2. At 4% level:
   - 1NV-221A (Unit 1 NV Pump Suction From FWST Isol) opens
   - 1NV-222B (Unit 1 NV Pump Suction From FWST Isol) opens
   - 1NV-141A (Unit 1 VCT Outlet Isol) closes
   - 1NV-142B (Unit 1 VCT Outlet Isol) closes

Immediate Action:

1. Determine if level is high or low.
2. **IF** VCT level high:
   A. Secure makeup.
   B. Ensure 1NV-137 (NC Filters Otlt 3-Way Cntrl) is operating correctly.

Continue On Next Page

3. **IF** VCT level low:

   A. Initiate makeup to VCT.

   B. Ensure 1NV-137 (NC Filters Otlt 3-Way Cntrl) is in "VCT" position.

   C. **IF AT ANY TIME** VCT level goes below 16% with NV Pump suction aligned to VCT **AND** efforts to restore VCT level prior to approaching 4% have been unsuccessful, **THEN** perform the following:

      1. Notify SRO.

      2. Open:

         - 1NV-221A (Unit 1 NV Pump Suction From FWST Isol)
         - 1NV-222B (Unit 1 NV Pump Suction From FWST Isol)

      3. Close:

         - 1NV-141A (Unit 1 VCT Outlet Isol)
         - 1NV-142B (Unit 1 VCT Outlet Isol)

      4. **IF** Turbine on line,
         THEN reduce turbine load to maintain T-Avg at T-Ref.

   D. **IF AT ANY TIME** indication approaches 4%, ensure NV pump suction swapped to FWST.

   E. **IF** VCT level low due to NC System leakage, go to AP/1/A/5500/010 (NC System Leakage Within The Capacity of Both NV Pumps).

Supplementary Action: **IF** a system malfunction occurs, determine cause and notify SRO.

References:
- MCFD-1554-2.0
- MCID-1499-NV.25
- DCS Control Builder Sheet 302, Drop 6
- DCS Control Builder Sheet 317, Drop 7

End Of Response

Unit 1

A. **Purpose**

Identify the appropriate actions for the following events:

- Loss of operating ND pump
- ND System leak
- ND flow control valve failures.

CAUTION

- **Use of a makeup path which contains a known NC System opening such as CLA check valve removed or S/G primary manway/nozzle dam removed, may reduce flow through the core.**
- **If no cold leg openings exist, a cold leg injection flow path may be preferable for purposes of removing decay heat.**
- **ND pumps must be off to use 1ND-35 (Unit 1 ND to FWST Isol) as a makeup flowpath.**

NOTE

- Makeup flow paths are not listed in any order of preference. NC System pressure, desired flow rate, and availability as noted in the Shift Supervisor checklist should be considered when making selection.
- If loss of all AC power event in progress, consider using gravity makeup initially while concurrently pursuing FLEX Hale pump makeup.
- If gravity makeup is desired, 1FW-27A is the preferred option, assuming power is available to the valve. If local operation is required, 1ND-35 (Unit 1 ND to FWST Isol) is an alternate, high volume makeup option that is easier to access than 1FW-27A.

__ 1. **Select desired makeup flowpath and initiate makeup PER indicated enclosure or procedure.**

MAKEUP FLOW PATHS					
FLOW PATH	FLOW	PRESSURE	INJECT TO	NOTE	Enclosure or Procedure
1FW-27A - Gravity	High	Low	C Hot Leg		4
NV Pumps - S/I Flowpath	High	High	Cold Legs		5
NI Pumps	High	High	Hot or Cold Leg		6
NV Pumps - Normal Charging	200 GPM	High	A or D Cold Leg		7
1ND-35, 1NI-173A - Gravity	High	Low	A & B Cold Leg	Local	8
1ND-35, 1NI-178B - Gravity	High	Low	C & D Cold Leg	Local	9
1ND-35, 1NI-183B - Gravity	High	Low	B & C Hot Leg	Local	10
VCT Overpressure	Low	Low	A or D Cold Leg		11
FWST - Gravity Charging	Low	Low	A or D Cold Leg		12
PD Pump	Low	High	A or D Cold Leg		13
Hale Medium Pressure Pump (limited to ECA-0.0 events)	300 GPM	400 PSIG	Cold Legs	Local	FSG-1
Hale High Pressure Pump (limited to ECA-0.0 events)	40 GPM	1550 PSIG	Cold Legs	Local	FSG-1

__ 1. **Ensure NC System is vented.**

__ 2. **Dispatch operator to lift white tag, unlock, and stand by 1ND-35 (Unit 1 ND to FWST Isol) (aux bldg, 750+7, KK-52, just outside 1B ND/NS Hx room).**

__ 3. **Ensure OPEN from Control Room or dispatch operator to OPEN, 1NI-173A (1A ND to A & B Cold Legs Cont Outside Isol) (aux bldg, 716+21, GG-52, room 602, midget hole near reactor bldg wall above ledge, 4 ft south of GG-52 near VCT area).**

__ 4. **Ensure OPEN from Control Room or dispatch operator to OPEN, 1ND-30A (1A ND To 1B & 1C NC Hotlegs Isol) (aux bldg, 733+4, LL-52, room 733, ND heat exchanger room 1A, 1 ft from east, 8 ft from south).**

__ 5. **Ensure ND pumps off.**

NOTE

- This enclosure isolates ND pump suction from NC System to eliminate potential for diversion of hot NC System inventory into ECCS FW suction line if NC pressure goes up.
- Local actions are not required if valves in Steps 6 and 7 do not close. Contingencies are provided in later steps.

6. **CLOSE the following valves:**

   __ • 1ND-19A (1A ND Pump Suction From FWST or NC Isol)

   __ • 1ND-4B (1B ND Pump Suction From FWST or NC Isol).

7. **IF 1ND-19A (1A ND Pump Suction From FWST or NC Isol) OR 1ND-4B (1B ND Pump Suction From FWST or NC Isol) is open, THEN perform the following:**

   __ • CLOSE 1ND-33 (1A ND Hx Byp Isol).

   __ • CLOSE 1ND-18 (1B ND Hx Bypass).

   • IF VI pressure greater than 40 PSIG, THEN CLOSE the following valves:

     __ • 1ND-29A (1A ND Hx Outlet Isol)

     __ • 1ND-34 (1A & 1B ND Hx Byp Isol)

     __ • 1ND-14B (1B ND Hx Outlet Isol).

__ 8. **Have operator THROTTLE OPEN 1ND-35 (Unit 1 ND to FWST Isol) for desired flow.**

Duke Energy
McGuire Nuclear Station

Background Document
for

AP/1 & 2/A/5500/019 (Loss of ND or ND System Leakage)

S. Hackney / **7**/15/15
Prepared by Date

/
Reviewed by Date

/
Additional Review by Date

/
Additional Review by Date

/
Approved by Date

INTRODUCTION

AP/19 provides the actions necessary to maintain core cooling and to protect the core in the event of (1) a loss of ND pump flow or (2) a leak on the ND System or (3) failure of ND control valve.

Summary

This procedure provides guidance to the operator in responding to the above abnormal conditions. The actions do not defeat any safety functions or prevent the required operational features of any safety system from performing as required

If ND flow is rapidly restored, the operator can terminate this AP and return to the appropriate procedure for existing plant conditions. If ND flow cannot be rapidly restored, the operator starts trending core exit T/Cs and initiates contingency recovery actions while trying to return ND to service. The major action categories in this AP are:

1) Protect the ND pumps

2) Address containment related concerns

3) Check if adequate heat sink or quick restart of ND available

4) Establish alternate means of decay heat removal

5) Establish support conditions and restore ND.

ENTRY CONDITIONS

Entry to this procedure will occur if (1) there are symptoms of a leak on ND, or (2) the ND pumps have tripped, or (3) ND flow is going up or down in an uncontrolled manner, or (4) other symptoms requiring the tripping of the ND pumps.

SUMMARY FOR ENCLOSURE 3, NC SYSTEM MAKEUP DURING LOSS OF ND

This enclosure can be entered from many points in the AP, whenever NC makeup is required or desired. The purpose of this enclosure is provide a list of some makeup options, with some of the criteria that can be used to help evaluate which of the makeup options may be most effective. In some cases, the steps in the body of AP or enclosures might directly specify a makeup enclosure to go to directly, or may offer their own criteria to use in addition to the ones provided here, to use in the evaluation.

The main point of emphasis for use of this enclosure is it is an aid to help the operator determine the desired makeup flow path. It does not specify any given makeup option as preferred. Because this AP can be entered from many different operating modes, NC System configuration conditions, support system configuration conditions, leak size and locations, and availability of makeup sources; the operator must consider all factors to arrive at the optimum makeup flow path and flow rate. In many cases, the amount of makeup flow desired is specified at the point in the procedure the operator is directed to this enclosure.

CAUTION 1:
In general, it is not preferred to select a makeup flow path that contains a known opening since a loss of some of the inventory through the opening will not be effective in core cooling. Related to this is if flow rate is raised to compensate, the makeup source will be depleted at a faster rate.

CAUTION 2:
If no cold leg openings exist, then cold leg injection is preferable to hot leg injection. The most effective cooling flow path is into the bottom of the core (from the cold legs) and out the top (hot legs).

CAUTION 3:
ND-35 uses the elevation difference to gravity feed from FWST, back through ND discharge, and into the NC System. If ND Pumps are on, FWST gravity feed can't overcome ND discharge pressure. In addition to not making up, the ND Pumps could also be pumping out NC inventory to the FWST.

makeup using NV Pumps through S/I flowpath cannot be used with normal charging aligned, since NV pump runout may occur.

SUMMARY FOR ENCLOSURE 8, MAKEUP BY GRAVITY THROUGH ND-35 AND ND-173A

The purpose of the note at the beginning of this enclosure is to inform operators of the compatibility issues that exist between this makeup option and the enclosures that start an ND pump. ND-35 must be closed prior to starting an ND pump to prevent pumping water from the NC system back to the FWST. In addition, other valves in this enclosure must be realigned out of their makeup alignment to support ND pump operation. The operator needs to be aware that if continuous makeup is required (e.g. if a leak exists), an additional makeup option may be needed, since the ND pump startup enclosure will isolate this flowpath just prior to starting an ND pump.

As noted in the table in the enclosure with the makeup options, the characteristics for this flow path are high volume, low pressure (NC System vented) and injects into cold legs ("A" & "B"). This enclosure may be best used for scenarios involving a loss of inventory in excess of normal charging capacity and with NC not pressurized above atmospheric, and without NC cold leg loss of inventory type events. The expected flow rate via this pathway may be in the neighborhood of 850 gpm with NC pressure 0 psig, and 670 gpm with NC pressure 10 psig (calc MCC-1223.11-00-0006, via the ND-35/NI-183 pathway) assuming a similar flowrate.

The flow path utilized is flow from the FWST, back through ND-35, forward flow through ND-30A, and forward flow through NI-173A, to "A" & "B" Cold leg.

This enclosure ensures the ND pumps are off, consistent with the caution in the enclosure 3. If ND pumps were allowed to run with ND-35 open, a loss of NC inventory outside containment (to the FWST) could occur. A cue is provided to immediately stop any ND pump that has inadvertently started.

One other consideration in the use of this enclosure is ND-35 is a manual local valve. Since ND-35 is locally throttled to the necessary makeup flow, it can't be performed solely from the control room.

SUMMARY FOR ENCLOSURE 9, MAKEUP BY GRAVITY THROUGH ND-35 AND ND-178B

The purpose of the note at the beginning of this enclosure is to inform operators of the compatibility issues that exist between this makeup option and the enclosures that start an ND pump. ND-35 must be closed prior to starting an ND pump to prevent pumping water from the NC system back to the FWST. In addition, other valves in this enclosure must be realigned out of their makeup alignment to support ND pump operation. The operator needs to be aware that if continuous makeup is required (e.g. if a leak exists), an additional makeup option may be needed, since the ND pump startup enclosure will isolate this flowpath just prior to starting an ND pump.

FOR REVIEW ONLY - DO NOT DISTRIBUTE

EXAM BANK QUESTION: 7244 MNS **C**

Given the following Unit 1 conditions:

- The Unit is in Mode 6
- NC System WR level is at 70% and decreasing
- AP/1/A/5500/019 (Loss of Residual Heat Removal System) has been implemented
- The CRS has decided to makeup to the NC system using gravity feed through 1ND-33 (ND System Return to FWST) and 1NI-173A (ND Hdr 1A To Cold Legs C&D)

In accordance with AP-19:

Flow to the NC system will be established by throttling 1ND-33 _____(1)_____.

ND pump operation is not allowed with 1ND-33 OPEN because _____(2)_____ will occur.

Which ONE (1) of the following completes the statements above?

A. 1. from the Control Room
   2. a loss of NC system inventory outside containment

B. 1. from the Control Room
   2. ND pump runout conditions

C. 1. locally
   2. a loss of NC system inventory outside containment

D. 1. locally
   2. ND pump runout conditions

FOR REVIEW ONLY - DO NOT DISTRIBUTE

EXAM BANK QUESTION: 7244 MNS C

General Discussion

AP-19 enclosure 8 states, since ND-33 is locally throttled to the necessary makeup flow, it can't be performed solely from the control room.

This enclosure ensures the ND pumps are off, consistent with the caution in enclosure 3. If ND pumps were allowed to run with ND-33 open, a loss of NC inventory outside containment (to the FWST) could occur.

Answer A Discussion

Part 1 is plausible because all other valves that would align NC system flow via ND to the cold legs are control room operated valves.

Part 2 is correct.

Answer B Discussion

Part 1 is plausible because all other valves that would align ND to the cold legs are control room operated valves.

Part 2 is plausible because having 1ND-33 and 1NI-173A open would provide multiple discharge flowpaths for the running ND pump.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

Part 1 is correct.

Part 2 is plausible because having 1ND-33 and 1NI-173A open would provide multiple discharge flowpaths for the running ND pump.

Basis for meeting the KA

The KA is matched because the applicant is required to have knowledge of a task that is performed locally during the implementation of AP-19 (Loss of ND) and the resultant operational effects of performing this task.

Basis for Hi Cog

This question is higher cognitive because the applicant must perform more than one mental step to correctly answer it. The applicant must first recall from memory where 1ND-33 can be operated from and then have a thorough understanding of system design and flowpath to be determine what undesired circumstances could arise from operating an ND pump with 1ND-33 open.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT-17 CNS Audit Examination

Development References

REFERENCES:
AP-19 (Loss of ND or ND System Leakage) Rev 29
AP-19 (Loss of ND or ND System Leakage) Bckgd doc, pg 36 of 54 Rev 17

LEARNING OBJECTIVES:
NONE

Student References Provided

KA	KA_desc
APE025 2.4.35	APE025 GENERICKnowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. (CFR: 41.10 / 43.5 / 45.13)

1.0 INTRODUCTION

1.1 Purpose

1.1.1 Introduce the Objectives

1.1.2 Describe the Evaluation method

Objective # 1

1.1.3 Purpose - the Component Cooling Water System (KC) supplies cooling water to various essential and non-essential heat exchangers within the Auxiliary and Reactor Buildings and serves as a boundary (buffer) between the Reactor Coolant and Nuclear Service Water Systems.

1.2 General Description

Objective # 2

Instructor Note: Students will be required to draw a simplified system diagram as shown on drawing 7.2. The students should refer to Drawing 7.2 as needed.

1.2.1 The KC System consists of four pumps (2 per train), two heat exchangers (1 per train), one surge tank (shared by two trains) and associated valves, piping and instrumentation.

1.2.2 A drain tank, drain tank pump and standby drain tank pump are shared by the two units.

Objective #3

1.2.3 Each train is always aligned to supply its own Engineered Safeguards Header which includes the ND Heat Exchanger (normally isolated unless ND is in service) and ND Pump Mechanical Seal Heat Exchanger. Along with its safeguards header, one of the two trains will supply the non-essential headers.

Auxiliary Building Header

- ***H_2 Recombiners***
- **Waste Gas Compressors**
- **Recycle Evaporator Packages**
- **S/G Blowdown Sample Heat Exchangers**
- **ND Sample Heat Exchanger**
- **Pressurizer Sample Heat Exchanger**
- **NC Loop Sample Heat Exchanger**
- **Letdown Heat Exchanger**
- **Seal Water Heat Exchanger**
- **Fuel Pool Cooling Heat Exchangers**

2.3.5 An annunciator "KC Surge Tk LVL Abnormal" is provided to indicate high (7 ft, 2 in.) and low (4.0 ft.) level conditions.

Objective #6

2.3.6 Make up supply to surge tank is normally from the YM System, with a backup supply from the RN System.

2.3.7 The KC Surge Tank serves the following purposes:

- Accommodates for thermal expansion and contraction
- Provides time for the operator to respond in the event of in-leakage or out-leakage
- Provides NPSH for KC Pumps
- Provides the ability to recirculate through the surge tank to ensure uniform chemistry concentrations

2.4 Component Cooling Drain Tank and Pump

2.4.1 KC Drain Tank - To minimize makeup and waste handling of treated water, system drains are piped to the KC drain tank.

2.4.2 One drain tank is shared by both units.

2.4.3 The tank is constructed primarily of stainless steel due to potential exposure to the atmosphere.

2.4.4 The tank is then pumped back to the KC surge tank. Local level indication is available near the tank (0-100%).

2.4.5 KC Drain Tank Pump - The pump discharge can be aligned to either unit's KC surge tank.

2.4.6 The pump controls are located in the Control Room.

2.4.7 In automatic, the pump automatically starts on high drain tank level, and automatically stops on tank low level.

2.4.8 In manual the pump is started and stopped at the operators discretion.

Objective #7

2.4.9 The pump/motor is powered from SMXA Cmpt. R1I (600 VAC).

2.4.10 A standby drain pump was installed as a backup to the permanently installed pump.

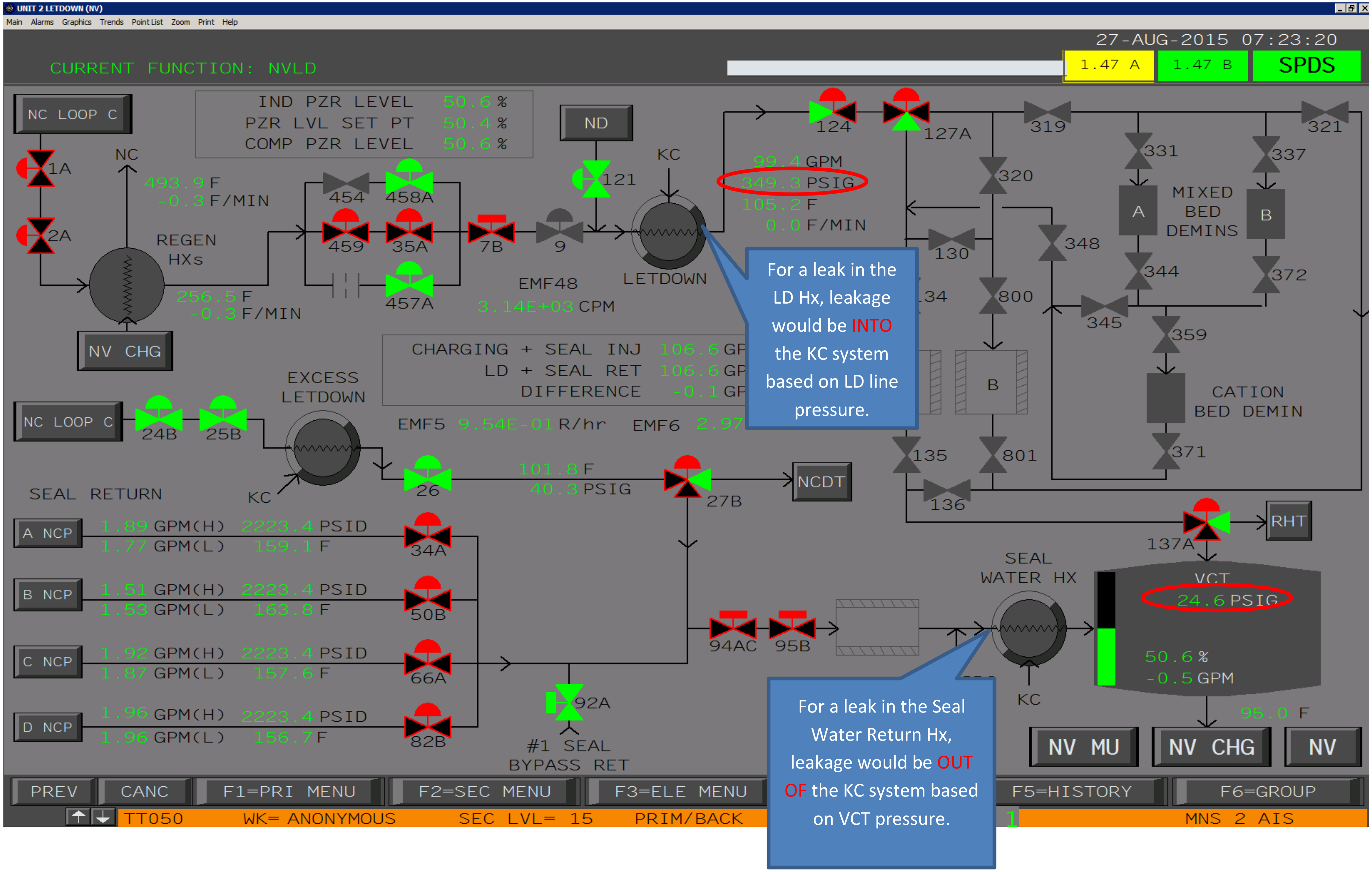
2.4.11 The pump/motor power supply is 120 VAC from a nearby wall outlet.

2.4.12 The pump must be manually connected to the KC System (using pre-staged rubber hoses).

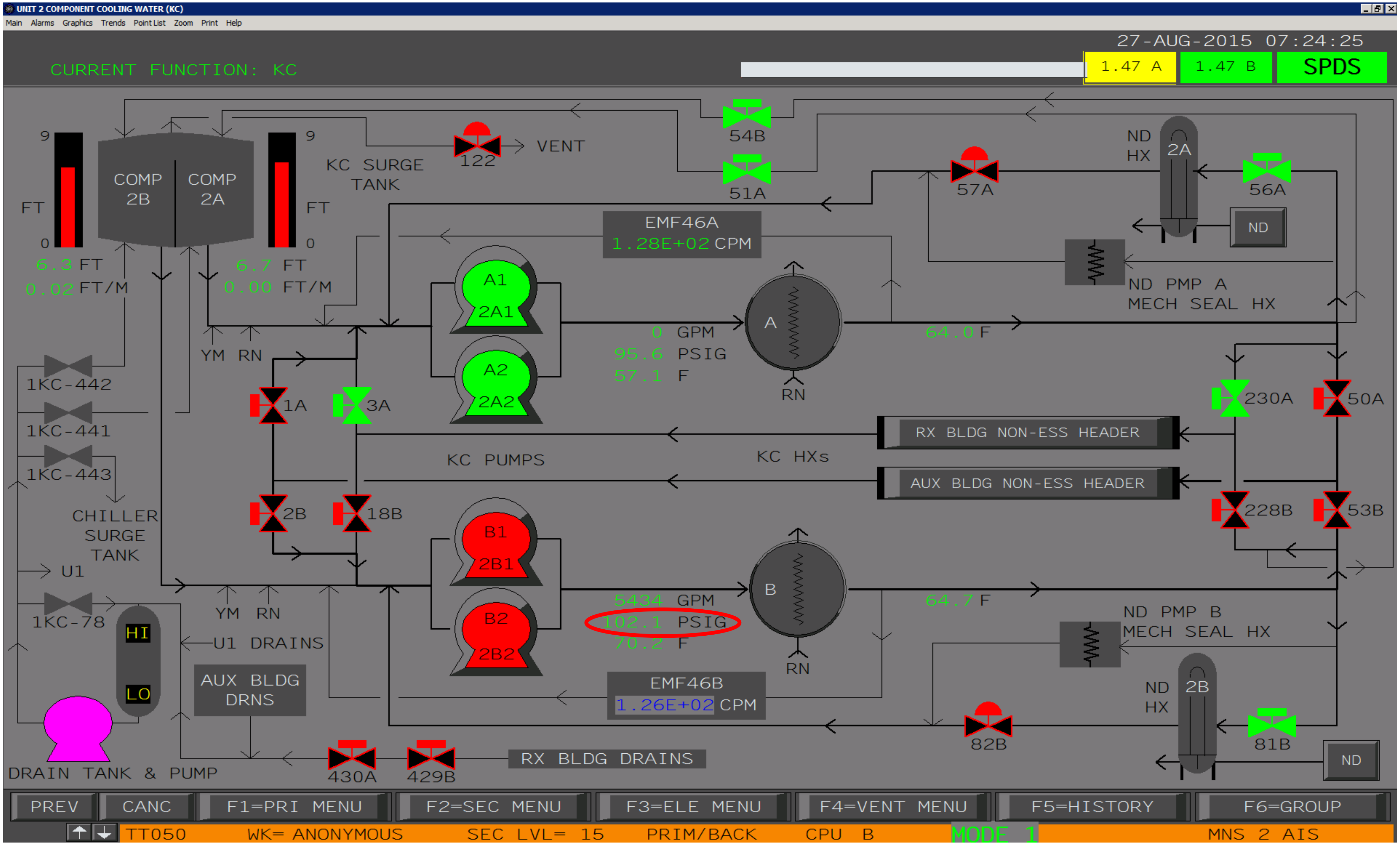
2.4.13 The pump must be manually operated by plugging the pump in (e.g., when the drain tank high level alarm is received), and unplugging it when no longer needed (e.g., when the drain tank reaches its low level alarm setpont).

2.4.14 It is scheduled to be run annually per the Routine Operations Task List. This may be waived if it has been run in the previous year.

Q46 References



Q46 References



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ILT-16-1 MNS SRO NRC Examination **QUESTION 44** 44

APE026 AA2.02 - Loss of Component Cooling Water (CCW)
Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: (CFR: 43.5 / 45.13)
The cause of possible CCW loss ....

Given the following conditions on Unit 2:

- KC Surge Tank level is lowering slowly
- The crew has implemented AP-21 (LOSS OF KC OR KC SYSTEM LEAKAGE)

Based on the conditions above, a possible location of the KC system leakage is into the ___(1)___ heat exchanger.

The assured supply of makeup water to the KC Surge tank is ___(2)___ .

Which ONE (1) of the following completes the statements above?

A. 1. Letdown
2. YM

B. 1. Letdown
2. RN

C. 1. Seal Water Return
2. YM

D. 1. Seal Water Return
2. RN

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ILT-16-1 MNS SRO NRC Examination **QUESTION 44** 44 **D**

General Discussion

KC system leakage into the seal water return heat exchanger is a possible leak location due to KC system pressure being maintained at 100-110 psig and the seal water return header being maintained at VCT pressure of 25-30 psig.

Normal makeup water supply to the KC Surge Tank is YM. The assured water supply is from RN.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible since KC cools the letdown Hx and is letdown pressure is relatively low, however normal letdown pressure is greater than KC system pressure.

Second part is plausible because YM is the source of normal makeup for the KC Surge Tank..

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible since KC cools the letdown Hx and is letdown pressure is relatively low, however normal letdown pressure is greater than KC system pressure.

Second part is correct and therefore plausible.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct and therefore plausible.

Second part is plausible because YM is the source of normal makeup for the KC Surge tank.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The KA is matched because the applicant is required to determine from the information and choices given the cause of the KC system leakage.

Basis for Hi Cog

This is a high cog question because the applicant is required to analyze the data given and perform a calculation to determine the KC surge tank level rate of decrease and then recall from memory whether or not YM is capable of keeping up with the leakage.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
Lesson Plan OP-MC-PSS-KC (Component Cooling Water System) Rev 29B

LEARNING OBJECTIVES:
OP-MC-PSS-KC Objective 12

Student References Provided

APE026 AA2.02 - Loss of Component Cooling Water (CCW)
Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: (CFR: 43.5 / 45.13)
The cause of possible CCW loss ....

Remarks/Status

401-9 Comments: SAT

APE026 AA2.02
K/A is met. drl 2/9/16

Facility Response: NONE

the wet reference legs of the pressurizer level transmitters channels 1 through 3. (See drawing 7.3 Pressurizer Pressure and Level Indication for specifics.) Each channel is displayed on the MCB, with CH 1 also displayed on the Auxiliary Shutdown Panel (ASP). Most control and alarm functions are normally provided from Selected Pressurizer Pressure 1 or Selected Pressurizer Pressure 2. The pressurizer pressure control signals are developed using a Median Select Second Highest algorithm. The Selected pressurizer pressure signal is displayed on the pressurizer pressure recorder.

2.2 Pressurizer Pressure Control Signals

Objective # 2, 8

Refer to Drawing 7.3, Composite Pressurizer Pressure Control. The Pressure Control Signals are developed using a Median Select Second Highest Algorithms receiving input from the available pressurizer pressure channels. Selected Pressurizer Pressure 1, inputs to the Pressurizer Master Controller (heaters, sprays, Low/Hi Press Dev. Annunciators, & PORV NC-34A), the MCB Recorder, and the Low Pressure Interlock for PORV's NC-32B and NC-36B(2185 psig). Selected Pressurizer Pressure 2, inputs the pressure signal to PORV's NC 32B and NC-36B (lift setpoint) 2335 psig, the High pressure alarm (setpoint 2310 psig) and the Low Pressure Interlock for NC-34A (setpoint 2185 psig).

2.3 Pressurizer Pressure Master Controller

The Pressurizer Pressure Master Controller (Soft Panel Only) compares actual pressure (Median Select 2nd Highest) with a reference pressure. The reference pressure is entered on the graphic soft controller. Refer to Drawing 7.13, PZR Pressure Control DCS Graphic. Using the PZR PRESS MASTER Pop-up on the PZR Pressure Control Graphic, the operator will depress the “A” button and using the "Increase/Decrease" pushbuttons underneath can adjust the setpoint to the desired value. The range of the Master controller is 1700 to 2335 psig with the normal setpoint being 2235 psig. The difference between actual pressure and reference pressure generates a pressure error. Depending on the size and polarity of the error, the Pressurizer Pressure Master will cause various control functions to actuate in attempts to restore actual pressure back to the reference value.

2.3.1 Signal Conditioning

The output of the Actual vs Setpoint comparison is conditioned by a proportional/integral circuit. The proportional part of the circuit generates an output equal to the amount of offset (actual minus reference). The integral part of the circuit boosts the output in the direction of the offset, depending on how long the offset exists. The intention of the integral function is to return the controlled parameter to (or close to) the desired setpoint.

Objective #5

The integral function can come into play during steady state operation. During normal operation if a set of backup heater are turned on, (normally NOT required to make up for ambient losses), pressure will start to slowly increase. With no integral, the pressure would increase to 2260 psig, with a corresponding controller output of 25 psig (Error)

where sprays would begin to open. With the integral, as soon as pressure increased above 2235 psig, the output would begin to be boosted to more than just the amount attributable to the offset. The result is the output would reach 25 psig (Error) prior to pressure getting to 2260 psig, and the output would continue to be boosted, even though the pressure starts to decrease back down to 2235, because of the integral function.

Refer to Drawing 7.12

As the deviation between the setpoint and process (actual pressure) turns and narrows, the integral rate of change slows. When pressure is equal to setpoint the output stops its integration until pressure moves either above or below setpoint. Typically a proportional integral controller will hunt (cycle above and below setpoint). The end result of turning on a bank of backup heaters will result in pressure going up, and then the spray valves open and remain open with pressure reduced to 2235. The master controller output will remain at approximately 32 psig (Error).

The scaling of the master controller output is such that the difference between 2235 psig (normal operation, C heaters half on) and 2335 psig (PORV NC 34 opens) is equivalent to 100 psig (Error). If operating with the controller output at 60% the margin to lifting the PORV is reduced. A 70 psig increase in pressure could cause the PORV to lift. This is why the PORV could lift before 2335 psig.

Operator Fundamental Focus; Knowledge and Monitoring

Another effect the integral function can have on the controller can be seen after a large transient, like a steam break. With PZR pressure significantly below the controlling setpoint for a period of time, a large negative integral builds in. Later, when pressure recovers to 2235, the controller output would be at 0 psig (Error) if only a proportional controller. However, because of the large negative integral built in, the controller output would still be very low (backup heaters ON), resulting in pressure overshoot. Some of these transients could be severe enough so that the PORVs not controlled by the master controller could open prior to the spray valves opening.

***Explain** that operators should understand how and why the plant is operating at any given time. They must verify automatic system actuations or response, which includes operator actions if the plant has NOT responded as expected.*

2.3.2 Controller Outputs

Objective #3

The master pressure controller output is sent to:

- *C Bank PZR Heater Control*
- Spray Valve Controllers
- HIGHMON for PORV NC-34A actuation
- LOWMON for Low Pressure Deviation Control (Annunciator. and Backup Heaters)

- HIGHMON for High Pressure Deviation Control (Annunciator Only).
- Graphic on the DCS display.

These components are controlled by the master controller based strictly upon the error signal between actual pressure and setpoint. They are not directly affected by Pressurizer Pressure and may actuate at pressures well above or below what one might expect. For example, one may expect the PORV's (NC-32B, NC-34A, and NC-36B) to open at 2335 psig. Indeed, NC-32B and NC-36B will open at that pressure since they are controlled directly from Pressurizer Pressure Instruments via DCS, and are "hard" set at 100 psig above the nominal operating pressure of 2235 psig. However, NC-34A, which is controlled by the Pressurizer Pressure Master controller, will open whenever a pressure error signal of 100 psig is generated. If the setpoint for the Pressurizer Pressure Master controller is 2200 psig, NC-34A would open 2300 psig but recall that the integral and proportional features of the Pressurizer Pressure Master controller will boost any error signal, and NC-34 may actually open even before 2300 psig is reached. The lift setpoint for NC-32B and NC-36B will be unaffected by changes in the setpoint or output of the Pressurizer Pressure Master controller. Refer to Drawing 7.7, Pressure Master Controller Output vs Function.

2.3.3 Controller Operation

Objective #7

Automatic operation of the controller is as described above. With actual pressure equal to the reference setpoint, this controller is setup to have a 0 psig (Error) output, if no integral function has built in. As actual pressure goes high, the controller output will go up, and this will cause the control system to try to decrease pressure. So it follows that, in manual, depressing the raise pushbutton will cause pressure to go down, and vice versa.

Objective #6

In automatic, the controller output will vary if the setpoint setting is changed. Assume the setpoint is 2235 psig with actual pressurizer pressure at 2235 psig, the controller output would be 0 psig ERROR. If under these conditions the setpoint was changed to 2155 psig , then it would try to control at 2155, and the controller would see actual pressure as 80 psig too high, with a corresponding controller output of 80 psig ERROR, calling for sprays to be full open. Eventually, the pressure master controller would be controlling pressure at 2155 psig, with a controller output back at approximately 0 psig ERROR.

2.4 "C" Heater Group

"C" Heater Group is made up of 7 heater banks. The heater banks have variable power control. The capacity of the "C" Heaters totals 484 KW. There are two power sources available for the "C" Heaters, LXF (normal) and LXC (Alt.). The breakers are Kirk Key interlocked so that only one can supply at a time. The supply breaker auto trips on Low PZR Level <17% and also if charging flow lowers to <20 gpm for >20 seconds, to prevent heater damage if uncovered (due to the poor heat conduction into non-liquid surroundings). When level recovers to >17% or 15 seconds after the heaters are de-

2.5.1 MCB Backup Heater Control

Objective #4

Each Backup Heater Group has an AUTO/MAN selector switch on the MCB. In AUTO, the heaters will energize on a "PZR High Level Deviation" (5% > programmed level) or a "PZR Low Press Deviation". The setpoint for Low Pressure Deviation are "Heaters ON" at -25 psig (Error) output on the Pressure Master Controller and "Heaters OFF" at -17 psig (Error) output. The reason for energizing heaters on a high level deviation is to warm the liquid temperature back to saturation on the assumed cold water insurge that caused the high level. In MAN, the heaters will energize via the MCB ON/OFF control switch, one for each backup heater. When in manual, the AUTO functions are disabled (still get the PZR Low Low Level, Blackout, and charging flow <20 gpm for > 20 seconds, & S_s trips, as appropriate).

There is indication of the heater elements and amperage supplied to each Heater Group on the "NC - Pressurizer and PRT" DCS Graphic (Figure 7.13). The heater elements will indicate red when a demand signal is present and green with no signal present. This is not an indication of power being supplied to the heater elements, it only indicates if a demand signal is present.

2.5.2 Local Heater Control

"A" & "B" Group Heaters can be locally controlled from the ASP. This is accomplished by going to LOCAL on the CR/LOCAL switches. In LOCAL, the MCB functions are disabled (Auto energize & MAN operation). "A" & "B" Group heaters would still trip on a Blackout or Ss, but not on PZR Low-Low level (17%).

Bank 1 of D Group can be locally controlled at the SSF. This is accomplished by going to LOCAL on the REM/LOCAL switch. In LOCAL, the MCB functions are disabled (Auto energize & MAN operation) and Bank 1 of D Group will not trip on PZR Low-Low level (17%). Bank 1 is energized/de-energized via the ON/OFF switch at the SSF.

2.6 Pressurizer Spray Control

Operator Fundamental Focus; Knowledge and Monitoring

***Inform** the class that the intermediate position of the spray valves is indicated by the bottom, middle, & top windows on the spray valve controllers (Soft and SLIMs).This valve position indication is unique to the spray valves. Other similar controllers such as feed regulating valves only indicate full open/closed position. The spray valves are set up like this because there is no other indication of spray flow on the control board. Refer to NCR 1717132.*

Flow to the spray nozzles (900 gpm maximum capacity) is controlled by the positioning of valves NC-27 & NC-29. Each spray valve has a SLIMs controller on the MCB. Refer to Drawing 7.4. The controller sends a 0 - 100% output through an I/P converter for the resulting 3 -15 psig pneumatic signal to control the air operated spray valve (3 psig - full closed, 15 psig - full open). When the MCB Spray controller is in MAN, the Operator can use the raise/lower pushbuttons to position the output to the desired value. When

the MCB Spray Controller is in AUTO, the Pressure Master Controller controls the Spray Controller output.

Objective #4

The Spray Controller output is ramped linearly from 0% - 100% as the Pressure Master Controller output goes from +25 psig (Error) to +75 psig (Error). Positive feedback of spray valve position (OPEN, INTERMEDIATE, or CLOSED) is provided via illuminated windows on the PV bar graph on the spray controller (Soft Control and SLIMs). These lights are generated from signals received from the valve limit switches. When the full

CLOSED limit switch is made up, the bottom window will be the only window that is lit. When the valve comes off the full CLOSED limit switch the middle window will illuminate and now both the bottom and middle windows will be lit. When the Valve reaches the full open position and the full OPEN limit switch is made up the top window will illuminate. At this point all windows, bottom, middle, and top will all be lit.

If the PV value is selected for display on the SLIMs, there are three values that will be displayed over the full range of valve motion. When the valve is full CLOSED the display will indicate 10%. When the valve comes off of the full CLOSED limits switch the display will indicate 60% and when the full OPEN limit switch is made up the display will indicate 100%. These are not actual valve position values, but artificial values set up in the SLIMs to provide the desired light indication representing valve position.

The spray valves fail closed on loss of air signal. There are Industry Operating Events where Unit Trips have been caused by a pressurizer spray valve failure to close. Spray valves are designed to fail close on loss of instrument air. However, a positioner failure could cause a valve to open or close. A “Pressurizer Spray Emergency Close” switch has been added to the Main Control Board. These switches operate in parallel with the existing SSF controls. Selecting “Close” will energize solenoid valves which will isolate operating air to the valves.

The spray valves have bypass flow. Manual valves in parallel with the spray valves are throttled to provide approximately 0.5 gpm bypass flow. This prevents thermal shock to the spray line and provides for mixing between the NCS and the PZR. The spray lines are equipped with low temperature alarms to provide indication of low bypass flow. During boration or dilution events, PZR Heaters should be placed in MANUAL and energized. This will result in pressure trying to increase, with resultant spray flow. Doing this will allow faster mixing of the NCS and the PZR to maintain a closer boron concentration.

When EMXA-4 is swapped to its alternate supply (SMXG), Capability to close the Spray Valves, NC-27C and NC-29C is given to SSF.

2.7 PORVs

2.7.1 PORV Operation

On an ‘OPEN’ signal, a solenoid actuates to align air to operate the PORVs. Normally the operating air is supplied from VI. Refer to Drawing 7.7, (PORV N_2 Backup). All three PORV’s are provided with back-up N_2 from the Cold Leg Accumulators, to be used if VI is lost. NC-32B & NC-36B get N_2 from CLA ‘B’ via NI-431B, and NC-34A from

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EXAM BANK QUESTION: 6310 CNS **A**

Given the following conditions on Unit 1:

- Operating at 100% RTP at normal temperature and pressure

Subsequently:

- The Pressurizer Pressure Master controller has suffered an internal failure resulting in a Pressurizer Pressure Error of +100 PSIG
- Actual Pressurizer Pressure is 2100 PSIG and decreasing

Pressurizer Spray valves are currently _____(1)_____.

At the time of the failure, _____(2)_____ received a signal to open.

Which ONE (1) of the following completes the statements above?

A. 1. OPEN
2. 1NC-34A ONLY

B. 1. OPEN
2. all Pressurizer PORVs

C. 1. CLOSED
2. all Pressurizer PORVs

D. 1. CLOSED
2. 1NC-34A ONLY

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EXAM BANK QUESTION: 6310 CNS A

General Discussion

With a +100 PSIG error signal, PORV 1NC-34A and the Spray Valves would be open. Pressurizer PORVs 1NC-32B and 1NC-36B receive a signal to open from SPP-2. Since this channel never saw pressure at +100 PSIG, these valves did not open.

Answer A Discussion

CORRECT - See discussion above.

Answer B Discussion

INCORRECT:

Part 1 is CORRECT.

Part 2 is plausible because it would be true if Pressurizer actual pressure was at +100 PSIG (2335 PSIG).

Answer C Discussion

INCORRECT:

Part 1 is plausible if the applicant reasons that a low pressurizer pressure block exists from SPP-2 for the pressurizer spray valves like for the Pressurizer PORVs (block closed at 2177 PSIG decreasing).

Part 2 is plausible because it would be true if Pressurizer actual pressure was at +100 PSIG (2335 PSIG).

Answer D Discussion

INCORRECT:

Part 1 is plausible if the applicant reasons that a low pressurizer pressure block exists from SPP-2 for the pressurizer spray valves like for the Pressurizer PORVs (block closed at 2177 PSIG decreasing).

Part 2 is CORRECT.

Basis for meeting the KA

The KA is matched because a malfunction has occurred on the Pressurizer Pressure Master Controller and the applicant must determine the effect on the Pressurizer Pressure Control System.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. The applicant must first analyze the given conditions and then determine based on system knowledge that 1NC-34A and the Spray Valves have an OPEN signal and that the other PORVs do not have an OPEN signal.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT16 CNS NRC Examination

Development References
Lesson Plan OP-CN-PS-IPE pages 10-12, 16-18 (Rev 101)

Student References Provided

KA	KA_desc
APE027 AK2.03	Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: (CFR 41.7 / 45.7)Controllers and positioners ....

Q48 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. Control feed flow to minimize NC System cooldown as follows:	
__ a. Check all S/G N/R levels - GREATER THAN 11% (32% ACC).	__ a. Maintain at least 25 GPM feed flow to any S/G with a N/R level less than 11% (32% ACC).
__ b. Check cooldown rate in NC T-Colds - LESS THAN 100°F IN AN HOUR.	b. Perform the following: __ 1) Reduce feed flow to 25 GPM to each S/G. __ 2) **<u>GO</u> <u>TO</u>** Step 6.d.
__ c. Check N/R level in all S/Gs - LESS THAN 50%.	__ c. THROTTLE feed flow to maintain N/R level less than 50% in all S/Gs.
__ d. Check NC T-Hots - STABLE OR GOING DOWN.	__ d. THROTTLE feed flow or dump steam to stabilize NC T-Hots.
__ **7. Check NC subcooling based on core exit T/Cs - GREATER THAN 0°F.**	**<u>IF</u> at least one NV <u>OR</u> NI pump on, <u>THEN</u> perform the following:** __ a. Ensure all NC pumps - OFF. __ b. Maintain seal injection flow.

A. **Purpose**

This procedure provides guidance on monitoring the Critical Safety Functions.

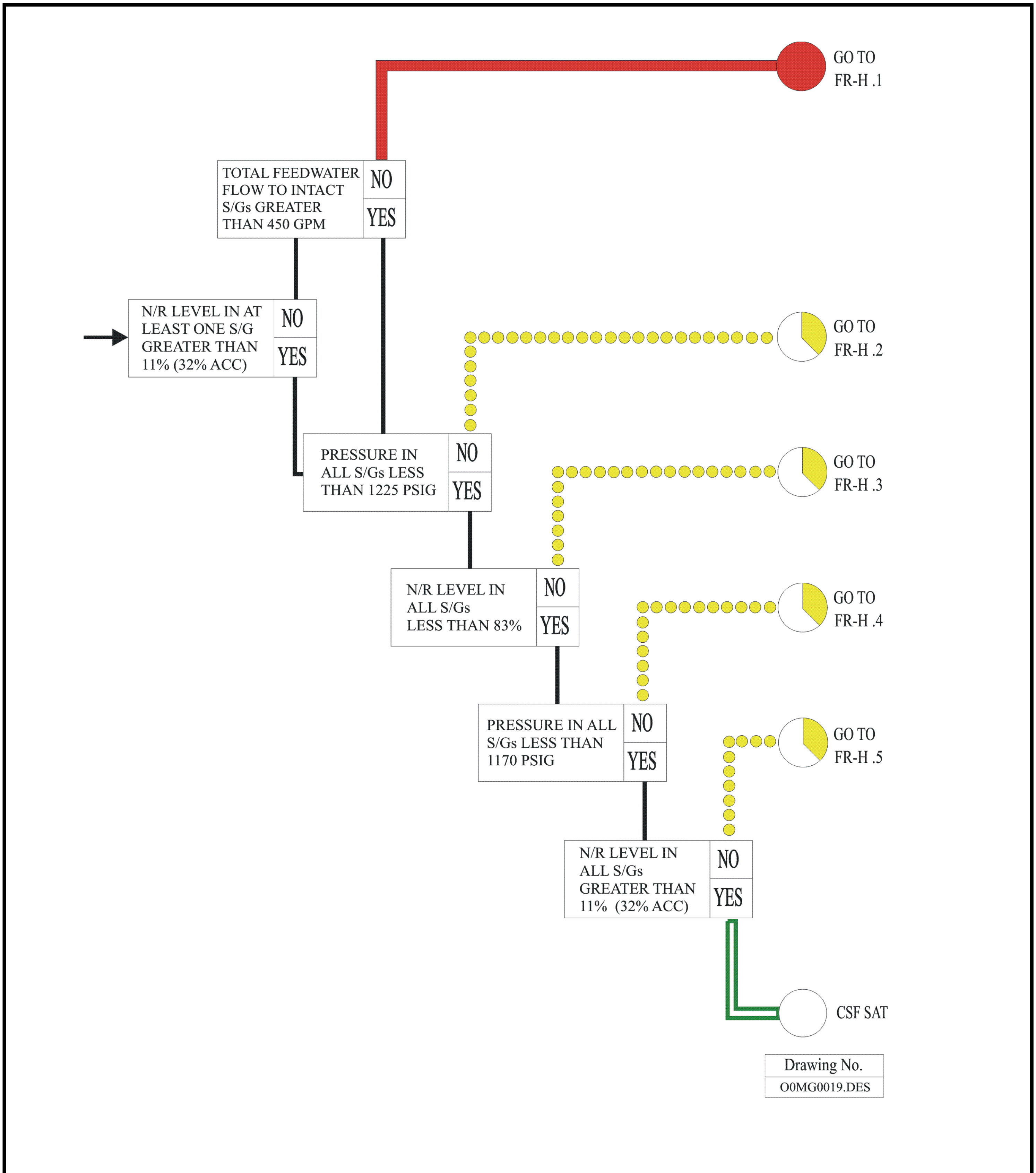
B. **Symptoms or Entry Conditions**

This procedure is entered from:

- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), when S/I cannot be terminated and cause has not been determined.
- On any transition out of EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).

Q48 Parent Question

MNS EP/1/A/5000/F-0 **UNIT 1**	CRITICAL SAFETY FUNCTION STATUS TREES Heat Sink - Page 1 of 1	PAGE NO. 6 of 11 Rev. 6



B

Given the following conditions on Unit 1:

- Reactor trip from 100% power has occurred
- Crew is implementing EP/1/A/5000/ECA-2.1 (Uncontrolled Depressurization of All Steam Generators)
- All S/G N/R levels are 0%
- Cooldown rate based on NC T-colds in the last hour is 150°F
- CA flow to each S/G has been throttled to 75 GPM

A RED path on the Heat Sink CSF _____(1)_____ exist.

Based on the above conditions and in accordance with ECA-2.1, CA flow to all but one S/G _____(2)_____ required be isolated.

Which ONE (1) of the following completes the statements above?

A. 1. does
2. is

B. 1. does
2. is NOT

C. 1. does NOT
2. is

D. 1. does NOT
2. is NOT

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EXAM BANK QUESTION: 6322 CNS

B

General Discussion

CA flow to each S/G will be throttled to 75 GPM due to the cooldown in the previous hour being > 100 degrees F/hour. This will leave only 300 GPM CA flow to the S/Gs and with all S/G N/R levels being < 11%, the conditions for a RED path on the Heat Sink CSF status tree would be met. FR-H.1 will be entered, but it will immediately direct the crew to "Return to procedure and step in effect" due to the CA flows being < 450 GPM due to operator action.

ECA-2.1 will require that CA flow be maintained at a minimum of 75 gpm to any S/G with N/R levels < 11%.

Answer A Discussion

INCORRECT:

Part 1 is CORRECT.

Part 2 is plausible because most EP procedures will have the operators to decrease CA flow to address an uncontrolled cooldown as long as one S/G N/R level is maintained > 11%. In this case, however, all S/G N/R levels are < 11%, so 75 GPM flow must be maintained to all the S/Gs.

Answer B Discussion

CORRECT - See discussion above.

Answer C Discussion

INCORRECT:

Part 1 is plausible because CA flow is still being maintained to all S/Gs. Applicants could also incorrectly recall the total CA flow necessary to keep the Heat Sink CSF from turning red, or miscalculate the total CA flow that is going to the S/Gs at this time.

Part 2 is plausible because most EP procedures will have the operators to decrease CA flow to address an uncontrolled cooldown as long as one S/G N/R level is maintained > 11%. In this case, however, all S/G N/R levels are < 11%, so 75 GPM flow must be maintained to all the S/Gs.

Answer D Discussion

INCORRECT:

Part 1 is plausible because CA flow is still being maintained to all S/Gs. Applicants could also incorrectly recall the total CA flow necessary to keep the Heat Sink CSF from turning red, or miscalculate the total CA flow that is going to the S/Gs at this time.

Part 2 is CORRECT.

Basis for meeting the KA

The KA is matched because applicants are tested on the ability to evaluate plant performance (S/G N/R levels being < 11%) and make operational judgements (whether or not CA flow can be throttled to < 75 GPM per S/G) based on that instrument interpretation.

Basis for Hi Cog

This is a higher cognitive order question due to requiring more than one mental step to answer correctly. The applicants must first recall information from ECA-2.1 (S/G N/R level that must be maintained for heat sink) and then recall that if this level cannot be maintained, that further throttling of CA is not allowed and a minimum of 75 GPM to each S/G must be maintained.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT16 CNS NRC Examination

Development References
EP/1/A/5000/F-0 (Rev 9) EP/1/A/5000/ECA-2.1 (Uncontrolled Depressurization of All S/Gs) (Rev 37)

Student References Provided

KA	KA_desc
WE12 2.1.7	WE12 GENERICAbility to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. (CFR: 41.5 / 43.5 / 45.12 / 45.13)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. **Check at least one of the following NV pumps - AVAILABLE:** __ • 1A NV pump OR __ • 1B NV pump.	__ **GO TO Step 22.**
5. **Check if NC System feed and bleed should be initiated:**	
__ A. Check W/R level in at least 3 S/Gs - LESS THAN 24% (36% ACC).	A. Perform the following: __ 1) Monitor feed and bleed initiation criteria. __ 2) **WHEN** criteria satisfied, **THEN GO TO** Step 22. __ 3) **GO TO** Step 6.
__ B. **GO TO** Step 22.	
__ 6. **Ensure S/G BB and NM valves CLOSED PER Enclosure 3 (S/G BB and Sampling Valve Checklist).**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
26. **Establish NC System bleed path as follows:**	
__ A. Check all Pzr PORV isolation valves - OPEN.	__ A. OPEN all Pzr PORV isolation valves.
__ B. Select "OPEN" on two Pzr PORVs that have an open Pzr PORV isolation valve.	
C. Align N_2 to all Pzr PORVs as follows: __ • OPEN 1NI-430A (Emerg N2 From CLA To 1NC-34A). __ • OPEN 1NI-431B (Emerg N2 From CLA To 1NC-32B & 36B).	C. Perform the following: __ 1) Ensure Phase B reset. 2) OPEN the following valves: __ • 1VI-129B (VI Supply to A Cont Ess VI Hdr Outside Isol) __ • 1VI-160B (VI Supply to B Cont Ess VI Hdr Outside Isol) __ • 1VI-150B (Lwr Cont Non-Ess Cont Outside Isol). 3) **IF** VI header pressure is less than than 85 PSIG, **THEN** perform the following: __ • Ensure Pzr PORVs with N_2 aligned have been OPENED. __ • Ensure only two Pzr PORV bleed paths are selected OPEN. __ • Restore VI **PER** AP/1/A/5500/22 (Loss Of VI).

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EXAM BANK QUESTION: 3050 MNS

C

Given the following conditions:

- The crew has entered FR-H.1 (Response to Loss of Secondary Heat Sink) due to a loss of inventory in the S/Gs and failure of the CA pumps to start

Time	1400	1410	1420	1430
S/G 1A WR [%]	43	37	30	26
S/G 1B WR [%]	41	32	25	20
S/G 1C WR [%]	42	34	29	25
S/G 1D WR [%]	40	33	26	21
Total feed flow [GPM]	0	0	0	0
Cont press [PSIG]	0.75	2.1	3.2	2.8

Which ONE (1) of the following is the EARLIEST time (if any) that the crew would be required to initiate NC system Feed and Bleed based on plant conditions?

A. Feed and Bleed is not required.

B. 1410

C. 1420

D. 1430

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EXAMAM BANK QUESTION: 3050 MNS **C**

General Discussion

At time 1410 Feed and Bleed criteria is not met because S/G NR levels are greater than 24%. At time 1420, S/G NR levels are above those required for Feed and Bleed based on normal conditions in Containment. However, Containment pressure has increased above 3 PSIG requiring the use of adverse numbers (36%). Since all S/Gs are less than 36% NR level, initiation of Feed and Bleed is required.

Answer A Discussion

Incorrect: See explanation above. Plausible because Feed and Bleed criteria would be met if the candidate determines that Adverse Containment numbers are applicable.

Answer B Discussion

Incorrect: See explanation above. Plausible if candidate does not understand the required number of S/Gs to meet Feed and Bleed criteria or that Adverse Containment numbers already applied in at previous time.

Answer C Discussion

Correct.

Answer D Discussion

Incorrect: See explanation above. Plausible if candidate does not apply Adverse Containment numbers as S/G WR levels do NOT meet the criteria for Feed and Bleed without Adverse conditions.

Basis for meeting the KA

KA is matched because candidate is provided with multiple sets of plant conditions (Monitor) and then apply the criteria for feed and bleed iniitialion for a loss of feedwater event. He must also recall the criteria for initiating feed and bleed (Safety Injection) under both normal and adverse conditions.

Basis for Hi Cog

This is a higher cognitive level question because the candidate must analyze multiple sets of indications and apply adverse Containment condition numbers to determine when Feed and Bleed is required.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2009 MNS NRC Q11

Development References

EP/1/A/5000/FR-H.1, Rev. 12, page 3
Lesson Plan OP-MC-EP-FRH, Rev. 10, page 31
EPFRH003

Student References Provided

KA	KA_desc
WE05 EA2.2	Ability to determine and interpret the following as they apply to the (Loss of Secondary Heat Sink) (CFR: 43.5 / 45.13)Adherence to appropriate procedures and operation within the limitations in the facility*s license and amendments.

KA	KA_desc
WE05 EA1.1	Ability to operate and / or monitor the following as they apply to the (Loss of Secondary Heat Sink) (CFR: 41.7 / 45.5 / 45.6)Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

KA	KA_desc
WE05 EK1.3	Knowledge of the operational implications of the following concepts as they apply to the (Loss of Secondary Heat Sink) (CFR: 41.8 / 41.10, 45.3)Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Secondary Heat Sink).

KA	KA_desc
WE05 EK1.2	Knowledge of the operational implications of the following concepts as they apply to the (Loss of Secondary Heat Sink) (CFR: 41.8 / 41.10, 45.3)Normal, abnormal and emergency operating procedures associated with (Loss of Secondary Heat Sink).

KA	KA_desc
WE05 2.1.23	WE05 GENERICAbility to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)

1.4 Sequencer Actuation Signals

Signal	Setpoint	Coincidence	Interlock	Protection
Manual Safety Injection		1/2 Switches		Operator Judgment
Low Pressurizer Pressure	1845 psig	2/4 Channels	P-11	LOCA
High Containment Pressure	1.0 psig	2/3 Pressure Switches		Steam Break LOCA

2/3 Under-voltage on affected 4160 Volt Bus (Blackout)

2.0 SYSTEM DESCRIPTION

2.1 Sequencer Modes of Operation

Objective # 3

The Sequencer has basically two modes of operation;

The **Priority Mode** of operation is actuated by a Safety Injection signal from the SSPS. When Safety Injection is actuated, the signal seals in and sequencing begins immediately.

The **Secondary Mode** of operation is actuated by a 2/3 phase Loss of Voltage (LOV) on the 4160 Volt Essential Bus. Upon actuation, the sequencer starts the diesel and goes through an 8 second test for verification of a Blackout. If a Blackout does not exist, the Sequencer will automatically reset to its initial operating state and the Diesel Generator must be manually shut down. For an actual Blackout, the signal is sealed in, the 4160V bus normal and alternate incoming breaker is tripped, the 4160 Volt Essential Bus is load shed, and the Diesel Generator Breaker is closed provided the Diesel Generating unit has attained 95% speed. **The relays that sense undervoltage are located on the sequencer panel and receive power via sequencer power. They are independent of SSPS signals. If the sequencer has control power the undervoltage relays are capable of actuating blackout sequencing.**

See Section 5.1 for OE associated with this via NCR 1671060.

Objective # 4

When both actuation signals (LOV and SI) are present simultaneously, the Sequencer will select the SI logic and perform those functions necessary to sequence that mode (i.e., load shed, sequencer reset, removing blackout logic, and energizing SI loads). This is also true when the Loss of Voltage condition was initiated by the Degraded Voltage relaying. If an SI signal were present following the completion of the 9.7 second alarm timer cycle, the 4160 Volt Normal and Standby incoming circuit breakers

Seq	Equipment/ Application	Load Per D/G	Req'd For SBO	Time After SBO Signal	Req'd For LOCA	Time After LOCA Signal	Voltage	Switchgear Grp/LC/MCC	REMARKS
2	Annulus Ventilation System Fan	30 HP	---	---	24 HP	16 sec.	575V	1EMXC & D 2EMXC & D	One Per Diesel
2	Annulus Ventilation System Moisture Separator Heaters	43 KW	---	---	43 KW	16 sec.	575V	1EMXC & D 2EMXC & D	One Per Diesel
2	Radiation Monitoring	(6)	(6)	16 sec.	(6)	16 sec.	575V	1EMXC & D 2EMXC & D	(6)
2	Pipe Tunnel Booster Fans	15 HP	15.5 HP	16 sec.	---	---	575V	1EMXC & D 2EMXC & D	One Per Diesel
2	Control Rod Drive Ventilation Fans	100 HP	100 HP	16 sec.	---	---	575V	1EMXC & D 2EMXC & D	Two 50 HP Fans Per Diesel
2	Lower Containment Cooling Units	250 HP	261 HP	16 sec.	---	---	575V	1EMXC & D 2EMXC & D	Two 125 HP Fans Per Diesel
2	Upper Containment Air Handling Units	20 HP	12.8 HP	16 sec.	---	---	575V	1EMXC & D 2EMXC & D	Two 10 HP Fans Per Diesel
2	Upper Containment Return Air Fans	2 HP	2 HP	16 sec.	---	---	575V	1EMXC & D 2EMXC & D	Two 1 HP Fans Per Diesel
2	Incore Instrumentation Room Air Handling Unit	3 HP	1.7 HP	16 sec.	---	---	575V	1EMXC & D 2EMXC & D	One Per Diesel
2	Pressurizer Booster Fan	20 HP	8.6 HP	16 sec.	---	---	575V	1EMXC & D 2EMXC & D	One Per Diesel
3	Residual Heat Removal Pump	400 HP	---	---	455 HP	20 sec.	4160V	1ETA & B 2ETA & B	One Per Diesel
4	(Group 4 NS deleted see section 3.11 in lesson plan)								
5	Component Cooling Water Pumps	400 HP	380 HP	30 sec.	350 HP	30 sec.	4160V	1ETA & B 2ETA & B	Two 200 HP Pumps Per Diesel

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EXAM BANK QUESTION: 3163 MNS

B

Given the following conditions on Unit 1:

- The unit is in Mode 5 with both trains of ND in operation
- Subsequently, a loss of off-site power occurs

Which ONE (1) of the following describes the status of the ND pumps 11 seconds after the LOOP, AND the reason for this configuration?

A. Both ND pumps are OFF;
The Sequencers have NOT sequenced them on yet.

B. Both ND pumps are OFF;
These pumps are NOT sequenced on due to a loss of off-site power.

C. Both ND pumps are ON;
These pumps are sequenced on immediately (1 second) in this plant configuration.

D. Both ND pumps are ON;
It is an immediate action of AP-07, Loss of Electrical Power, to turn these pumps on when power is restored.

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EXAM BANK QUESTION: 3163 MNS

B

General Discussion

Answer A Discussion

Incorrect. While it is true that both pumps are OFF, the reason is not correct. This implies that the pumps will be automatically started by the sequencer in the near future. This is plausible because under certain circumstances, such as an SI signal and after a delay of 20 seconds, the ND Pumps will receive a start signal, but this is, according to TS 3.8.1 AC Sources - Operating (B.3.8.1-3, 26: Rev 92), in order to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a loss of coolant accident (LOCA).

Answer B Discussion

Correct. According to DG-EQB (p39-43; Rev 16), these pumps do not receive a start signal for an SBO (Station Blackout). This is identified in the AP7 Background Document (p9, Rev 6) which states: If a blackout occurs while ND is in RHR mode, an operator will have to manually restart the pump, since the sequencer will not do it automatically. At certain times during an outage, a loss of RHR cooling can result in the NC system reaching saturated conditions in as little as 15 minutes. For this reason, it is advantageous to restart an ND pump as soon as possible following a blackout.

Answer C Discussion

Incorrect. This plausible because the operator may incorrectly believe that the pumps are automatically started by the sequencer, which according to the MNS FSAR, Table 8-16, does have a load group that starts in 1 second (Group 1); and under certain circumstances, such as an SI signal and after a delay of 20 seconds, the ND Pumps will receive a start signal, but this is, according to TS 3.8.1 AC Sources - Operating (B.3.8.1-3, 26: Rev 92), in order to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a loss of coolant accident (LOCA).

Answer D Discussion

Incorrect. This is plausible because according to AP/1/A/5500/07 (p7; Rev 27A), Step 11.i will direct the operator to manually restart the ND Pump, if the Pumps were previously operating in the RHR Mode. However, this is NOT an immediate action.

Basis for meeting the KA

The KA is matched because the operator must know that the reason for the order and timing of the Sequenced loads is to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a loss of coolant accident (LOCA), and that neither condition exists in the conditions of the question. For instance, the reactor is already shutdown, and a LOCA has not occurred.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	

Development References

Student References Provided

KA	KA_desc
APE056 AK3.01	Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power: (CFR 41.5,41.10 / 45.6 / 45.13)Order and time to initiation of power for the load sequencer ....

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
25. **Check all Vital AC panelboards energized as follows:**	__ **<u>GO</u> <u>TO</u> Step 31.**
• For 2EKVA:	
__ • Top row of channel status lights - NORMAL	
• For 2EKVB:	
__ • Second row of channel status lights - NORMAL	
• For 2EKVC:	
__ • Third row of channel status lights - NORMAL	
• For 2EKVD:	
__ • Bottom row of channel status lights - NORMAL.	
__ 26. **<u>GO</u> <u>TO</u> Step 41.**	
27. **Check all Vital AC panelboards energized as follows:**	**Perform the following:**
• For 2EKVA:	__ A. Announce loss of affected bus on paging system.
__ • Top row of channel status lights - NORMAL	__ B. **<u>GO</u> <u>TO</u>** Step 29.
• For 2EKVB:	
__ • Second row of channel status lights - NORMAL	
• For 2EKVC:	
__ • Third row of channel status lights - NORMAL	
• For 2EKVD:	
__ • Bottom row of channel status lights - NORMAL.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 28. **GO TO Step 41.**	
29. **Dispatch operator to perform the following while continuing with this procedure:** __ A. Determine the exact cause of alarm(s). B. Restore power to the affected panelboard using the following enclosures: __ • Enclosure 9 (Restoring Power To 2EKVA) OR __ • Enclosure 10 (Restoring Power To 2EKVB) OR __ • Enclosure 11 (Restoring Power To 2EKVC) OR __ • Enclosure 12 (Restoring Power To 2EKVD).	
__ 30. **WHEN power is restored to all affected bus(s), THEN GO TO Step 76.**	
31. **Check both of the following Vital DC panelboards energized as follows:** • For 2EVDA: __ • Switch indication on any pump powered from 2ETA - LIT. • For 2EVDD: __ • Switch indication on any pump powered from 2ETB - LIT.	__ **GO TO Step 36.**

NOTE The following actions occur when 2EKVD is deenergized. This enclosure requires no action and is for information only.

1. **Reactor Protection System and SSPS:**

__ • All Channel 4 bistables (except for "CONT HI-HI PRESS") - LIT

__ • All Channel 4 control board meters - FAILED

__ • SSPS Train B Output Slave Relays will lose ability to generate any Train B ESF or RPS actuations (Train B General Warning)

• Loss of Control board indications for the following Train B lights:

  __ • Pzr SI Trn B Block - "BLOCKED"

  __ • Stm Line SI Trn B Block - "BLOCKED"

  __ • Safety Injection Reset Train B - "RESET"

  __ • Phase B Cont Isol Train B - "RESET"

  __ • Phase A Cont Isol Train B - "RESET"

  __ • Cont Vent Isol Reset Train B - "RESET".

2. **Nuclear Instrumentation N-44 and Gammametrics:**

__ • Inputs to Interlocks P-8, P-10, and C-2 inoperable

__ • Loss of Instrument Power, Control Power, and Detector Power

__ • All associated Reactor trip bistables - LIT

__ • Comparator and Rate Drawers out of service

__ • Source range audio count rate drawer out of service

__ • 2ENB9520 (Neutron Flux WR B) inoperable.

3. **The following Post Accident Monitoring components are inoperable:**

__ • ICCM Train B

__ • 2NILP5270 (Cont Sump WR Lev B).

B

MNS ILT 18-1 SRO NRC Examination **QUESTION 53** 53

APE057 AA1.01 - Loss of Vital AC Electrical Instrument Bus
Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus: (CFR 41.7 / 45.5 / 45.6)
Manual inverter swapping ....

Given the following on Unit 1:

- A loss of 1EVID Static Inverter has occurred
- The crew has implemented AP-15 (LOSS OF VITAL OR AUX CONTROL POWER)

Based on the conditions above and in accordance with AP-15,

1) the Safety Injection Train B "RESET" light ________ be lit.

2) Bus 1EKVD ________ auto-transfer to its alternate power source.

Which ONE (1) of the following completes the statements above?

A. 1. will NOT
2. will

B. 1. will NOT
2. will NOT

C. 1. will
2. will

D. 1. will
2. will NOT

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General Discussion

Each unit's 120 VAC Vital Instrumentation and Control Power System normally receives power from the 125 VDC Vital Instrumentation and Control Power System through static inverters, 1(2)EVIA, 1(2)EVIB, 1(2)EVIC and 1(2)EVID, and their respective manual transfer switch (when in the "Inverter to Load" position).
Two static inverters are fed from each independent 125V DC distribution center. Each static inverter provides power to one of the eight AC power panel boards (1EKVA, 1EKVB, 1EKVC, 1EKVD, 2EKVA, 2EKVB, 2EKVC, and 2EKVD). Four Distribution Centers (EVDA, EVDB, EVDC and EVDD) supply four channels of power which are shared between the two units (Units 1 & 2 EVIA fed from distribution center EVDA and etc.).
A manual transfer switch (also called manual bypass switch), associated with each static inverter, allows power transfer from the respective inverter to an alternate regulated power source (1KRP or 2KRP) during a loss of inverter. Because the manual transfer switch is a "make before break" switch, with overlapping contacts, transfer of the power source can be accomplished without an interruption of power.

IAW AP-15 , Enclosure 17 (1EKVD load list), SI Train B Reset light is powered from1EKVD.
IAW AP-15 , Enclosure 14 (1EKVA load list), SI Train A Reset light is powered from 1EKVA.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the regulated alternate power source (1/2 KRP) to the vital inverters does have an automatic transfer of incoming power. Also plausible because in the 120 VAC aux power system (which has a similar arrangement to the 120 VAC vital system) KXA and KXB power panel boards do have an auto swap through inverters KXA and KXB to their alternate power supply.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude due to normal convention that 1EVIB would be the power supply to the Train B SI reset light. 1EVIA is the power supply to the Train A SI reset light.

Part 2 is plausible because the regulated alternate power source (1/2 KRP) to the vital inverters does have an automatic transfer of incoming power. Also plausible because in the 120 VAC aux power system (which has a similar arrangement to the 120 VAC vital system) KXA and KXB power panel boards do have an auto swap through inverters KXA and KXB to their alternate power supply.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude due to normal convention that 1EVIB would be the power supply to the Train B SI reset light. 1EVIA is the power supply to the Train A SI reset light.

Part 2 is correct.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate the ability to monitor the effects of losing a vital bus and determine if that vital bus will be manually/auto aligned to its alternate power source.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2014 MNS NRC Q50 (Bank 4479)

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MNS ILT 18-1 SRO NRC Examination QUESTION 53

53

B

Development References
REFERENCES: Lesson Plan OP-MC-EL-EPL LEARNING OBJECTIVES: OP-MC-EL-EPL Objective 15

Student References Provided

APE057 AA1.01 - Loss of Vital AC Electrical Instrument Bus

Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus: (CFR 41.7 / 45.5 / 45.6)

Manual inverter swapping ....

Remarks/Status

Rearranged answers form original bank question, correct answer is now "B". SLM 03/22/17.

401-9 Review Comments: ENHANCEMENT

APE057 AA1.01
Do A/C as written tie trains together, ie violate general principle of train separation? If so A/C are none plausible distractors

Facility Response:
No. this alignment would allow opening the previously closed cross-tie between trains due to the tagout. It is performed in a normal OP and is done quite often. Manual alignments made on purpose. Not sure how the train separation comment is even relevant here. Exam team agrees that A and C are plausible. SLM 02/23/18

Response 1:
53 Additional information provided
Discuss did the response state that A/C actions are done in the plant?

Facility Response:
Wrote a modified question (keeping the concept of manual/auto transfer for vital inverters) due to plausibility issues with distractors A and C. SLM 03/06/18

Question is now SAT per telecon. 3/8/18

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. **Maintain RN flow within operating limits as follows:**	
__ A. Check VI header pressure - GREATER THAN 60 PSIG.	__ A. **GO TO** Step 10.
__ B. Check 1A RN pump - RUNNING.	__ B. **GO TO** Step 9.E.
__ C. THROTTLE 1RN-89A (RN to A KC Hx Control) to maintain 1A RN pump discharge pressure greater than 50 PSIG.	
__ D. Check 1A RN pump flow - LESS THAN 14,000 GPM.	__ D. Attempt to lower RN flow below limit using 1RN-89A (RN to A KC Hx Control).
__ E. Check 1B RN pump - RUNNING.	__ E. **GO TO** Step 10.
__ F. THROTTLE 1RN-190B (RN To B KC Hx Control) to maintain 1B RN pump discharge pressure greater than 50 PSIG.	
__ G. Check 1B RN pump flow - LESS THAN 14,000 GPM.	__ G. Attempt to lower RN flow below limit using 1RN-190B (RN To B KC Hx Control).
10. **Investigate reason for loss of RN train as follows:**	
__ A. Dispatch operator to check RN pump.	
__ B. Dispatch operator to check RN pump breaker.	
__ C. Check suction flowpath alignment.	
__ D. Check discharge flowpath alignment.	
__ 11. **Ensure Control Room Area Chiller in service PER Enclosure 2 (VC/YC Operation).**	

Nomenclature:	**B RN PUMP ABNORMAL FLOW**	Window:	**E3**

Setpoint: Greater than 16,000 gpm or less than 2700 gpm with RN Pump breaker closed

Origin: Flow transmitter 1RNFT-5050 on discharge of pump

Probable Cause:
- Failure of flow transmitter 1RNFT-5050
- Failure of flow control valve
- Excessive load demand for 1B RN Pump
- 1B RN Pump trip
- RN strainer clogged

Automatic Action: None

Immediate Action:
1. Start 1A RN Pump per OP/1/A/6400/006 (Nuclear Service Water System).
2. Check components flow rate.
3. Ensure RN strainer is clean.

Supplementary Action:
1. **IF** flow valve or instrument malfunctioned, notify SRO.
2. Notify SRO to review RP/0/B/5700/031 (Equipment Important To Emergency Response) for possible NRC Notification requirements.

References: Flow Diagram - MCFD-1574

End Of Response

Unit 1

- Unit 2B Train valves open on 7.0# for 3.5 sec + .5 sec.

The A and B Train assured CA supplies come from the inlet side of the DG HXs and are at approximately Ess. Hdr pressure. A small line for a continuous vent is installed downstream of 1/2RN -69A and 1/2RN-162B to ensure any leakage by its seat is vented to the discharge side of the DG HX into the discharge header and doesn't leak by the other isolation valves into the suction of the CA pumps. A pressure gauge installed in the CA pump room monitors pressure on this line. Normally discharge header pressure (approx. 15 psig) will be indicated. Pressure should remain less than 50 psig.

The KC HX Supply isolation Valves (RN-86A, 187B) have an AUTO/MANUAL mode select switch and an open/close pushbutton on MC11. The open/close pushbuttons are only operable when the mode switch is in the Manual position. If the mode select switch is in the AUTO position, the valve will auto open when the train related RN pump starts and will receive a signal to close when the train related RN pump is stopped. In either the AUTO or MANUAL mode of operation, these valves will automatically open upon receipt of a Blackout or Safety injection signal. Also, the Blackout and Safety injection signal is interlocked with the AUTO portion of the valve closure circuitry to prevent the valve from automatically closing while a Blackout or Safety injection signal is still present. The valves are normally selected to the AUTO mode.

These valves (RN-86A, RN-187B) are modified to open to a "throttled" position when they indicate full open. This was documented in MEVN - 2545. This allows the electric isolation valves to the KC HX to be in a throttled position which allows the air operated outlet valve to be in a throttled position that minimizes cavitation and vibration at the air operated valves. Operators should be aware if the motor operated valves go to the "full" open position, there are operability concerns since the RN flow balance is done with the valves in the "throttled" position that indicates OPEN. See OE section 5.0 for additional details in NCR 1902474.

Objective # 12

Low Level intake isolation valve 1RN1 is a non-safety related MOV controlled from 1MC11 by a pushbutton which is covered to prevent operation of the valve except in an emergency. The valve is wired through two breakers in MCC SMXL. The breaker in compartment 3C is normally disconnected which allows power to the valve to be disconnected while still leaving control power available for position indication in the Control Room. Therefore in order to close 1RN1, power must be restored by reconnecting the breaker in MCC SMXL compartment 3C and using the manual close pushbutton. If maintenance activities require shifting RN suction to the RC cross over or SNSWP such that 1RN1 will be closed, compensatory action will be required for Train A to prevent specific valves from automatically re-aligning to LLI on a S_S or BO signal.

0RN-4AC (Train 1B & 2B RC Supply) and 0RN-148AC (Train 1A & 2A Disch to RC) will get a signal to automatically open on SSF transfer. In addition, valves 0RN-147AC, 0RN-283AC, 0RN-301AC, 0RN10AC, and 0RN12AC can be operated from the SSF.

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EXAM BANK QUESTION: 3574 MNS **A**

Given the following conditions:

- Unit 1 is at 70% power.
- "B" Train in service.
- A loss of RN has occurred.
- The crew is performing actions of AP/20, Loss of RN, Case I, Loss of Operating RN Train.
- 1A RN Pump has been started, aligned to LLI.

Which ONE (1) of the following describes how 1A RN flow rate will be controlled AND the maximum allowable flow rate?

A. Throttle 1RN-89A, RN to A KC HX Flow Control, to establish desired flow while maintaining 1A RN Pump flow less than 16,000 GPM.

B. Throttle 1RN-90B, RN to B KC HX Flow Control to establish desired flow while maintaining 1A RN Pump flow less than 16,000 GPM.

C. Throttle 1RN-89A, RN to A KC HX Flow Control, to establish desired flow while maintaining 1A RN Pump flow less than 11,500 GPM.

D. Throttle 1RN-90B, RN to B KC HX Flow Control to establish desired flow while maintaining 1A RN Pump flow less than 11,500 GPM.

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EXAM BANK QUESTION: 3574 MNS **A**

General Discussion

Answer A Discussion

Answer B Discussion

B is incorrect. Action for 1B RN Pump

Answer C Discussion

C is incorrect. Action if aligned to SNSWP

Answer D Discussion

D is incorrect. Action if B aligned to SNSWP

Basis for meeting the KA

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	

Development References	Student References Provided

KA	KA_desc
APE062 AA1.06	Ability to operate and / or monitor the following as they apply to the Loss of Nuclear Service Water (SWS): (CFR 41.7 / 45.5 / 45.6)Control of flow rates to components cooled by the SWS ....

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

1. **Perform the following steps once every 6 hours:**

__ a. Check OAC - IN SERVICE.

a. Perform the following:

__ 1) Dispatch operator to obtain RN strainer accumulator tank pressure readings **PER** Enclosure 16 (Local Pressure Check of RN Strainer Accumulator Tanks).

__ 2) **WHEN** 15 minutes have elapsed from time of dispatch, **THEN** contact dispatched operator to check on status of local action.

__ 3) Do not continue until pressure readings obtained.

__ b. Record RN strainer backwash assured VI accumulator tank pressures in table below:

Date/Time	1RN-21A Accumulator Tank Pressure (OAC point M1A0000)	1RN-25B Accumulator Tank Pressure (OAC point M1A0006)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

1. (Continued)

__ c. Check both accumulator tank pressures - GREATER THAN 294 PSIG.

c. **IF** either accumulator tank pressure is less than 294 PSIG, **THEN** place both Unit 1 RN strainers in backwash as follows:

__ 1) Determine time limit from table below for placing both Unit 1 RN strainers in backwash:

Lowest Strainer Accumulator Tank Pressure	Time Limit
206 - 294 PSIG	4 Hrs
144 - 205 PSIG	2 Hrs
113 - 143 PSIG	1 Hr

__ 2) Dispatch operator to perform Enclosure 17 (Placing RN Strainers in Manual Backwash) as time allows, not to exceed time limit in table above.

__ 3) Discontinue monitoring of accumulator tank pressures **PER** this enclosure.

__ 4) Exit this enclosure.

__ d. Perform this enclosure again in 6 hours.

__ e. Have STA or other licensed operator assist in tracking elapsed time.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. **Perform the following steps once every 6 hours:**	
__ a. Check OAC - IN SERVICE.	a. Perform the following: __ 1) Dispatch operator to obtain RN strainer accumulator tank pressure readings **PER** Enclosure 11 (Local Pressure Check of RN Strainer Accumulator Tanks). __ 2) **WHEN** 15 minutes have elapsed from time of dispatch, **THEN** contact dispatched operator to check on status of local action. __ 3) Do not continue until pressure readings obtained.
__ b. Record RN strainer backwash assured VI accumulator tank pressures in table below:	

Date/Time	2RN-21A Accumulator Tank Pressure (OAC point M2A0000)	2RN-25B Accumulator Tank Pressure (OAC point M2A0006)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

1. (Continued)

__ c. Check both accumulator tank pressures - GREATER THAN 294 PSIG.

c. **IF** either accumulator tank pressure is less than 294 PSIG, **THEN** place both Unit 2 RN strainers in backwash as follows:

__ 1) Determine time limit from table below for placing both Unit 2 RN strainers in backwash:

Lowest Strainer Accumulator Tank Pressure	Time Limit
206 - 294 PSIG	4 Hrs
144 - 205 PSIG	2 Hrs
113 - 143 PSIG	1 Hr

__ 2) Dispatch operator to perform Enclosure 12 (Placing RN Strainers in Manual Backwash) as time allows, not to exceed time limit in table above.

__ 3) Discontinue monitoring of accumulator tank pressures **PER** this enclosure.

__ 4) Exit this enclosure.

__ d. Perform this enclosure again in 6 hours.

__ e. Have STA or other licensed operator assist in tracking elapsed time.

9.0 ECA-1.2, LOCA OUTSIDE CONTAINMENT

9.1 Purpose

This procedure provides guidance for a LOCA that occurs outside containment. Specifically, the objective of this procedure is to provide actions to identify and isolate a LOCA outside containment.

This entire EP is a significant deviation from the ERGs. Isolating an ISLOCA into the ND system is considered PRA significant operator action as described in NCR#1573507. The valves used to do this isolation (NI-173A/178B) are not designed to close against the DP that could be seen during an ISLOCA, since this is a beyond design basis event. To meet the intent of this EP to isolate a break on low pressure ND system piping, this EP includes actions to cooldown and depressurize the NC system to the point where the isolation valves are capable of closing.

9.2 Symptoms/Entry Conditions

Operator Fundamental Focus; Knowledge, Monitor and Teamwork
Reinforce *the importance of maintaining solid system knowledge to fully understand the possibility of inter-system LOCA's such as from the NC to ND. Further reinforce the importance of continuing to closely monitor and question indications that may appear to be "off-normal" for the procedure initially in progress. Monitoring is the responsibility of the control room team.*

ECA-1.2 is entered when either of the following conditions occur:

1. In E-0, when abnormal radiation occurs in the Aux Building due to a loss of NC system inventory outside containment.
2. When it is determined in E-1 or ES-1.2 that the cause of abnormal radiation is due to a loss of NC inventory outside containment.

9.3 Major Actions

The recovery/restoration technique of ECA-1.2 includes the following major action categories:

1. Stop and isolate ND pumps from FWST.
2. Ensure normally closed valves are closed.
3. Attempt to identify and isolate breaks.
4. Cooldown and depressurize the NC system.
5. Isolate break from NC system to ND system.
6. Terminate S/I.

There are two time critical actions in this EP to ensure core cooling:

1. Isolate ND suction from FWST to stop rapid depletion of FWST.

Stop break flow from NC to ND break after NC cooldown and depressurization by fully closing NI-173A and NI-178B.

A. **Purpose**

This procedure provides actions to identify and isolate a LOCA outside containment.

B. **Symptoms or Entry Conditions**

This procedure is entered from:

- EP/2/A/5000/E-0 (Reactor Trip or Safety Injection) Step 40, on abnormal radiation in the aux bldg due to a loss of NC System inventory outside containment.
- EP/2/A/5000/E-1 (Loss of Reactor or Secondary Coolant) Step 12, if it is determined that the cause of abnormal radiation is due to a loss of NC System inventory outside containment.
- EP/2/A/5000/ES-1.2 (POST LOCA Cooldown and Depressurization) Step 4, if it is determined that the cause of abnormal radiation is due to a loss of NC System inventory outside containment.

C. Operator Actions

__ 1. **Monitor Foldout page.**

2. **Dispatch operator to close the following breakers:**

- __ 2EMXA-R2A (2A ND To 2A&2B Cold Legs Cont Outside Isol Motor (2NI-173A)) (aux bldg, 750, FF-57)
- __ 2EMXA-R1E (Unit 2 NI To Cold Legs Cont Outside Isol Motor (2NI-162A)) (aux bldg, 750, FF-57)
- __ 2EMXB1-6B (2B ND To 2C&2D NC Cold Leg Cont Outside Isol Motor (2NI-178B)) (aux bldg, 733, GG-56).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. Check if ND pumps should be stopped and isolated as follows:	
__ a. Check NC pressure - GREATER THAN 275 PSIG.	a. Perform the following: __ 1) **<u>IF</u>** containment pressure is less than 1 PSIG, **<u>AND</u>** the LOCA is <u>only outside</u> containment, **<u>THEN</u> <u>GO TO</u>** Step 3.b. __ 2) Contact station management to evaluate any actions to isolate potential leak. __ 3) **<u>RETURN TO</u>** procedure and step in effect.
__ b. ND pumps suction - ALIGNED TO FWST.	__ b. **<u>GO TO</u>** Step 5.
c. Check the following for indications of leak into ND System: • Abnormal ND temperatures on chart recorders: __ • ND to NC Cold Leg A and B temperature __ • ND to NC Cold Leg C and D temperature. __ • Abnormal ND System pressure.	
__ d. Check leak location - ON ND SYSTEM.	__ d. **<u>IF</u>** ND System has remained intact, **<u>THEN</u> <u>GO TO</u>** Step 5.
__ e. Check any ND pump - ON.	__ e. **<u>GO TO</u>** Step 4.d.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. Stop ND pumps and isolate potential FWST depletion path as follows:	
__ a. Reset S/I.	
__ b. Reset Sequencers.	
__ c. Stop both ND pumps.	
d. CLOSE the following valves:	
__ • 2ND-19A (A ND Pump Suct From FWST or NC)	
__ • 2ND-4B (B ND Pump Suct From FWST or NC).	
__ e. Enable power disconnect and CLOSE 2FW-27A (FWST Supply To ND).	
5. Check proper valve alignment as follows:	
a. Valves in ND pump suction from NC System - CLOSED:	a. Perform the following:
__ • 2ND-1B (C NC Loop to ND Pumps)	__ 1) Dispatch operator to close breaker for valve(s).
__ • 2ND-2AC (C NC Loop To ND Pumps).	__ 2) CLOSE valve(s).
	3) **IF** valve cannot be closed, **THEN** dispatch operator to CLOSE the following valve(s):
	__ • 2ND-1B (reactor bldg, 725+12, 184 degrees, 5 ft from shield wall)
	__ • 2ND-2AC (C NC Loop To ND Pumps) (reactor bldg, 738+8, 184 degrees, between B and C AHU, 4 ft up).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
__ b. 2NI-183B (ND To B & C Hot Legs Isol) - CLOSED.	b. Perform the following: __ 1) Dispatch operator to close breaker for valve. __ 2) CLOSE valve. __ 3) **<u>IF</u>** valve cannot be closed, **<u>THEN</u>** dispatch operator to CLOSE 2NI-183B (aux bldg, 733+13, EE-60, midget hole, 3 ft from ceiling, 4 ft from reactor bldg wall).
c. NI pump hot leg injection valves - CLOSED: __ • 2NI-121A (Train A NI To B & C Hot Leg) __ • 2NI-152B (Train B NI To A & D Hot Leg).	c. Perform the following: __ 1) Dispatch operator to close breaker for valve(s). __ 2) CLOSE valve(s). 3) **<u>IF</u>** valve(s) cannot be closed, **<u>THEN</u>** dispatch operator to CLOSE the following valve(s): __ • 2NI-121A (aux bldg, 733+10, GG-59, 5 ft from ceiling, 4 ft from reactor bldg wall) __ • 2NI-152B (aux bldg, 750+4, HH-60, room 830, south of UHI valves).
__ d. 2NV-840A (ND To Pzr Aux Spray Control)- CLOSED.	d. Perform the following: __ 1) CLOSE valve. __ 2) **<u>IF</u>** valve cannot be closed, **<u>THEN</u>** dispatch operator to CLOSE 2NV-840A (aux bldg, 750+9, LL-60, room 786, between ND and NS heat exchanger).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
__ e. **IF** NC System leak is known to be isolated by actions taken in Step 5, **THEN GO TO** EP/2/A/5000/E-1 (Loss of Reactor or Secondary Coolant).	

NOTE

- 2NI-173A (Train A ND To A & B CL) and 2NI-178B (Train B ND To C & D CL) may not fully close if NC pressure is above 450 PSIG. These valves may indicate closed with valve still 20% open.
- Since ND trains are cross-tied, a check valve failure on one ND discharge line can affect either ND train.
- If NC System is saturated, NC pressure may not be a good diagnostic of leak isolation. NC pressure will respond very slowly after leak is isolated, or may continue to drop if cooldown is in progress, until subcooling is restored.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. **Try to identify and isolate break as follows:**	
a. Check the following for indications of leak into ND System:	
• Abnormal ND temperatures on chart recorders:	
__ • ND to NC Cold Leg A and B temperature	
__ • ND to NC Cold Leg C and D temperature.	
__ • Abnormal ND System pressure.	
__ b. Check leak location - ON ND SYSTEM.	__ b. **IF** ND System has remained intact, **THEN GO TO** Step 6.f to isolate potential leak on NI System.
c. Do not continue until breakers for the following valves are closed:	
__ • 2NI-173A (Train A ND To A & B CL)	
__ • 2NI-178B (Train B ND To C & D CL).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. (Continued)	
d. CLOSE the following valves:	
__ • 2NI-173A (Train A ND To A & B CL)	
__ • 2NI-178B (Train B ND To C & D CL).	
__ e. **GO TO** Step 7.	
f. Isolate NI header to cold legs as follows:	
1) Check the following valves - OPEN:	__ 1) Stop NI pumps.
__ • 2NI-115B (A NI Pump Miniflow)	
__ • 2NI-144B (B NI Pump Miniflow)	
__ • 2NI-147A (NI Pumps Miniflow Hdr Isol).	
__ 2) Do not continue until breaker for 2NI-162A (NI Pumps Cold Leg Isol) has been closed.	
__ 3) CLOSE 2NI-162A (NI Pumps Cold Leg Isol).	
4) Evaluate the following to determine if NC System leak is isolated:	
__ • NC System pressure	
__ • RVLIS	
__ • Pzr level	
__ • Local observation.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. (Continued)	
__ 5) Check NC System Leak - ISOLATED.	5) Perform the following: __ a) OPEN 2NI-162A (NI Pumps Cold Leg Isol). __ b) **IF** NI pumps stopped in previous step, **THEN** restart pumps. __ c) **GO TO** Step 7.
__ 6) Initiate actions as necessary to complete isolation of leak from FWST and other systems.	
__ 7) **GO TO** EP/2/A/5000/E-1 (Loss of Reactor or Secondary Coolant).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

7. **Check if break is isolated as follows:**

a. Evaluate the following to determine if NC System leak is isolated:

__ • NC System pressure

__ • RVLIS

__ • Pzr level

__ • ND System pressure

__ • Local observation.

__ b. Notify station management to assist in determining which injection line failed.

NOTE Leak should be assumed to still exist unless it's clear that it's isolated.

__ c. Check NC System leak - KNOWN TO BE ISOLATED.

c. **IF** NC System leak still exists, **OR** status of leak isolation is unknown, **THEN** perform one of the following:

__ • **IF** break location is suspected to be on ND system, **THEN GO TO** Step 8.

OR

__ • **IF** break location is **NOT** indicated on ND System, **THEN GO TO** EP/2/A/5000/ECA-1.1 (Loss of Emergency Coolant Recirc).

__ d. **IF** NC System leak is known to be isolated, **THEN GO TO** EP/2/A/5000/E-1 (Loss of Reactor or Secondary Coolant).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. **Reset the following:**	
__ a. S/I.	__ a. Reset S/I **PER** EP/2/A/5000/G-1 (Generic Enclosures), Enclosure 23 (Local Reset of S/I Signal).
__ b. Sequencers.	b. Dispatch operator to open affected sequencer control power breaker: __ • A Train - 2EVDA Breaker 6 __ • B Train - 2EVDD Breaker 8.

NOTE

- After the Low Pressure Steamline Isolation signal is blocked, maintaining steam pressure negative rate less than 2 PSIG per second will prevent a Main Steam Isolation.
- The following steps will perform a cooldown and depressurization as quickly as possible to reduce NC pressure low enough to allow isolation valves to close.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. **Initiate NC System cooldown to 430°F based on core exit T/Cs as follows:**	
a. Check condenser available as follows: __ • MSIV on intact S/G(s) - OPEN __ • "C-9 COND AVAILABLE FOR STEAM DUMP" status light (2SI-18) - LIT.	__ a. **GO TO** RNO for Step 9.e.
b. Perform the following to place steam dumps in steam pressure mode: __ 1) Place "STM PRESS CONTROLLER" in manual. __ 2) Adjust "STM PRESS CONTROLLER" output to equal "STEAM DUMP DEMAND" signal. __ 3) Place "STEAM DUMP SELECT" in steam pressure mode.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

9. (Continued)

c. **WHEN** "P-11 PRESSURIZER S/I BLOCK PERMISSIVE" status light (2SI-18) lit, **THEN** perform the following:

__ 1) Depress "BLOCK" on Low Pressure Steamline Isolation block switches.

__ 2) Maintain NC pressure less than 1955 PSIG.

__ d. **WHEN** "P-12 LO-LO TAVG" status light (2SI-18) lit, **THEN** place steam dumps in bypass interlock.

__ e. Dump steam from intact S/G(s) to condenser at maximum rate while attempting to avoid a Main Steam Isolation.

RNO:

e. Perform the following:

__ 1) Ensure at least one Pzr PORV isolation valve is OPEN.

2) **IF** VI is lost, **OR** a Phase B Isolation has occurred, **THEN** align N_2 to PORVs by OPENING the following valves:

__ • 2NI-430A (Emerg N2 From CLA To 2NC-34A)

__ • 2NI-431B (Emerg N2 From CLA To 2NC-32B & 36B).

__ 3) **IF** Pzr pressure is greater than 1955 PSIG, **THEN** depressurize to 1900 PSIG using Pzr PORV.

__ 4) Depress "BLOCK" on Low Pressure Steamline Isolation block switches.

__ 5) Maintain NC pressure less than 1955 PSIG.

__ 6) Ensure Main Steam Isolation reset.

(RNO continued on next page)

9. (Continued)

__ 7) Ensure SM PORVs reset.

8) **IF** any intact SG SM PORV isolation valve is closed, **AND** associated SM PORV is operable, **THEN** perform the following:

__ a) OPEN SM PORV isolation valve(s).

__ b) **IF** isolation valve will not open, **THEN** dispatch operator to OPEN isolation valve.

9) Dump steam using all intact S/G(s) SM PORVs at maximum rate as follows:

__ a) CLOSE SM PORV manual loader on any ruptured S/G(s).

__ b) Place intact S/G SM PORV manual loaders at 50%.

__ c) Select "MANUAL" on "SM PORV MODE SELECT".

__ d) Adjust manual loaders on intact S/G SM PORVs as required to control intact S/G depressurization rate at approximately 2 PSIG per second.

10) **IF** any intact S/G SM PORV closed, **THEN** dispatch operators to perform the following:

__ • Immediately fully OPEN affected intact S/G(s) SM PORVs (at valves).

__ • Establish communication with Control Room.

__ 11) **GO TO** Step 10.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
__ f. Check Low Pressure Steamline Isolation - BLOCKED.	f. Perform the following: 1) Depressurize Pzr to less than 1955 PSIG using one of the following: __ • Maximum available Pzr spray. OR __ • **IF** normal Pzr spray is not available, **THEN** use Pzr PORV. __ 2) Do not continue until Pzr pressure is less than 1955 PSIG. __ 3) Depress "BLOCK" on Low Pressure Steamline Isolation block switches. __ 4) CLOSE Pzr spray valve(s) and Pzr PORVs. __ 5) Maintain NC pressure less than 1955 PSIG.
10. **Check if CLAs should be isolated:**	
a. Check the following: __ • NC System subcooling based on core exit T/Cs - GREATER THAN 0°F __ • Pzr level - GREATER THAN 11% (29% ACC).	a. Perform the following: __ 1) **WHEN** NC subcooling based on core exit T/Cs is greater than 0°F, **AND** Pzr level is greater than 11% (29% ACC), **THEN** isolate CLAs **PER** Enclosure 2 (Cold Leg Accumulator Isolation). __ 2) **GO TO** Step 11.
__ b. Isolate CLAs **PER** Enclosure 2 (Cold Leg Accumulator Isolation).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. **<u>IF AT ANY TIME</u> while in this procedure Pzr level goes above 76% (58% ACC), <u>AND</u> subcooling based on core exit thermocouples is greater than 0°F, <u>THEN</u> stop the following ECCS pumps:** __ • Both NI pumps __ • All but one NV pump.	
12. **Do not continue until one of the following are met:** __ • Core exit T/Cs are less than 430°F OR __ • NC pressure - LESS THAN 400 PSIG.	
__ 13. **Stop NC System cooldown.**	
__ 14. **Check Core exit T/Cs - LESS THAN 430°F.**	**Perform the following:** __ a. Maintain Core exit T/Cs stable at existing temperature. __ b. **<u>GO TO</u>** Step 16.
__ 15. **Maintain Core exit T/Cs less than 430°F and stable.**	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
16. Depressurize NC System and isolate leak as follows:	
__ a. Check NC pressure - GREATER THAN 450 PSIG.	__ a. **GO TO** Step 16.c.
__ b. OPEN one Pzr PORV until NC pressure is less than 450 PSIG.	b. **IF** Pzr PORV will not operate, **THEN** perform the following: 1) Align N_2 to all PORVs by OPENING the following valves: __ • 2NI-430A (Emerg N2 From CLA To 2NC-34A) __ • 2NI-431B (Emerg N2 From CLA To 2NC-32B & 36B). __ 2) Depressurize using one Pzr PORV.
__ c. Ensure Step 10 is performed as soon as criteria to isolate CLAs are met.	
__ d. Ensure Step 11 is performed as soon as criteria to stop ECCS pumps are met.	
__ e. Do not continue until NC System pressure is less than 450 PSIG.	
__ f. CLOSE Pzr PORV.	
__ g. Continue to cycle Pzr PORV as required to maintain NC System pressure less than 450 PSIG, until valves are closed in next steps.	

NOTE Valves must be reopened in next step to clear the torque switch mechanical latch. This will allow fully closing valves.

h. OPEN the following valves:

__ • 2NI-173A (Train A ND To A & B CL)

__ • 2NI-178B (Train B ND To C & D CL).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

16. (Continued)

i. CLOSE the following valves:

__ • 2NI-173A (Train A ND To A & B CL)

__ • 2NI-178B (Train B ND To C & D CL).

__ j. CLOSE Pzr PORV.

17. **Check if break is isolated:**

a. Evaluate the following to determine if NC System leak is isolated:

__ • NC System pressure

__ • RVLIS

__ • Pzr level

__ • ND System pressure

__ • Local observation.

__ b. Check NC System leak - ISOLATED.

RESPONSE NOT OBTAINED:

__ b. **GO TO** EP/2/A/5000/ECA-1.1 (Loss of Emergency Coolant Recirc).

McGuire Nuclear Station
ILT-31 MNS RO NRC Examination

Question: 54
(1 point)

Given the following conditions on Unit 1:

- ECA-1.2 (LOCA OUTSIDE CONTAINMENT) has been implemented
- NC System pressure is 1700 psig and stable

In accordance with ECA-1.2,

1) the crew will FIRST stop and isolate the ________ pumps from the FWST.
2) the overall mitigating strategy includes cooldown and depressurization of the NCS to allow the ________.

Which ONE (1) of the following completes the statement above?

A. 1. ND
   2. Cold Leg Accumulators to inject

B. 1. NI
   2. Cold Leg Accumulators to inject

C. 1. ND
   2. ND isolation valves (1NI-173A and 1NI-178B) to close

D. 1. NI
   2. ND isolation valves (1NI-173A and 1NI-178B) to close

General Discussion

The first Major action in ECA-1.2 is to stop and isolate ND pumps from FWST.
The objective of ECA-1.2 is to provide actions to identify and isolate a LOCA outside containment. For a LOCA on the Residual Heat Removal (ND) system, the valves used to do this isolation are NI-173A /178B (ND to Cold Legs Cont Isol). These valves are not designed to close against the DP that could be seen during an ISLOCA. To meet the intent of ECA-1.2 to isolate a break on low pressure ND piping, this EP includes actions to cooldown and depressurize the NC system to the point where the isolation valves are capable of closing.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

The first part is correct and therefore plausible.

The second part is plausible because if the ND leak cannot be isolated before depleting the FWST, a transition to ECA-1.1 (Loss of ECR) would occur, and then the NCS is depressurized to allow CLA injection.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

The first part is plausible because the high pressure injection lines will be checked later in ECA-1.2 to attempt to identify and isolate the break.

The second part is plausible because if the ND leak cannot be isolated before depleting the FWST, a transition to ECA-1.1 (Loss of ECR) would occur, and then the NCS is depressurized to allow CLA injection.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT:

PLAUSIBLE:

The first part is plausible because the high pressure injection lines will be checked later in ECA-1.2 to attempt to identify and isolate the break.

The second part is correct and therefore plausible.

Basis for meeting the KA

The K/A is matched because the applicant must demonstrate knowledge of the reasons for the procedural direction to cooldown and depressurize the NCS to allow cycling of NI-173A/NI-178B to ensure these valves will provide leak isolation, since these valves are not designed to close against the DP that could be seen during an ISLOCA.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2013 MNS SRO AUDIT Q55 (Bank 5745)

Development References

REFERENCES:
Lesson Plan OP-MC-EP-E1 (Basis Document for ECA-1.2

LEARNING OBJECTIVES:
EPE1003
OP-MC-EP-E1 Objective 3

Student References Provided

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ILT-31 MNS SRO NRC Examination QUESTION 54

54

C

WE04 EK3.4 - LOCA Outside Containment

Knowledge of the reasons for the following responses as they apply to the (LOCA Outside Containment)
(CFR: 41.5 / 41.10, 45.6, 45.13)

RO or SRO function within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated.

401-9 Comments:

Remarks/Status
Consider sending to Chief Examiner for pre-401-9 review. Question sent to Chief Examiner for pre-401-9 review on 1/22/15. HCF Chief Examiners Early Submittal comments: K/A WE04 EK3.4 Question was submitted for preliminary review. The first bullet is a cue and is not needed. May need to add plant pressure to the initial conditions (>450 psig).   Facility Response: Removed first bullet from stem and added NCS pressure to stem per chief examiners comments. SLM030215 401-9 Comment from Chief Examiner: Revised question is Satisfactory.

1. **Emergency Coolant Recirc Capability Restoration:**
   - **WHEN** Cold Leg Recirc capability is restored, **THEN GO TO** Step 3.f in body of this procedure.

2. **ECCS Suction Monitoring Criteria:**
   - **IF** FWST level goes below "FWST LEVEL LO-LO" alarm setpoint (20 inches), **THEN** stop all pumps taking suction from the FWST.
   - **IF** suction source is lost to any NV, NI, ND, or NS pump, **THEN** stop pump.

3. **CA Suction Sources:**
   - **IF** CA Storage Tank (water tower) goes below 1.5 ft, **THEN** perform EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 20 (CA Suction Source Realignment).

4. **CLA Isolation:**
   - **IF** at least two NC T-Hots are less than 388°F, **THEN** isolate CLAs **PER** Enclosure 10 (CLA Isolation).

2.3.8 ND-67B (B ND Pump & B HX Mini-flow) and ND-68A (A ND Pump & A HX Mini-flow)

These safety related, normally closed motor operated valves are interlocked to automatically open on a train related pump start when ND flow through its train related ND heat exchanger falls below the 750 gpm setpoint (as sensed by NDFT5250 for pump A and NDFT5260 for pump B). When flow reaches the 1400 gpm setpoint or if the associated pump stops, the valve will close.

2.3.9 ND-35 (ND System to FWST Isolation)

This valve is an 8" manually operated gate valve. ND-35 is used during outage periods to transfer water from the reactor coolant system or refueling canal to the refueling water storage tank. ND-35 is also used as a gravity flow path from the FWST to the NC system during loss of ND events.

ND-35 shall not be opened during Modes 1 - 4. Opening this valve during Modes 1 - 3 would allow both trains of ND to recirculate to the FWST, since ND-15B and ND-30A are required to remain open. With the ND to FWST recirculation path open, both trains of ND would be inoperable due to the insufficient ECCS injection flowrate to the NC loops. Opening this valve while in Mode 4 with the ND System in service could cause a rapid loss of reactor coolant inventory and void the 24" FW header with steam, making all ECCS trains inoperable. Therefore, ND-35 shall remain locked closed during Modes 1 - 4.

2.3.10 NI-184B (RB Sump to Train B ND & NS) and NI-185A (RB Sump to Train A ND & NS)

Objective # 7

NI-184B and NI-185A have open/close pushbuttons on the ND section of MC11. These valves are designed to automatically open on FWST low level (95"), following a safety injection signal, to swap the ND pump suction from the FWST to the containment sump. Each valve has an S-latch control circuit which ensures that the valves will not swap to the containment sump unless certain conditions exist (Refer to drawing 7.2). The S latch is activated by the train related safety injection signal and has two train related indication/switches on MC11. When the S_S signal is actuated, the S LATCHED indication will illuminate and remain lit until the SS RESET pushbutton is depressed. The S LATCH seals in the S_S SIGNAL, therefore the automatic swap will be enabled even if the S_S signal is reset. The S-latch allows the automatic opening of NI-184B and/or NI-185A on 2 of 3 FWST LO level bistables provided the FWST level instruments are not in test.

Operator Fundamental Focus; Monitoring and Control
Operators are expected to monitor for automatic system and component response and, if the expected response does not occur, take manual action.

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ILT-16-1 MNS SRO NRC Examination **QUESTION 56** 56 **A**

WE11 EK2.2 - Loss of Emergency Coolant Recirculation
Knowledge of the interrelations between the (Loss of Emergency Coolant Recirculation) and the following:
(CFR: 41.7 / 45.7)

Facility*s heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.

Given the following conditions on Unit 1:

- A Large Break LOCA has occurred inside Containment
- A and B ND pumps are not available
- The Control room crew has implemented ECA-1.1 (LOSS OF EMERGENCY COOLANT RECIRC) but, NO actions have been taken
- Containment pressure is 8 PSIG and slowly rising
- FWST level is 105 inches and lowering

When the FWST Level LO setpoint is reached, 1NI-184B (1B ND PUMP SUCTION FROM CONT SUMP ISOL) AND 1NI-185A (1A ND PUMP SUCTIONFROM CONT SUMP ISOL) ___(1)___ automatically OPEN.

Per ECA-1.1 Foldout Page, when FWST level decreases to less than a MAXIMUM of ___(2)___ inches ALL ECCS pumps must be secured.

Which ONE (1) of the following completes the statements above?

A. 1. will
2. 20

B. 1. will NOT
2. 20

C. 1. will
2. 95

D. 1. will NOT
2. 95

General Discussion

There are five levels which are important to proper FWST operation:
- Low-Low 20"
- Low 95"
- Pre-Low Level 135"
- Makeup 475"
- High 483"
- Overflow 484"

The Low and Low-Low levels are used for post accident monitoring. Redundant annunciators alarm at each point. Valves NI-184B and NI-185A automatically open at the Low level setpoint.

Valves NI-184B and NI-185A are part of the ECCS System. They are controlled from the Control Room and are normally closed. These valves automatically open on a 2/3 low level in conjunction with a Safety Injection Signal.

IF FWST level goes below "FWST LEVEL LO-LO" alarm setpoint (20 inches), THEN stop all pumps taking suction from the FWST.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible since all other actions to align to the Reactor bldg. sump are not performed until after the FWST reaches the Low-Low setpoint. However, automatic opening of the Reactor bldg. sump valves occurs at the FWST Low level setpoint.

Second part is correct and therefore plausible.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct and therefore plausible.

Second part is plausible since 95 inches is the setpoint for FWST Level Low.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible since all other actions to align to the Reactor bldg. sump are not performed until after the FWST reaches the Low-Low setpoint. However, automatic opening of the Reactor bldg. sump valves occurs at the FWST Low level setpoint.

Second part is plausible since 95 inches is the setpoint for FWST Level Low.

Basis for meeting the KA

The K/A is matched because the applicant is required to know the interrelations between the Loss of Emergency Coolant Recirculation and the facilities decay heat removal systems.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2015 MNS NRC Exam Q56 (Bank 5961)

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ILT-16-1 MNS SRO NRC Examination **QUESTION 56** 56 **A**

Development References	Student References Provided
REFERENCES: OP-MC-FH-FW ECA-1.1 (Loss of Emergency Coolant Recirc) Rev. 16 Lesson Plan OP-MC-PS-ND (Residual Heat Removal) Rev. 49 LEARNING OBJECTIVES:	

WE11 EK2.2 - Loss of Emergency Coolant Recirculation
Knowledge of the interrelations between the (Loss of Emergency Coolant Recirculation) and the following:
(CFR: 41.7 / 45.7)
Facility*s heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.

Remarks/Status

401-9 Comments: UNSAT

WE11 EK2.2
K/A is met.
This is not a very discerning question. Why would anyone state recirc is available on a loop with the recirc valve closed? The second question is ok. Drl 2/10/16

Facility Response:
Decided that the question could not be replaced and still keep the question reasonable for an RO. Therefore, the exam team selected a replacement question. Rearranged answers from previous exam question such that the correct answer is now "A". Distracter analysis rearranged accordingly. HCF 02/25/2016

Submitted replacement question to Chief Examiner for review. Chief Examiner approved replacement question as SAT. HCF 03/02/2016

Instructor Note:

1. While covering this procedure series, discuss different plant conditions walking through procedure flowpaths to determine any required action and its basis. It is not intended that the instructor cover all potential scenarios. The walkthrough should include discussion of branching steps and what conditions would require alternate procedure routing.

3.0 FR-H.1, LOSS OF SECONDARY HEAT SINK

3.1 Purpose

This procedure provides actions to respond to a loss of secondary heat sink in all S/Gs.

3.2 Symptoms/Conditions

The table below shows the procedures and step numbers that provide a transition to FR-H.1.

TRANSITION PROCEDURE AND STEP NUMBER	SYMPTOM
E-0, Reactor Trip Or Safety Injection, Step 18	When minimum CA flow is not verified **AND** N/R level in all S/Gs is less than 11% (32% ACC).
F-0, Critical Safety Function Status Trees, Heat Sink	On a red condition.

3.3 Major Actions

Operator Fundamental Focus; Teamwork and Knowledge
Reinforce *that it is important to understand major action categories of the EP network. This allows more effective* ***teamwork*** *by ensuring that all crew members understand what the procedure is trying to accomplish and what each Operators' role is to make the procedure successful.* ***Explain*** *that the four major actions for recovery/restoration of FR-H.1 include;*

1. *Attempt restoration of feed flow to S/Gs.*
2. *Initiation of feed and bleed heat removal.*
3. *Restore and confirm secondary heat sink.*
4. *Termination of feed and bleed heat removal.*

The following subsections provide a more detailed discussion of each major action category.

3.3.1 Attempt Restoration of Feed Flow to S/Gs

The operator attempts to restore or establish auxiliary feedwater flow, main feedwater flow, and condensate flow (in that order) while checking symptoms for a loss of secondary heat sink. Auxiliary feedwater flow restoration is attempted first and, if unsuccessful, NC pumps are tripped to extend the available time to establish feed flow

from the main feedwater and condensate systems. If all other feedwater sources are unavailable feed flow from RY is established.

3.3.2 Initiation of NC System Feed and Bleed Heat Removal

If symptoms for loss of secondary heat sink are reached, feed and bleed heat removal is initiated through S/I actuation (feed path) and opening the Pzr PORVs (bleed path). Feed and bleed heat removal is maintained until the secondary heat sink is reestablished and confirmed.

3.3.3 Restore and Confirm Secondary Heat Sink

After feed and bleed heat removal is established, the operator continues attempts to restore N/R level in at least one S/G. After level is established, NC system temperatures going down confirm the effectiveness of the secondary heat sink.

3.3.4 Termination of NC System Feed and Bleed Heat Removal

With a confirmed secondary heat sink, the operator performs a coordinated sequence for S/I flow reduction and closing of Pzr PORVs. After the completion of the sequence, the operator is transferred to ES-1.1, Safety Injection Termination, for plant recovery.

Conduct of Operations Focus: Nuclear Safety Culture

Nuclear safety is at the forefront of all operational decisions. Nuclear safety must be established as the overriding priority for all aspects of plant operation. Safe operation of the facility takes precedence over all other considerations including time, economics and competitive pressures.

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EXAM BANK QUESTION: 6619 CNS **A**

Given the following:

- Unit 1 has experienced a Safety Injection due to Hi Containment Pressure
- Containment pressure peaked at 2.7 psig and is now slowly decreasing
- The crew has implemented EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink)
- All attempts to restore CA flow have been unsuccessful

In accordance with FR-H.1:

The NEXT source of feed water attempted for restoration of flow to the S/Gs is through the CM/CF system using _____(1)_____ .

The crew will be required to establish bleed and feed when W/R level in at least 3 S/Gs is less than a MAXIMUM level of _____(2)_____ .

A. 1. either Main Feed Water pump
   2. 24%

B. 1. either Main Feed Water pump
   2. 36%

C. 1. Hotwell and Booster pumps
   2. 24%

D. 1. Hotwell and Booster pumps
   2. 36%

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EXAM BANK QUESTION: 6619 CNS A

General Discussion

If CA flow is not available, FR-H.1 will first attempt to place MFPs in service followed by a depressurization and attempts to feed from the Howell and Booster pumps.

Bleed and Feed initiation criteria is 3 S/Gs less than 24% or 36% (ACC). Adverse Containment is 3 psig in containment.

Answer A Discussion

CORRECT. See explanation above.

Answer B Discussion

Part 1 is correct.

Part 2 is plausible because this would be the correct answer if adverse containment condition numbers were in effect.

Answer C Discussion

Part 1 is plausible because the Hotwell and Booster pumps could be used if S/Gs were first depressurized and are an option specified in FR-H.1 (following attempts to place MFPs in service).

Part 2 is correct.

Answer D Discussion

Part 1 is plausible because the Hotwell and Booster pumps could be used if S/Gs were first depressurized and are an option specified in FR-H.1 (following attempts to place MFPs in service).

Part 2 is plausible because this would be the correct answer if adverse containment condition numbers were in effect.

Basis for meeting the KA

The applicant is required to demonstrate knowledge of heat removal system prioritization and initiation setpoints upon a loss of secondary heat sink.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	ILT15 CNS NRC Examination

Development References
OP-CN-EP-FPH (FR-H Lesson Plan), Rev. 101, Section 3.2 EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink), Rev. 42, Enclosure 1, Step 1

Student References Provided

KA	KA_desc
WE05 EK2.2	Knowledge of the interrelations between the (Loss of Secondary Heat Sink) and the following: (CFR: 41.7 / 45.7)Facility*s heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.

WG discharges are normally monitored and if release rate limits are exceeded, terminated by 0EMF50. 1EMF36 will duplicate 0EMF50 actions.

Operator Fundamental Focus; Monitoring and Teamwork
Reinforce *the fundamental attribute for the CRS to track degraded and inoperable technical specification equipment.* ***Relate*** *this fundamental behavior to the fact that it is preferable to not make a release with either 1EMF-36 or 0EMF-50 inoperable. Controlling EMF operability (1EMF-36 or 0EMF-50), and any necessary inoperable actions, is a responsibility of the entire crew and communicating problems to the CRS, so that the appropriate Tech Spec actions can be taken, support the Operator Fundamental Teamwork.*

EMF35, 36, 37 use a particulate-iodine-gas assembly. The Gas channel has a high and low range. The low range uses a plastic Scint detector while the high range uses a GM detector. The iodine portion uses a NaI Scint.

There are Loss of Sample Flow annunciators associated with both the EMF vacuum pump and the RP Composite Sampler. However, the actions required by SLC 16.11-7 are different for each. Loss of the Unit Vent Composite Sampler requires RP to estimate flow once per four hours. (Ref. NCR# 1705224)

2.1.5 Containment Airborne Monitor

The containment air is sampled by the following channels:

- 1(2) EMF 38 (L) - Unit 1 (2) Containment Particulate (Low Range)
- 1(2) EMF 39 (L) - Unit 1(2) Containment Gas (Low Range)
- 1(2) EMF 39 (H) - Unit 1(2) Containment Gas (High Range)
- 1(2) EMF 40 - Unit 1(2) Containment Iodine

Objective # 2

The above channels monitor the particulate, iodine and gaseous activity levels in the:

- Containment atmosphere during normal unit operation.
- Containment purge exhaust flow during containment purge operations.

These channels monitor containment to warn personnel if containment atmospheric activity exceeds preset limits and to secure liquid and atmospheric releases from containment.

Objective # 4

Three sample points, selected from the control console, provide coverage of the containment. Sample points are located in:

- Upper Containment

- Lower Containment
- Incore Instrumentation Room

The three sample points are monitored by a single Particulate-Iodine-Gas detector assembly. Selection of the point to be sampled is made using the toggle switches on the sample flow select module on the control cabinet (refer to Drawing 7.1). To prevent damage to the sample pump, at least one flow path must be opened. The sample air is returned to the containment.

According to the basis of T.S. 3.4.15 (RCS Leakage Detection Instrumentation), a sample from the lower containment region is required for NC leakage detection. The reason is that the NC system is physically located within the lower containment region. The incore area and lower containment samples are both obtained from the lower containment region. Applicable RP and Operations procedures reflect this requirement. For example, the Semi-Daily PT has a note to alert the operators that EMF-38 is inoperable if the sample pump is selected to Upper Containment only for greater than 15 minutes.

Objective # 3

A Trip 2 high radiation alarm on EMF-38(L), EMF-40(L), or EMF-39(L) channels will stop the CFAES pumps and the Incore Sump pump. Also, trip 2 will initiate a Containment Ventilation isolation signal (S_H) through the Solid State Protection System. This S_H signal will:

- Secure VQ
- Secure VP

A high alarm on the EMF-39(L) (gaseous) channel will also sound the Containment Evacuation Alarm unless both source range high flux trips are blocked.

The purpose of the auto actions are to:

- terminate a release originating in containment which is discharging to the Unit Vent if the release limits are exceeded.
- Stop the containment sump pumps to prevent pumping potentially highly contaminated water into the Aux. Building (i.e., FDT or WEFT).
- Sound the containment evacuation alarm to inform personnel to leave the containment due to the potential for high airborne concentration existing in containment.

The Gas channel has a high and low range. The low range uses a plastic Scint detector while the high range uses a GM detector. The iodine portion uses a NaI Scint.

2.1.6 Auxiliary Building Ventilation Monitor

The Auxiliary Building is monitored by 0EMF 41 - Aux Building Ventilation.

2.1.20 Equipment Staging Building Ventilation System (VK)

Objective #2

The Equipment Staging Building could contain radioactive materials which if released to the environment could violate the 10CFR release limits. This facility is not designed to perform controlled radioactive releases however, there is the possibility that the ventilation system could become a vent path to the environment. 2EMF-59 - Equipment Staging Building Ventilation Monitor is use to monitor gaseous activity exhausted to the atmosphere.

Objective #3

If the Equipment Staging Bldg. Vent (VK) is in "Auto" it will trip the supply fan and exhaust fan with a Trip 2 high radiation alarm. If the VK System is in "On", no automatic actions will occur with a Trip 2 alarm.

The purpose of the auto actions are to prevent exceeding release rate limit via this pathway.

2EMF-59 is a single range Beta gas channel with a plastic scintillation detector. The instrument range is 10 to 10^7 CPM.

2.1.21 Unit Vent Activity Monitor

Objective #2

1(2) EMF 36 (HH) - Unit 1(2) Unit Vent Activity Monitor is used for the assessment of the level of radioactivity being released to the atmosphere through the Unit Vent during an accident or post-accident condition. This EMF utilizes a sample probe located within the Unit Vent.

Objective #3

A high radiation alarm (Trip I) on 1EMF-36 (HH) will shut off the 1EMF 35/36/37 sample pump. A high alarm on 2EMF 36 (HH) will shut off the 2EMF 35/36/37 sample pump.

Note that the automatic action occurs on Trip I instead of Trip II.

EMF 36(HH) uses an Ionization chamber detector. The instrument range is 1 to 10^8 R/hr.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

B. <u>Symptoms</u>

- **"1EMF-36 UNIT VENT GAS HI RAD" alarm**
- **"1EMF-38 CONTAINMENT PART HI RAD" alarm**
- **"1EMF-39 CONTAINMENT GAS HI RAD" alarm**
- **"1EMF-40 CONTAINMENT IODINE HI RAD" alarm**
- **"1EMF-42 FUEL BLDG VENT HI RAD" alarm**
- **"1EMF-16 CONTAINMENT REFUELING BRIDGE" alarm**
- **"1EMF-17 SPENT FUEL BLDG REFUEL BRDG" alarm**
- **Gas bubbles originating from the damaged assemblies**
- **Visible evidence of spent fuel damage anywhere on site with the potential for radioactive releases.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 1. **Check location of spent fuel damage - IN CONTAINMENT.**	__ **GO TO Step 13.**
__ 2. **Notify Containment Closure Coordinator to initiate Containment Closure.**	

CAUTION **Damage to the rubber Reactor Vessel Cavity Seal may occur if an assembly is dropped on or near it.**

3. **Evacuate containment as follows:**

   a. Announce the following over paging system:

      __ 1) Description of event.

      __ 2) All personnel evacuate Unit 1 Containment bldg and assemble in hot side of change room.

   __ b. Ensure Containment Evacuation alarm has sounded.

   __ c. **REFER TO** RP/0/A/5700/011 (Conducting a Site Assembly, Site Evacuation, or Containment Evacuation).

NOTE The following enclosure is time critical and must be completed within 30 minutes of fuel assembly becoming damaged.

__ 4. **Place one Outside Air Pressure Filter train in service PER Enclosure 1 (Control Room Pressurization).**

__ 5. **Remove VP from service PER Enclosure 2 (Securing VP).**

__ 6. **Stop any VQ release in progress.**

Given the following Unit 1 conditions:

- The refueling crew is lowering an irradiated fuel assembly next to a new fuel assembly in the core
- The assembly inadvertently drops completely into the core
- 1RAD-3 D/2 (1EMF-17 REACTOR BLDG REFUEL BRIDGE) alarms
- No other annunciators have been received
- The crew has entered AP/1/A/5500/025 (Damaged Spent Fuel)

As a result of this event:

The Containment Evacuation Alarm _____(1)_____ automatically initiate.

AP/25 _____(2)_____ direct VP to be manually secured.

Which ONE of the following completes the statements above?

A. 1. will
   2. does

B. 1. will
   2. does NOT

C. 1. will NOT
   2. does

D. 1. will NOT
   2. does NOT

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EXAM BANK QUESTION: 7116 CNS **A**

General Discussion

In accordance with Annunciator Response Procedure OP/1/B/6100/010Z, 1RAD-3, D/2, 1EMF17 REACTOR BLDG REFUEL BRIDGE, when radiation monitor 1EMF- 17 alarms, it sends a signal to automatically actuate the Containment Evacuation alarm, as long as power level is below permissive P-6 (10E-5%). Since EMF-39 has not entered Trip 2, the VP system will not be automatically shutdown. AP/25 will direct the crew to manually secure the system.

Answer A Discussion

CORRECT. See explanation above.

Answer B Discussion

Part 1 is correct.

Part 2 is plausible because VP would be automatically secured upon EMF-39 actuation (not present).

Answer C Discussion

Part 1 is plausible because AP/25 directs operators to ensure the containment evacuation alarm is initiated. However, this should occur automatically in response to the EMF-17 actuation.

Part 2 is correct.

Answer D Discussion

Part 1 is plausible because AP/25 directs operators to ensure the containment evacuation alarm is initiated. However, this should occur automatically in response to the EMF-17 actuation.

Part 2 is plausible because VP would be automatically secured upon EMF-39 actuation (not present).

Basis for meeting the KA

Given a fuel handling incident, the applicant is required to demonstrate knowledge related to monitoring operation of an associated Area Radiation Monitor.

Basis for Hi Cog

The applicant is required to evaluate plant conditions, recall a setpoint, then determine if a set of automatic actions should have occurred.

Basis for SRO only

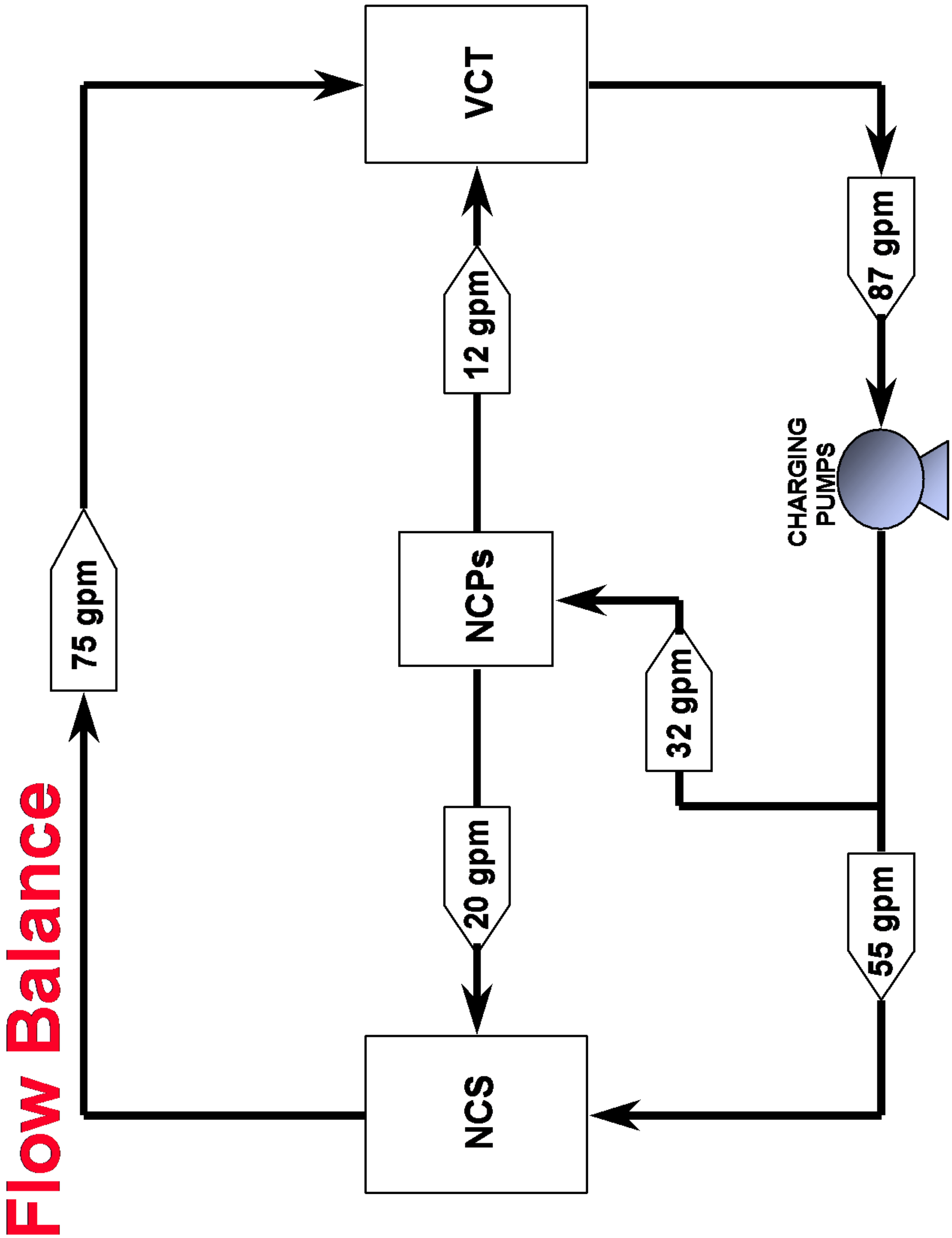
Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT-17 NRC Written Exam CNS NRC Examination

Development References
AP/1/A/5500/025, Case I, Rev. 017, Steps 1 & 7 OP/1/B/6100/010Z (Annunciator Response Procedure for 1RAD-3), Rev. 024, A/2 & D/2

Student References Provided

KA	KA_desc
APE036 AA1.02	Ability to operate and / or monitor the following as they apply to the Fuel Handling Incidents: (CFR 41.7 / 45.5 / 45.6)ARM system ....

7.2 NV System Flow Balance (05/10/99)



STEP DESCRIPTION FOR Case I, Steam Generator Tube Leakage

CASE I STEP 1:

PURPOSE:
Restore NC System inventory as required and provide criteria to manually initiate SI.

DISCUSSION:
When the operator enters this guideline, he does not necessarily know the size of the tube leak that is in progress nor can he expect the size of the leak to remain constant. Leak sizes that will result in entry into this guideline will range from a few gallons per day to in excess of 100 gallons per minute. The initial plant conditions will range from full power operation to a plant shutdown. In all cases it is important that the operator maintain control of pressurizer level as an indication of reactor coolant system inventory and the capability of the charging system to makeup for the steam generator tube leak.

If is preferable to use this AP rather than SI if charging can keep up with the leak. The analysis for AP/10 shows that the integrated leakage using the strategy of this guideline would be less than if SI was actuated and the EP's were entered. Therefore, charging flow should be maximized as much as possible to prevent the loss of Pzr level and the requirement to SI. For that reason, the second charging pump should be started to maximize charging flow if physically possible without damaging other plant equipment (i.e., Regen HX).

Charging is increased and letdown is reduced as necessary to maintain Pzr level. A maximum flowrate of 232 GPM charging is allowable. This will ensure there is not excessive Regen HX tube vibration. Note this is assuming 32 GPM going to the seals, which will limit the flow through the Regen HX to 200 GPM during **transient/accident** operation (PIP M-03-05739). The control board gauge for "Charging Flow" reads from 0 -200 GPM. In order to maintain charging flow on scale, the step provides guidance to maintain charging flow less than 200 GPM. This is well below the maximum allowable flowrate of 232 GPM. It should be noted here that the maximum flowrate allowed through the Regen HX during Normal/Start Up/Shut Down operation is 155 GPM.

If this AP is used during a shutdown mode after isolating CLAs, initiating an SI signal is not appropriate during a S/G tube leak or rupture. The emergency procedures assume CLAs are aligned open or ensure they are open. In a shutdown event, opening the CLAs would cause the Pzr to rapidly fill and make it difficult to control Pzr pressure. Initiating S/I will also rapidly refill the Pzr with initial conditions of low NC pressure. In a shutdown mode after CLAs are isolated, the optimum means to stop S/G tube leakage is to stay in this AP. If Pzr level or NC subcooling is lost, manually aligning S/I flow would be appropriate. This is consistent with guidance provided in AP/34 for shutdown LOCA. Since McGuire decided to allow use of AP/10 in any mode, this guidance was required. Note that in lower modes, normal charging is likely to be adequate to maintain Pzr level, since the NC system will already be partially depressurized. An enclosure was provided to address aligning SI flow during shutdown modes (after CLAs are isolated). ARG-3 background document “FREQUENT QUESTIONS” section provides guidance

B

ILT-30 MNS SRO NRC Examination QUESTION 59 59

APE037 AA1.08 - Steam Generator (S/G) Tube Leak

Ability to operate and / or monitor the following as they apply to the Steam Generator Tube Leak: (CFR 41.7 / 45.5 / 45.6)
Charging flow indicator ....

Given the following on Unit 2:

- The unit is at 75% RTP
- 2EMF-33 (CONDENSER AIR EJECTOR EXHAUST) is in Trip 2 alarm
- 2EMF-73 (S/G C LEAKAGE) is in trip 2 alarm
- The crew has implemented AP-10 (NC SYSTEM LEAKAGE), Case 1 (S/G TUBE LEAKAGE)
- Pressurizer level has been stabilized
- Letdown flow is 75 GPM
- Charging flow is 125 GPM

Based on the above conditions, the estimated leak rate is ___(1)___ GPM.

In accordance with AP-10, the MAXIMUM allowed charging flow to stabilize Pressurizer level is ___(2)___ GPM.

Which ONE (1) of the following completes the statements above?

A. 1. 38
   2. 155

B. 1. 38
   2. 200

C. 1. 50
   2. 155

D. 1. 50
   2. 200

B

General Discussion

The estimated leak rate is 125 gpm (Charging flow) - [75 gpm (Letdown flow) + 12 gpm (Seal return)],which equals 38 gpm.

Charging is increased and letdown is reduced as necessary to maintain Pzr level. A maximum flowrate of 232 GPM charging is allowable. This will ensure there is not excessive Regen HX tube vibration. Note this is assuming 32 GPM going to the seals, which will limit the flow through the Regen HX to 200 GPM during transient/accident operation (PIP M-03-05739). The control board gauge for "Charging Flow" reads from 0 - 200 GPM. In order to maintain charging flow on scale, the step provides guidance to maintain charging flow less than 200 GPM. This is well below the maximum allowable flowrate of 232 GPM. It should be noted here that the maximum flowrate allowed through the Regen HX during Normal/Start Up/Shut Down operation is 155 GPM.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct.

Second part is plausible because the maximum flowrate allowed through the Regen HX during Normal/Start Up/Shut Down operation is 155 GPM.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible because 50 gpm will be calculated as the leak rate if the applicant only subtracts letdown flow from charging flow and fails to include seal return in their calculation.

Second part is plausible because the maximum flowrate allowed through the Regen HX during Normal/Start Up/Shut Down operation is 155 GPM.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible because 50 gpm will be calculated as the leak rate if the applicant only subtracts letdown flow from charging flow and fails to include seal return in their calculation.

Second part is correct.

Basis for meeting the K

The K/A is matched because the applicant is required to monitor charging flow and letdown flow during a S/G tube leakage event and use this data to determine leak rate.

Basis for Hi Cog

This is a higher cognitive level question because the applicant must perform a level of analysis concerning the given indications and then perform a calculation (solve a problem) to determine leak rate.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

References:
AP-10 (NC SYSTEM LEAKAGE)

Learning Objectives:
OP-MC-AP-10 Objectives 4 & 5

Student References Provided

APE037 AA1.08 - Steam Generator (S/G) Tube Leak

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B

ILT-30 MNS SRO NRC Examination QUESTION 59 59

Ability to operate and / or monitor the following as they apply to the Steam Generator Tube Leak: (CFR 41.7 / 45.5 / 45.6)
Charging flow indicator ....

401-9 Comments:	Remarks/Status
	401-9 Comments: SAT 1.KA appears to match. 2.First part of question is calculate, second part is memory. This is a low level comprehension. 3.Is it possible that based on the question that an applicant states there is no correct answer because charging flow of 125 GPM has stabilized PZR level. Would a better distractor for A and C second part be 125 GPM based on the question? Not sure this would make sense or not. Ask licensee to determine if could be correct based on the wording of the question. Do we need to change terminology? 4.Otherwise appears to be ok. RESPONSE: 2. More than one mental step and one part is something other than memory. First part requires a calculation. Second part is recalled memory. Therefore, by the NUREG definition, a comprehension question. 3. The first question is "based on the conditions above". The second question is asking a limit imposed by the procedure for NC system leakage (AP-10) and is NOT "based on the conditions above.. 155 gpm was used since it is the limit for "normal" ops on charging flow to prevent flow induced vibration of the tubes in the Regen Hx. SLM 06/25/14

Title:	DIGITAL ELECTRO-HYDRAULIC CONTROL SYSTEM (EHC)						
Number: OP-MC-GEN-EHC			Revision: 40				Program: AO/AOCT/RO/SRO/LOCT
Time Required:	AO	AOCT	RO	SRO	LOCT		Prerequisites: None
			3.0	3.0	2.0	Hrs.	

Overview:

This lesson explains the systems used to control the Main Turbine Speed and Load using the turbine throttle, governor, reheat stop and intercept valves. The speed and load control block diagrams are explained. Included are all turbine trips and runbacks.

HP turbine change out on unit 1 and unit 2 during 2012 and 2013 caused some changes in terminology, some pressures and OAC graphics. You may review the Main turbine LP for more details.

References:

1. Westinghouse Turbine-Generator Training Manual
2. Westinghouse Turbine Technical Manual MCM 1200-00-152
3. MNS Flow diagrams
4. MCEE - 121 series
5. Design Basis Specification MCS-121.00-ITE-001
6. Bailey/ETSI Technical Manuals
7. OP/1(2)/A/6300/001, Controlling Procedure for Unit operation
8. PT/1(2)/A/4250/004C, Turbine OPC and Mechanical Overspeed Trip Test
9. PT/1(2)/A/4250/004I, Pre-Startup Turbine Testing
10. PT/1(2)/A/4250/004 A, Turbine Valve Movement Test
11. AP/1(2)/A/5500/002, Turbine Generator Trip
12. AP/1(2)/A/5500/003, Load Rejection
13. AP/1(2)/A/5500/023, Loss of Condenser Vacuum
14. INPO Operator Fundamentals
15. EC-11050-R1 HP Turbine Pressure Taps Relocation For Indirect Main Steam Flow Measurement For McGuire Unit #1 AND #2
16. EC-11071-R1 BB296FA High Pressure Turbine Design Analysis Report For McGuire Units 1 And 2
17. I.L. 1250-8421A New HP Turbine Upgrade Limitations And Recommendations

Operating Experience:

1. OEDB 96-009193, Switch Mispositioning Causes Plant Trip
2. NCR 1709400, Turbine Overspeed requiring Manual Trip
3. NCR 1595341, Unplanned Power Increase During TVMT
4. NCR 1597242, Allowable Changes in Turbine Impulse Pressure Exceeded During Turbine Valve Movement Test
5. NCR 1902305, 1AD-1, D1 "ASR/VTL Reset Operator Not Normal" alarm is in and will not clear (11-17-2014)

to Auto 1(2) A or Auto 1(2) B. When in Auto, the selected Generator Breaker will close if Generator frequency and voltage match the system. This is known as an **Auto Synchronization**.

Objective #11

The **second** method used to sync the generator to the grid uses the **Auto Sync feature on the DEH panel.**

If the selected Generator Breaker failed to close, the Control Room Operator is required to depress Auto Sync on DEH Panel (**Refer to drawing 7.3**). The **AUTO SYNC** pushbutton lights when depressed and **enable inputs** from an **external** AUTO SYNC device to **raise or lower speed** reference for synchronization. The generator is then synchronized and placed on the grid. Typically the generator will only pick up about 7 to 10 MWE.

The Main Generator is then loaded quickly to prevent a reverse power event. The MW loop is placed in service. The **MW IN/MW OUT** pushbutton is an alternate action push-button that when depressed places the megawatt feedback loop in or out of service. The MW loop is “in service” when the pushbutton is lit. Taking the MW feedback loop in and out of service is a bumpless transfer to ensure no control valve movement. The MW feedback signal is derived from the output of the Main Generator and is fed into the EHC. This feedback signal is compared to the desired MW output and is used to fine tune the EHC, which will adjust Governor Valve position to obtain the desired megawatt output. When the MW feedback loop is placed is service, a quality check is done to determine the validity of the megawatt transducer input signal. If the signal is not valid, the loop will be “kicked” out of service.

MW IN is selected when the turbine is synchronized to the Grid, and removed from service at 98% power. At 98% power only the SPEED IN feedback loop is in service. All four GVs open at the same height, which ensures the valves are in the optimum throttling position. This configuration helps to prevent Reactor power from exceeding 100% due to grid load changes or loss of plant efficiency. If the MW IN loop was in service under these conditions, the EHC would attempt to maintain the desired MW setting by opening all four GV’s and increasing total steam flow. This could cause Reactor power to exceed 100%.

To test a GV, the CLOSE push-button is depressed. This starts to close the GV displayed in the window. The Operator can immediately release the CLOSE push-button after depressing it on a GV Test. Once the GV has reached the fully closed position, the CLOSE light blinks indicating the valve can now be reopened. The OPEN push-button is depressed to initiate reopening of the valve. If the Operator does not depress the open push-button within 60 seconds, the system will time out and automatically reopen the valve. **HALT"** again will resume testing for the selected valve.

A new **"GV TEST HALT"** pushbutton has been added to the Operator Panel. It allows the Operator to stop a GV test if deemed necessary. Should this button be depressed during testing, the TVMT will be suspended and the DEH will maintain load at the halted position. Depressing "**GV TEST HALT**

Initiating a CLOSE function in conjunction with the IV/RV TEST functions will cause the IV being tested to close. Once the IV is fully closed, the associated RV automatically closes. The CLOSE push-button must be continuously depressed during this test. Once both valves are fully closed the Operator releases the CLOSE push-button which permits the RV to open. After the RV is fully open, the IV will automatically open. More details on conducting Turbine Valve Movement Tests are in <u>Section 3.2</u>.

<u>SYSTEM OPERATION WITHOUT FEEDBACK LOOPS</u>

Objective #5

If the **MW feedback loop fails, the controller reverts to MW out in Load Control and system remains in Auto.** The governor valves' position will revert to the position in the valve tables associated with the desired megawatts. Since the MW feedback loop is used to fine-tune the valve table position, the valve movement should be minimal. The MW feedback loop is not used in Speed Control.

The speed feedback loop uses three (3) speed signals in 2/3 logic. A 2/3 comparison is made to determine validity of each speed-reading. Failure of any one speed channel causes the system to function on the remaining two. **Failure of a second channel** will **remove the speed loop from service.** If this occurs while in Speed Control Mode, the valves remain where they are and the system will automatically transfer from Auto to the Manual mode. If in Load Control Mode, the system will remain in Auto and the control system will revert to SPEED OUT.

A. Purpose

The purpose of this procedure is to ensure proper response in the event of a rod control malfunction and to assess plant conditions and identify appropriate steps for the following conditions:

- Dropped/Misaligned Rod
- Failure of Rods to Move on Demand
- Continuous Rod Movement

B. Symptoms

1. **Dropped/Misaligned Rod**

- "RPI AT BOTTOM ROD DROP" alarm (1AD-2, D-9)
- "RPI AT BOTTOM > 1 ROD DROPPED" alarm (1AD-2, E-9)
- Individual rod "RB" indication on DRPI monitor (yellow or green rod with orange background)
- "DEVIATION > 12 STEPS" DRPI monitor alarm
- DRPI indicates misaligned rod(s)
- Demand step counters indicate misaligned group of rods
- "P/R CHANNEL DEVIATION" alarm (1AD-2, B-3)
- "P/R LOWER DET HI FLUX DEV OR AUTO DEFEAT" alarm (1AD-2, B-1)
- "P/R UPPER DET HI FLUX DEV OR AUTO DEFEAT" alarm (1AD-2, B-2)
- Nuclear Instrument indication of flux tilt
- Unanticipated rod withdrawal
- Sudden drop in T-Avg
- "T-REF/T-AVG ABNORMAL" alarm (1AD-6, B-10)
- Turbine load deceasing
- "PZR LO PRESS CONTROL" alarm (1AD-6, C-6)

2. **Failure of Rods to Move on Demand**

- No automatic rod motion occurring when expected
- No manual rod motion occurring when expected
- "ROD CONTROL URGENT FAILURE" alarm (1AD-2, A-10)
- "T-AVG/T-REF FAILURE ROD STOP" alarm (1AD-2, B-7)

3. **Continuous Rod Movement**

- Unwarranted rod insertion or withdrawal
- "T-REF/T-AVG ABNORMAL" alarm (1AD-6, B-10)

Q59 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
1. <u>IF</u> two or more rods are either dropped <u>OR</u> misaligned by greater than 24 steps, <u>THEN</u> perform the following:	
__ a. Trip reactor.	
__ b. **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	
__ **2. Place control rods in manual.**	
__ **3. Check rod movement - STOPPED.**	**<u>IF</u> rod movement continues, <u>THEN</u> perform the following:** __ a. Trip reactor. __ b. **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).
__ 4. **Check all rods - ALIGNED WITH ASSOCIATED BANK.**	**Perform the following:** **<u>NOTE</u>** DRPI problems are not addressed by this AP. __ a. **<u>IF</u>** misaligned rod(s) due to DRPI indication failure only, **<u>THEN</u>** exit this procedure. __ b. **<u>IF</u>** T-Avg has gone down, **<u>THEN</u>** lower Turbine load as necessary to restore T-Avg to T-Ref. __ c. **<u>GO</u> <u>TO</u>** Enclosure 1 (Response To Dropped or Misaligned Rod).
__ 5. **Check "ROD CONTROL URGENT FAILURE" alarm (1AD-2, A-10) - DARK.**	__ **<u>GO</u> <u>TO</u> Enclosure 2 (Failure Of Rods To Move On Demand).**
__ 6. **Check "T-AVG/T-REF FAILURE ROD STOP" alarm (1AD-2, B-7) - DARK.**	__ **<u>GO</u> <u>TO</u> Enclosure 2 (Failure Of Rods To Move On Demand).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 7. **IF this AP entered due to unwarranted rod insertion or withdrawal, THEN GO TO Enclosure 3 (Response To Continuous Rod Movement).**	
__ 8. **IF this AP entered due to a failure of rods to withdraw or insert when required, THEN GO TO Enclosure 2 (Failure Of Rods To Move On Demand).**	

END

Q59 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

__ 1. **Announce occurrence on paging system.**

2. **Dispatch rod control system qualified IAE to perform the following:**

- __ Correct cause of misaligned rod.
- __ Notify Control Room operators when auto or manual rod motion is available for reactivity control.

__ 3. **Do not move rods until IAE determines rod movement is available.**

4. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u> a runback occurs while in this procedure, <u>THEN</u> observe the following guidance:**

   __ a. **<u>IF</u>** IAE has determined that it is permissible to move rods, **<u>THEN</u>** respond to the runback **<u>PER</u>** AP/1/A/5500/03 (Load Rejection).

   b. For all other circumstances, assume rod control is not available and respond to the runback as follows:

      __ 1) Trip Reactor.

      __ 2) **<u>GO</u> <u>TO</u>** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).

__ 5. **Check "ROD CONTROL URGENT FAILURE" alarm (1AD-2, A-10) - DARK.**

RESPONSE NOT OBTAINED (Step 5): Perform the following:

__ a. Do not move control rods while the "ROD CONTROL URGENT FAILURE" alarm is lit, unless instructed by IAE.

__ b. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u>** IAE desires to reset "ROD CONTROL URGENT FAILURE" alarm, **<u>THEN</u>** depress the "ROD CONTROL ALARM RESET" pushbutton.

Duke Energy
McGuire Nuclear Station

Background Document
for

AP/1 & 2/A/5500/014 (Rod Control Malfunction)

S. Hackney / 04/10/14
Prepared by Date

/
Reviewed by Date

/
Additional Review by Date

/
Additional Review by Date

/
Approved by Date

INTRODUCTION

The purpose of AP/1and 2/A/5500/014 (Rod Control Malfunction) is to ensure proper plant response in the event of a rod control malfunction, stabilize plant conditions, and recover from each malfunction for the following conditions:

- failure of rods to move on demand,
- continuous rod movement,
- dropped or misaligned rod.

Control rods are used to provide control for short-term reactivity effects, aid in power distribution, provide proper shutdown margin and control reactor power below the Point Of Adding Heat.

The ability to move control rods on demand and maintain bank alignment is essential in reactor control and managing reactivity.

The procedure is written to diagnose which rod control malfunction has occurred and send the operator to an appropriate enclosure to address the specific problems associated with that particular malfunction.

ENTRY CONDITIONS

The procedure will be entered when any of the above conditions are encountered. The conditions are based on the symptoms listed for each failure, some of which are common to more than one control rod malfunction and others which are specific only to a certain malfunction.

This procedure is not intended to address Digital Rod Position Indication (DRPI) problems. DRPI problems do not create transients or reactivity management concerns that are typically associated with control rod malfunctions. DRPI problems should be addressed through alarm response procedures and the normal Work Control process with IAE and Engineering assistance.

STEP DESCRIPTION FOR AP

STEP 1:

PURPOSE:
Trip the reactor if two or more rods are either dropped or misaligned by greater than 24 steps.

DISCUSSION:
Multiple dropped or misaligned rods don't necessarily result in power distribution limits being exceeded. However, multiple dropped/misaligned control rods are a significant reactivity transient that can have a serious effect on plant parameters under certain operating conditions. The guidance to trip the reactor is a conservative action to prevent the plant from challenging the Pzr low pressure trip setpoint, etc.; and is consistent with the conservative nature of the industry.

This step is consistent with the guidance given in response to industry event OEDB 90-002761 (SER 90-15). In that event, Vogtle1 dropped several rods during physics testing, and withdrew rods to get back critical. This resulted in bypassing the carefully controlled evolution of taking the reactor critical. The appropriate response should have been to trip the reactor or drive the other control rods to complete the shutdown. At McGuire, this step would have the operator trip for this type event. If only one rod were to drop, causing the reactor to go subcritical, Encl 1 would continue the shutdown.

The Nuclear Design and Reactor Support group (G.O.) performed an analysis to determine the safety significance of two misaligned rods. This analysis is documented in the calculation file "Misaligned Rod Peaking Evaluation" (DPC-1553.05-00-0169) and has been reviewed in sufficient detail to conclude that peaking resulting from two rods being misaligned up to 24 steps would not result in core safety limits (DNB or fuel melt) being challenged. Any reduction in SDM resulting from two rods being misaligned less than or equal to 24 steps would be small and judged to be bounded by the SDM assumptions of the highest worth rod in its full withdrawn position, Control Bank D at its insertion limit, transient xenon reactivity penalties and 10% rod worth uncertainty. The reactor should be tripped immediately if two or more rods are misaligned greater than **24 steps.** If multiple rods are misaligned between 12 and 24 steps, the 6 hour action time required by TS 3.1.4 is judged to be acceptable based on analysis of expected core peaking for this condition.

The guidance to go to E-0 is given assuming the plant is not shutdown (above P-11) as per the direction given in OMP's concerning when E-0 is applicable.

REFERENCES:
OEDB 90-002761 (SER 90-15)
PIP 1-M-98-0644
DPC-1553.05-00-0169

STEP 2:

PURPOSE:
Rods are placed in manual to prevent conditions from getting worse. If the AP was entered due to a dropped or misaligned rod, going to manual will stop the auto control from driving rods further out while it attempts to compensate for the rod problem. If the AP was entered due to a reactor control system failure, going to manual will stop the auto control from inappropriately driving rods. If the AP was entered because of an Urgent Alarm condition on the rod control system, going to manual should stop demanded rod motion and prevent challenging the rod control system's ability to hang on to the rods.

DISCUSSION:
Control rods are placed in manual to stop any transient that may be generated as a result of a Reactor Control System failure or dropped or misaligned control rod. Additional control rod movement beyond the identified failure serves to exaggerate any resulting transient from the initial rod movement.

Also, with control rods in automatic control, the potential exists for rod motion to be demanded without the problem being corrected and possibly result in a control rod drop event. The Rod Control system knows it's malfunctioning when it detects an Urgent Alarm condition. It attempts to mitigate the condition by ordering reduced currents to both the stationary and movable grippers in an attempt to hang on to what it has. Challenging this with attempted rod motion before the consequences have been evaluated should be avoided.

When control rods are maintained in manual control, any power and/or temperature mismatch can be corrected by changing turbine load or boration/dilution.

By placing control rods in manual, any flux tilt that has resulted from control rod movement will likely be less severe than with continued rod motion.

It is important to note that in the event of a runback, control rods are required to be placed in automatic. If a control rod misalignment problem occurs during the course of the runback, control rods should be left in automatic. Once the runback has been addressed through the guidance of AP/03, the control rod problem should be addressed. The load rejection or runback should have priority to the rod control failure.

It is very important to maintain an operator at the rod control station as long as control rods are in manual.

Note that if control rods are in the bank select position when the AP is entered, operators do NOT have to select "manual". In PIP M-08-7070, it was determined that being in bank select meets the intent of going to manual. All OPs and PTs

that require movement of rods in the bank select position (e.g. RCCA Rod Movement Test) contain steps to notify the Control Room at the beginning of the procedure of this acceptable deviation should it be necessary to enter AP14 with an individual bank selected.

REFERENCES:
PIP M-08-7070

STEP 3:

PURPOSE:
This step ensures that control rod movement has stopped after rod control has been placed in manual and directs tripping the reactor if it hasn't.

DISCUSSION:
Uncontrolled control rod movement is a major reactivity management concern which could lead to power distribution problems, flux anomalies and significantly impact other plant parameters if not immediately addressed. Failures in the automatic circuit of rod control should be defeated when control rods are placed in manual. If control rods continue to move in manual, the operator has no control, and the reactor is tripped.

STEP 4:

PURPOSE:
This step is a check to diagnose possible control rod alignment problems (dropped or misaligned) and provide guidance to respond to specific failures based on observed rod alignment.

DISCUSSION:
A dropped rod has the potential to cause a substantial NC cooldown; so a step in the RNO instructs the operator to lower turbine load as necessary to restore NC temperature. It is not desirable to move control rods to adjust temperature until the rod control problem has been properly identified and evaluated.

An actual dropped control rod (of greater than 12 steps) will be indicated by the following:

- orange background on the DRPI display for bank with the affected control rod(s)
- "Rod Deviation >12 Steps" and "Urgent Alarm" flashing on DRPI display
- "RB" indication illuminated for affected control rod(s), accompanied by "RPI AT BOTTOM ROD DROP" and/or "RPI AT BOTTOM >1 ROD DROPPED" annunciators

A misaligned control rod (of greater than 12 steps out with respect to the rods in its associated group) will be indicated by the following:

<< Emergency Closure of Airlock Door >>

3.0 INSTRUCTIONS

3.1 Emergency Closure Of Airlock Door

NOTE

- Only one door closed with one seal inflated per Airlock is required for containment closure. ☐
- Reactor Door should be first door closed. ☐
- On a loss of AC power only one seal can be inflated for each door. ☐

WARNING

Swing path of Airlock door shall be kept clear of personnel and equipment. A DP across the door could cause a violent swing resulting in injury to anyone or anything in its swing path. ☐

1. **IF** Annulus Door (VE) must be opened,
   THEN contact SRO to arrange access. ________
2. **Ensure** Containment Evacuation Alarm initiated. ________
3. **Notify** Control Room on affected UNIT to place "VP Sup & Exh Fan Mode Select" to "OFF". ________
4. **Perform** the following sections as applicable: ☐
   - Attachment 5 Section 3.2, Closing Reactor Door with loss of AC Power ☐
   - Attachment 5 Section 3.3, Closing Auxiliary Door with loss of AC Power ☐
   - Attachment 5 Section 3.4, Closing Reactor Door with AC power available ☐
   - Attachment 5 Section 3.5, Closing Auxiliary Door with AC power available ☐

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EXAM BANK QUESTION: 7119 CNS **A**

Which ONE of the following statements represents a loss of Containment Integrity?

A. Both lower personnel airlock doors closed with all seals deflated

B. Annulus doors blocked open for maintenance work

C. Submarine hatch is found open

D. Engineering discovery of major divider barrier seal degradation

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EXAM BANK QUESTION: 7119 CNS A

General Discussion

One of the four Personal Airlock Door seals (two per door) is required to maintain containment integrity.

Answer A Discussion

CORRECT. See explanation above.

Answer B Discussion

Plausible because this would affect Reactor Building operability.

Answer C Discussion

Plausible because this would affect divider barrier operability.

Answer D Discussion

Plausible because this would affect divider barrier operability.

Basis for meeting the KA

The applicant is required to demonstrate knowledge of the interrelation of the Personnel Airlock Doors (personnel access hatch) and the Submarine Hatch (emergency access hatch) as related to a Loss of Containment Integrity.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	ILT-17 NRC Written Exam CNS NRC Examination

Development References
LessonOP-CN-CNT-CNT(Containment System LP), Rev. 106, Sect. 2.4, 2.11, and 3.1

Student References Provided

KA	KA_desc
APE069 AK2.03	Knowledge of the interrelations between the Loss of Containment Integrity and the following: (CFR 41.7 / 45.7)Personnel access hatch and emergency access hatch ....

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
24. Check if NC pumps should be started:	
__ a. Check core exit T/Cs - GREATER THAN 1200°F.	__ a. **GO TO** Step 25.
b. Check if an idle NC cooling loop is available: __ • Any S/G N/R level - GREATER THAN 11% (32% ACC) __ • NC pump in associated loop - AVAILABLE AND OFF.	b. Perform the following: 1) Align N_2 to all Pzr PORVs as follows: __ • OPEN 1NI-430A (Emerg N2 From CLA To 1NC-34A). __ • OPEN 1NI-431B (Emerg N2 From CLA To 1NC-32B & 36B). __ 2) OPEN all Pzr PORVs and isolation valves. 3) **IF** any Pzr PORV still closed **OR** N_2 to PORVs unavailable, **THEN** perform the following: __ a) Ensure Phase B reset. b) OPEN the following valves: __ • 1VI-129B (VI Supply to A Cont Ess VI Hdr Outside Isol) __ • 1VI-160B (VI Supply to B Cont Ess VI Hdr Outside Isol) __ • 1VI-150B (Lwr Cont Non-Ess Cont Outside Isol). __ c) **IF** VI header pressure is less than than 85 PSIG, **THEN** restore VI **PER** AP/1/A/5500/22 (Loss Of VI). (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

24. (Continued)

4) **IF** core exit T/Cs remain greater than 1200°F, **THEN** OPEN one train of head vent valves:

   - A Train:
     - __ 1NC-272AC (U1 A Train Head Vent to PRT Isol)
     - __ 1NC-273AC (U1 A Train Head Vent to PRT Isol).

   OR

   - B Train:
     - __ 1NC-274B (U1 B Train Head Vent to PRT Isol)
     - __ 1NC-275B (U1 B Train Head Vent to PRT Isol).

5) **IF AT ANY TIME** while in this procedure a Phase B reoccurs **AND** N_2 to PORVs is unavailable, **THEN** perform the following:

   __ a) Reset Phase B.

   b) OPEN the following valves:

   - __ 1VI-129B (VI Supply to A Cont Ess VI Hdr Outside Isol)
   - __ 1VI-160B (VI Supply to B Cont Ess VI Hdr Outside Isol)
   - __ 1VI-150B (Lwr Cont Non-Ess Cont Outside Isol).

__ 6) **GO TO** Step 25.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
24. (Continued)	
NOTE Normal conditions are desired but not required for starting an NC pump.	
c. Start an NC pump as follows:	
__ 1) Check containment pressure - HAS REMAINED BELOW 3 PSIG.	1) OPEN the following RN valves: __ a) OPEN 1RN-277B (RB Non Ess Ret Cont Outside Isol). __ b) OPEN 1RN-252B (RB Non Ess Sup Cont Outside Isol). __ c) OPEN 1RN-253A (RB Non Ess Sup Cont Inside Isol). __ d) OPEN 1RN-276A (RB Non Ess Ret Cont Inside Isol).
__ 2) Start oil lift pump on NC pump to be started.	
__ 3) Start one NC pump in loop with S/G N/R level greater than 11% (32% ACC).	
__ d. **RETURN TO** Step 24.a.	

The recovery techniques applied in this procedure were developed from transient analyses. The expected system response to each of the recovery techniques is described below.

2.1.1 Reinitiation of High Pressure Safety Injection

The introduction of subcooled S/I into the highly voided NC system will cause steam in the cold legs to condense. Steam flow throughout the NC system will go up because of this condensation effect. Superheated steam forced out of the core may initially cause the core exit T/C temperatures to go up. As the vessel begins to refill, heat transfer from the fuel will cause the fluid entering the core to boil vigorously. This will create a two phase mixture which will eventually re-cover the entire core and cause the core exit T/C temperatures to quickly go down to saturation temperature.

This procedure uses the trends in core exit T/C temperatures and indicated vessel level to determine appropriate operator actions. The effectiveness of S/I in restoring NC system inventory is determined by the trend in RVLIS indication. If going up, then no further action may be necessary. The effectiveness of S/I in restoring core cooling is determined by the trend in core exit T/C temperatures. If going down, no further action is necessary. Exit temperatures less than 700°F indicate success, allowing the operator to return to the procedure and step in effect

2.1.2 Secondary Depressurization

If attempts to reinitiate high pressure S/I are unsuccessful, or are ineffective in restoring adequate core cooling, then a rapid S/G depressurization must be performed. A rapid secondary depressurization will raise primary-to-secondary heat transfer and cause steam in the primary side of the S/G U-tubes to condense. When the condensation rate exceeds the steam generation rate, the NC system will begin to depressurize. As the NC system pressure drops, voiding of the water resident in the lower plenum and downcomer will partially recover the core with a two phase mixture. The continued depressurization will eventually cause S/I accumulator injection and temporary core recovery.

The operator should check the NC hot leg temperature trend to determine the effectiveness of the S/G depressurization in reducing the NC system pressure. The hot leg temperatures may initially rise as superheated steam in the core is forced out by the advancing two phase flow, but should quickly go down to saturation and continue to go down as the NC system depressurizes.

To prevent nitrogen injection from the S/I accumulators, the operator must isolate them. NC T-Hot less than 388°F and intact S/G pressure less than 190 psig are used to determine when the S/I accumulators should be isolated.

After the CLAs have been isolated, the secondary should be depressurized to atmospheric pressure. The NC system pressure should follow secondary pressure until the ND pumps begin to inject. Adequate core cooling has been restored and preparations for long term plant recovery can be started once ND flow has been established and the core is completely covered.

2.1.3 NC Pump Restart and Opening Pzr PORVs

If some form of high pressure injection cannot be established or is ineffective in restoring adequate core cooling, and if S/G depressurization is not possible or

ineffective, then starting the NC Pumps will provide forced two phase flow through the core and temporarily improve core cooling. The core exit T/C temperatures should rapidly go down and the RVLIS indication should rapidly go up as a steam/water mixture is forced through the core by the NC Pumps. Analysis has shown that with secondary heat sink available, the NC Pumps will maintain core cooling as long as they continue to run. However, it should be noted that a degraded core cooling condition still exists.

The NC Pumps cannot be expected to run indefinitely under highly voided NC system conditions. The operator must still take action to establish a makeup source of water to the NC system to restore adequate long term cooling. NC system pressure must, therefore, be reduced in order for the CLAs and/or ND pumps to inject.

The operator should continue attempts to depressurize the S/Gs or to establish the secondary heat sink; however, if the core exit T/C temperatures remain above 1200°F and all available NC Pumps are running, the only other option is to effectively enlarge the hole in the NC system to reduce pressure. This may be achieved by opening all available NC system vent paths to containment, i.e., Pzr PORVs, head vents, etc.

It should be noted that venting the NC system to containment reduces NC system inventory and is not as effective in reducing NC system pressure as S/G depressurization. Some form of low pressure flow to the NC system must be established as soon as possible.

2.2 FR-C.2, Response to Degraded Core Cooling

Degraded core cooling is caused by a substantial loss of primary coolant. If the NC Pumps are not running, the degraded core cooling symptoms indicate the core is partially uncovered. If the NC Pumps are running, the symptoms indicate the potential for core uncovery exists if the pumps should fail or be manually tripped. Operator action is required to restore NC system inventory in either case.

Reinitiation of high pressure S/I is the most effective method to restore NC system inventory and core cooling. If some form of high pressure injection cannot be established or is ineffective in restoring core cooling, then the operator must take actions to reduce the NC system pressure in order for the S/I accumulators and ND pumps to inject. A controlled secondary depressurization is an effective method for achieving this, while at the same time avoiding a rapid NC system cooldown that could cause problems with pressurized thermal shock.

The expected system response to both of the recovery techniques is described below.

2.2.1 Reinitiation of High Pressure Safety Injection

This procedure uses the trends in core exit T/C temperatures and indicated vessel level to determine appropriate operator actions. The effectiveness of S/I in restoring NC system inventory is determined by the trend in RVLIS indication when the NC Pumps are running. If going up, then no further action may be necessary. Indications of core void fraction less than 50% indicates success in restoring NC system inventory, allowing the operator to return to the procedure and step in effect. The effectiveness of S/I in restoring core cooling is determined by the trend in core exit T/C temperatures when the NC Pumps are tripped. If going down, no further action is necessary. Exit temperatures

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EXAM BANK QUESTION: 6331 CNS **C**

Given the following conditions on Unit 1:

- Unit is responding to a LOCA
- All sources of feedwater have been lost, S/G N/R levels are 17% and decreasing
- NC pumps are secured
- EP/1/A/5000/FR-C.1 (Response to Inadequate Core Cooling) has been implemented
- KC, NI and NV pumps are unavailable
- Peak Containment pressure reached 2.5 PSIG

Subsequently:

- S/G depressurization has failed to restore adequate core cooling
- Core Exit Thermocouples are currently indicating 1210°F

Based on the above conditions, which ONE (1) of the following states the next major action(s) required by FR-C.1?

A. Do NOT restart NC pumps, open all Pzr PORVs and head vents to depressurize the NC system.

B. Restart **all** NC pumps and restore secondary heat sink per EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink) prior to proceeding in FR-C.1.

C. Restart NC pumps **one at a time** until CETs are less than 1200°F to force two phase flow through the core for core cooling.

D. Do NOT restart NC pumps, continue efforts to initiate feed and bleed of the NC system to restore core cooling.

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EXAM BANK QUESTION: 6331 CNS

C

General Discussion

The question stem establishes a scenario where the crew has implemented FR-C.1 and has proceeded through the procedure to the point where a RCP start is required. The stem also provides the information that first two major strategies of reestablishing SI flow and S/G depressurization have not been successful exemplified by CET currently indicating > 1200 degrees F. In this scenario, heat sink is verified and the NCPs are started one at a time with or without normal required support for pump operations. See NOTE prior to FR-C.1 step 23.c.

Answer A Discussion

INCORRECT:

Plausible if a pump were not available to be started or there was no heat sink available.

Answer B Discussion

INCORRECT:

NCPs are started one at a time and not all at once. Plausibility for restoring secondary heat sink is the information in the stem that "All sources of feedwater have been lost" and current S/G levels are low but still high enough to provide a heat sink.

Answer C Discussion

CORRECT - See discussion above.

Answer D Discussion

INCORRECT:

Plausiblity of the alternate strategy suggested would be correct in FR-H.1 if S/G W/R levels were to degrade to < 24% level and a complete loss of FW has occurred in this scenario.

Basis for meeting the KA

The KA is matched because the applicants are tested on their knowledge of the processes for removing decay heat from the core when CET temperatures exceed 1200 degrees F and heat sink is available. The operational implication would be core damage if steps were not taken to decrease CET temperatures (ie starting NCPs even though pump damage may occur).

Basis for Hi Cog

This question meets the criteria of analysis because the applicant must evaluate a given set of plant conditions and then apply this information to choose the required strategy in FR-C.1 and know that a pump run is required even though pump damage may result.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT16 CNS NRC Examination

Development References

Student References Provided

KA	KA_desc
EPE074 EK1.03	Knowledge of the operational implications of the following concepts as they apply to the Inadequate Core Cooling : (CFR 41.8 / 41.10 / 45.3)Processes for removing decay heat from the core ....

1. **S/I Reinitiation Criteria (applies after Step 10 in body of this procedure):**

   - **IF** NC subcooling based on core exit T/Cs is less than 0°F **OR** Pzr level cannot be maintained greater than 11% (29% ACC), **THEN** perform the following:

     a. Raise S/I flow as necessary to restore subcooling and level:

        - Start one or more S/I pumps.
        - Realign NV S/I flow path **PER** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 29 (NV Alignment to S/I Mode).

     b. **GO TO** EP/1/A/5000/E-1 (Loss of Reactor or Secondary Coolant).

2. **Secondary Integrity Criteria:**

   - **IF** any unisolated S/G pressure is going down in an uncontrolled manner, **OR** has completely depressurized, **THEN GO TO** EP/1/A/5000/E-2 (Faulted Steam Generator Isolation).

3. **Cold Leg Recirc Switchover Criteria:**

   - **IF** FWST level reaches 95 inches ("FWST LEVEL LO" alarm), **THEN GO TO** EP/1/A/5000/ES-1.3 (Transfer to Cold Leg Recirc).

4. **CA Suction Sources:**

   - **IF** CA Storage Tank (water tower) goes below 1.5 ft, **THEN** perform EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 20 (CA Suction Source Realignment).

1. **S/I Actuation Criteria:**

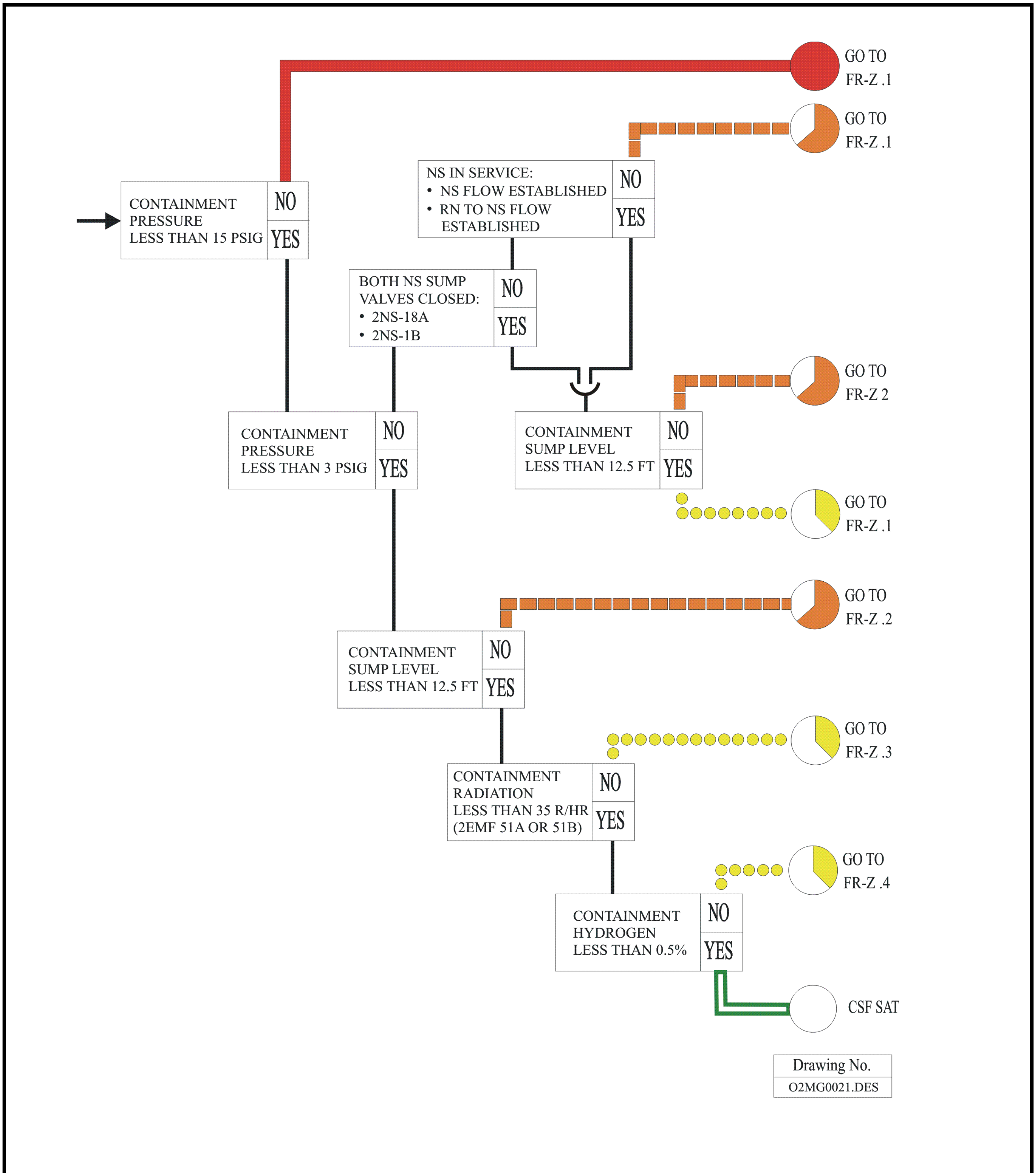
   - **IF** NC subcooling based on core exit T/Cs is less than 0°F **OR** Pzr level cannot be maintained greater than 4%, **THEN** initiate S/I and **GO TO** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).

   - **IF** S/I actuation occurs, **THEN GO TO** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).

2. **CA Suction Sources:**

   - **IF** CA Storage Tank (water tower) goes below 1.5 ft, **THEN** perform EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 20 (CA Suction Source Realignment).

MNS EP/2/A/5000/F-0 **UNIT 2**	CRITICAL SAFETY FUNCTION STATUS TREES Containment - Page 1 of 1	PAGE NO. 9 of 11 Rev. 7



A. Purpose

This procedure provides actions to respond to a high containment radiation level.

B. Symptoms or Entry Conditions

This procedure is entered from EP/1/A/5000/F-0 (Critical Safety Function Status Trees) (Containment), on a yellow condition.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
1. Check Containment ventilation isolation as follows:	
a. Check the following isolation valves - CLOSED:	__ a. CLOSE valve(s).
__ • 1VQ-1A (U1 Cont Air Release Inside Isol)	
__ • 1VQ-6A (U1 Cont Air Addition Inside Isol)	
__ • 1VQ-2B (U1 Cont Air Release Outside Isol)	
__ • 1VQ-5B (U1 Cont Air Addition Outside Isol).	
2. Check VE System in operation as follows:	
__ a. VE Fans - ON.	a. Start fans as follows: __ 1) Select "ON". __ 2) Return switch to "AUTO".
__ b. Annulus pressure being maintained - NEGATIVE.	b. Ensure the following damper mode select switches in "AUTO". __ • 1AVS-D-7 Mode Select __ • 1AVS-D-8 Mode Select __ • 1AVS-D-2 Mode Select __ • 1AVS-D-3 Mode Select.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. **Check if Containment Aux Carbon Filter Fan can be placed in service as follows:**	
__ a. Check containment sump level - LESS THAN OR EQUAL TO 0.5 FT.	__ a. **GO TO** Step 4.
__ b. Start 1A Containment Aux Carbon Filter Fan.	
__ 4. **Notify station management of containment radiation level to obtain recommended action.**	
__ 5. **RETURN TO procedure and step in effect.**	

END

are stopped in sequence, the second NV is aligned to normal charging. Therefore, if S/I is not in service, the last NV pump will have been aligned to normal charging and Pzr level can be maintained by adjusting the flow control valve.

NOTE: **The upper head region may void during NC System depressurization if NC pumps are not running. This will result in Pzr level going up rapidly.**

PURPOSE: To alert the operator of possible void formation in the NC during the NC depressurization.

BASIS: As the NC system is depressurized, steam may form in the hotter regions on the NC system. Pzr level will rise rapidly as water displaced from these voided regions replaces steam in the pressurizer. If voiding occurs, the Pzr may fill with water within a few minutes. This note informs the operator of this condition so that the NC system depressurization can be stopped quickly to avoid a water solid pressurizer.

STEP 13 Depressurize NC System to refill Pzr:

PURPOSE: To depressurize the NC to restore Pzr level using preferred or alternate methods for restoring Pzr level.

BASIS: The combination of subcooling and Pzr level ensures the NC conditions are under adequate operator control. Subcooling should have been established before entry to this step. If subcooling is lost during the depressurization, it will be reestablished after the depressurization is stopped as the NC continues to cool down.

If NC pump(s) are running, normal Pzr spray is the preferred means of restoring Pzr level. Level can be restored with normal spray since S/I flow increases and break flow decreases as the NC is depressurized.

Operator Fundamental Focus; Knowledge
Reinforce *fundamental system knowledge of preferential means to lower Pzr pressure. If normal spray is not available, use of one Pzr PORV has priority over auxiliary spray.* ***Reinforce*** *the concern for use of auxiliary spray by asking the class participants why it is selected or used as a last resort. The answer is to minimize thermal shock to the spray nozzles.*

This step is performed immediately before starting a NC pump. Transitions from other steps when Pzr level is low are also possible. For all such entries, the NC should be subcooled prior to NC depressurization. Since this prior subcooling requirement ensures a small break, subcooling should be restored with continued cooldown if subcooling is lost during the depressurization.

NOTE: **Preference should be given to running 1B NC Pump first, then 1A NC Pump to provide Pzr spray capability.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE The upper head region may void during NC system depressurization if NC pumps are not running. This will result in Pzr level going up rapidly.

13. **Depressurize NC System to refill Pzr as follows:**

__ a. Depressurize using normal Pzr spray until Pzr level is greater than 25% (50% ACC).

RNO:

a. Perform the following:

__ 1) Depressurize using one Pzr PORV until Pzr level is greater than 25% (50% ACC).

2) **IF** Pzr PORVs will not operate, **THEN** perform the following:

a) Align N_2 to all Pzr PORVs by OPENING the following valves:

__ • 1NI-430A (Emerg N2 From CLA To 1NC-34A)

__ • 1NI-431B (Emerg N2 From CLA To 1NC-32B & 36B).

__ b) Depressurize using one PORV until Pzr level is greater than 25% (50% ACC).

__ 3) **IF** Pzr PORV available **AND** effective, **THEN GO TO** Step 13.b.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

13. (Continued)

4) **IF** Pzr PORV not available **OR** effective, **THEN** use NV aux spray to depressurize as follows:

__ a) Ensure at least one NI pump on.

__ b) **IF** both NI pumps off, **THEN** observe Note prior to Step 14 and **GO TO** Step 14.

__ c) Ensure at least one NV pump on.

d) Ensure NV pumps miniflow valves OPEN:

- __ 1NV-150B (U1 NV Pump Recirc Isol)
- __ 1NV-151A (U1 NV Pump Recirc Isol).

e) CLOSE the following valves:

- __ 1NI-9A (NC Cold Leg Inj From NV)
- __ 1NI-10B (NC Cold Leg Inj From NV).

__ f) CLOSE 1NV-241 (U1 Seal Water Inj Flow Control).

g) OPEN the following valves:

- __ 1NV-244A (U1 Charging Hdr Cont Outside Isol)
- __ 1NV-245B (U1 Charging Hdr Cont Outside Isol).

__ h) Slowly OPEN 1NV-241 and THROTTLE 1NV-238 (U1 Charging Hdr Control) to establish charging and seal injection flow.

(RNO continued on next page)

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C

ILT-30 MNS SRO NRC Examination QUESTION 65

65

WE03 EK1.3 - LOCA Cooldown and Depressurization

Knowledge of the operational implications of the following concepts as they apply to the (LOCA Cooldown and Depressurization)
(CFR: 41.8 / 41.10 / 45.3)

Annunciators and conditions indicating signals, and remedial actions associated with the (LOCA Cooldown and Depressurization).

Given the following conditions on Unit 2:

- A Small Break LOCA occurred coincident with a Loss of Off-site power (LOOP)
- ES-1.2 (POST LOCA COOLDOWN AND DEPRESSURIZATION) has been implemented and the NC system has been cooled down to 510°F
- NC system pressure is 1600 PSIG
- PZR level is 8%
- Containment pressure peaked at 2.4 PSIG and is STABLE

Based on the conditions above,:

1) ________ will be used to depressurize the NC system.

2) NC system depressurization can be secured when PZR level exceeds a MINIMUM value of ________.

Which ONE (1) of the following completes the statements above?

A. 1. NV Aux Spray
   2. 25%

B. 1. NV Aux Spray
   2. 50%

C. 1. One PZR PORV
   2. 25%

D. 1. One PZR PORV
   2. 50%

ILT-30 MNS SRO NRC Examination QUESTION 65

65

C

General Discussion

Because offsite power has been lost, NC pumps are not running. Therefore, normal spray is not available for depressurization.

With normal spray not available, ES-1.2 will direct the crew to depressurize using ONE PZR PORV.

ES-1.2 step 13 directs depressurization until Pzr level is greater than 25% (50%ACC)

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible because if no Pzr PORV is available, then ES-1.2 directs the use of NV aux spray to depressurize.

Second part is correct and therefore plausible.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible because if no Pzr PORV is available, then ES-1.2 directs the use of NV aux spray to depressurize.

Second part is plausible since 50% is the correct Pzr level if containment pressure had exceeded 3 psig therefore requiring ACC values.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct and therefore plausible..

Second part is plausible since 50% is the correct Pzr level if containment pressure had exceeded 3 psig therefore requiring ACC values.

Basis for meeting the K

The K/A is matched because the applicant must have knowledge of the "condition indicating signals" provided in the stem of the question and the operational implications of those signals as they relate to the Post LOCA Cooldown and Depressurization.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

The applicant must first recall from memory the preferred methods of depressurization in ES-1.2. The applicant must then analyze the given conditions to determine what methods of depressurization are available.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2013 MNS NRC Q44

Development References

References:
ES-1.3 (POST LOCA COOLDOWN AND DEPRESSURIZATION)

Learning Objectives:
EPE1003

Student References Provided

WE03 EK1.3 - LOCA Cooldown and Depressurization

Knowledge of the operational implications of the following concepts as they apply to the (LOCA Cooldown and Depressurization)
(CFR: 41.8 / 41.10 / 45.3)

Annunciators and conditions indicating signals, and remedial actions associated with the (LOCA Cooldown and Depressurization).

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ILT-30 MNS SRO NRC Examination QUESTION 65

65 C

401-9 Comments:	Remarks/Status
	401-9 Comments: SAT 1.KA appears to match. 2.When do ACC numbers come into play? Containment Pressure? 3.Meets modified criteria. Appears to be ok. RESPONSE: 2- ACC values are required once containment pressure exceeds 3.0 psig and remain in effect after containment pressure lowers to less than 3.0 psig until maintenance can check out affected instrumentation. SLM 06/25/14

A. Purpose

This procedure provides actions to perform a Natural Circulation NC System cooldown and depressurization to Cold Shutdown, with no accident in progress, under requirements that will preclude any upper head void formation and stagnation in an inactive loop(s).

B. Symptoms or Entry Conditions

This procedure is entered from:

- EP/2/A/5000/ES-0.1 (Reactor Trip Response) Step 46, when it has been determined that a Natural Circulation cooldown is required.
- EP/2/A/5000/ES-1.1 (Safety Injection Termination) Step 31, after the plant conditions have been stabilized and no NC pumps can be started.
- EP/2/A/5000/ECA-0.1 (Loss of All AC Power Recovery Without S/I Required) Step 31, after the plant conditions have been stabilized following the restoration of AC emergency power.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. (Continued)	
	__ 2) Maintain cooldown rate in NC T-Colds less than maximum allowable limits of Enclosure 6 (Cooldown Limit with Stagnant Loop) in subsequent steps.
	__ 3) **GO TO** Step 11.d.
__ b. Check any CRDM fan - RUNNING.	b. Perform the following:
	__ 1) Maintain cooldown rate in NC T-Colds less than 70°F in an hour in subsequent steps.
	__ 2) **GO TO** Step 11.d.
__ c. Maintain cooldown rate in NC T-Colds less than 100°F in an hour in subsequent steps.	
__ d. Record natural circulation cooldown data every 30 minutes **PER** PT/2/A/4600/009 (Surveillance Requirements for Unit Cooldown).	
__ e. **REFER TO** Enclosure 3 (NC Cooldown Rate Monitoring) to assist in monitoring cooldown rate.	
__ f. Check "C-9 COND AVAILABLE FOR STEAM DUMP" status light (2SI-18) - LIT.	f. Perform the following: 1) Ensure the following are reset: __ a) Main Steam Isolation. __ b) SM PORVs. __ 2) **GO TO** Step 11.l.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

11. (Continued)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ g. Check active loops' S/G MSIVs - OPEN.	g. Perform the following: 1) Reset the following: __ a) Main Steam Isolation. __ b) SM PORVs. __ c) MSIV Bypass Valves. __ 2) **IF** any S/G is faulted, **THEN GO TO** Step 11.l. __ 3) **IF** active loops' S/G MSIVs required closed to isolate leak, **THEN GO TO** Step 11.l. __ 4) Place "STEAM PRESS CONTROLLER" in manual. __ 5) Adjust "STEAM PRESS CONTROLLER" output to 0%. __ 6) Place "STEAM DUMP SELECT" in steam pressure mode. __ 7) CLOSE 2AS-12 (U2 SM to AS Hdr Control Inlet Isol). __ 8) OPEN MSIV bypass valves to equalize pressure across S/G MSIVs on active loops' S/Gs. __ 9) OPEN MSIVs on active loops' S/Gs **PER** EP/2/A/5000/G-1 (Generic Enclosures), Enclosure 26 (Pressurizing Main Steam Header and Opening MSIVs). Use "active" loops' S/Gs in this G-1 enclosure in steps addressing "intact" S/Gs.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. (Continued)	
	10) **WHEN** MSIVs open on active loops' S/Gs, **THEN** perform the following: __ a) CLOSE all MSIV bypass valves. __ b) **WHEN** "P-12 LO-LO TAVG" status light (2SI-18) lit, **THEN** place steam dumps in bypass interlock. __ c) Dump steam to condenser from active loops' S/Gs while maintaining cooldown rate in NC T-Colds less than limit above. __ d) **WHEN** condenser dumps are established, **THEN** SM PORVs may be CLOSED.
	__ 11) **GO TO** Step 11.l to dump steam using SM PORVs while pressure is equalizing across MSIVs.
__ h. Check "STEAM DUMP SELECT" - IN STEAM PRESSURE MODE.	h. Perform the following to place steam dumps in steam pressure mode: __ 1) Place "STM PRESS CONTROLLER" in manual. __ 2) Adjust "STM PRESS CONTROLLER" output to equal "STEAM DUMP DEMAND" signal. __ 3) Place "STEAM DUMP SELECT" in steam pressure mode.
__ i. **WHEN** "P-12 LO-LO TAVG" status light (2SI-18) lit, **THEN** place steam dumps in bypass interlock.	
__ j. Dump steam to condenser while maintaining cooldown rate in NC T-Colds less than limit above.	__ j. **IF** steam cannot be dumped to condenser, **THEN GO TO** Step 11.l.
__ k. **GO TO** Step 11.n.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. (Continued)	
__ l. Dump steam from all active loops' S/Gs using SM PORVs while maintaining cooldown rate in NC T-Colds less than limit above.	l. **IF** any active loop S/G SM PORV cannot be opened from the Control Room, **THEN** perform the following: __ 1) Dispatch operator to operate active loops' S/G(s) SM PORV. 2) **IF** any active loop S/G SM PORV is unavailable, **THEN** perform the following to dump steam: __ • **IF** 2B **OR** 2C S/G affected, **THEN** start TD CA pump. __ • **IF** steam still not being released from affected S/G, **THEN** use steam drains **PER** EP/2/A/5000/G-1 (Generic Enclosures), Enclosure 19 (S/G Depressurization Using Steam Drains).
__ m. Check all NC loops - ACTIVE.	m. Perform the following: __ 1) Throttle inactive loop(s) S/G PORV open as required to ensure associated S/G safety does not open. __ 2) **WHEN** no longer required throttled to avoid lifting safety, **THEN** CLOSE inactive loop(s) S/G PORV.
__ n. **WHEN** any S/G pressure goes below 850 PSIG, **THEN** stabilize pressures between 800 PSIG and 850 PSIG, until Low Pressure Steamline Isolation is blocked.	
__ o. Maintain all intact S/G N/R levels - AT 39%.	
__ p. Maintain NC temperature and pressure within limits of Data Book curve 1.6.a.	

Instructor Notes:

1. Lecture: Major Actions
   a. Emphasize:
      - The five major action categories.
      - 6.3.1 is met by Step 3
      - 6.3.2 is met by Step 11
      - 6.3.3 is met by Steps 15
      - 6.3.4 is met by Step 38
      - 6.3.5 is met by Steps 40-43

6.3 Major Actions

The recovery/restoration technique of ES-0.2 includes the following five major action categories.

1. Try to start a NC pump.
2. Cool down and depressurize NC system with no upper head void growth.
3. Block automatic S/I.
4. Place ND system in service.
5. Cool down to cold shutdown.

The following subsections provide a more detailed discussion of each major action category.

6.3.1 Try to start a NC pump

Before initiating a natural circulation cooldown/depressurization, an attempt is made to start a NC pump since it is preferred to cool down the NC system under forced circulation. If this attempt is successful, the operator is instructed to transfer to the appropriate procedure for cooldown under forced circulation.

If proper conditions for starting a NC pump can be established during the course of this procedure, the operator is instructed to repeat the step for starting a NC pump, and to exit if appropriate.

6.3.2 Cool down and depressurize NC System with no upper head void growth

After cold shutdown boron concentrations are checked and at least 1 CRDM fan is running, a NC system cooldown is initiated by dumping steam at a cooldown rate (**less than 100°F in an hour**). If no CRDM fans are running, then cooldown rate is limited to **70°F in an hour.** At the permissive setpoints the automatic S/I signals are blocked. A minimum subcooling is established and maintained during subsequent cooldown and depressurization. If NC system subcooling requirements cannot be maintained or Pzr level exhibits large unexpected variations during the cooldown/depressurization, the

STEP 11 Initiate NC System cooldown to Cold Shutdown as follows:

PURPOSE: To begin a controlled NC system cooldown to cold shutdown at a maximum rate of 100°F per hour with 1 or more CRDM fans running, 70°F per hour with no CRDM fans running, as measured in the cold legs, with guidance given in Enclosure 3 on monitoring cooldown rate.

BASIS: To establish the cooldown of the NC system, steam should be released through the condenser steam dump valves. However, if the main condenser is not available for steam dump, the cooldown should be established by use of the PORVs, releasing steam to the atmosphere.

Instructor Notes:

1. Lecture: Detailed Description of Procedural Steps (Continued)
   a. Emphasize:

      Steps 13 and 14:

      - These steps prepare for blocking S/I in Step 15. The intent is to prevent a spurious S/I due to the cooldown and depressurization.

      Step 13: Caution:

      - Note that maintaining S/G pressures (per the RNO) greater than 775 PSIG will prevent Main Steam Isolation due to low S/G pressure.

      Step 15 Caution:

      - At 1955 PSIG, S/I will unblock.

Operator Fundamental Focus; Knowledge and Control

Explain *that the preferred means to initiate a cooldown of the NC is through use of the condenser steam dumps. Steam Generator pressures must be maintained greater than 800 psi until low Main Steam line pressure is blocked in subsequent steps. Ask the class participants "when is low Main Steam line pressure blocked?" The answer is "when NC is depressured to 1905 psig." Ask the class participant "what will happen if NC pressure increases above P-11 and SG pressures are below 775 psig?" Answer is "a MSIV will occur because the low steam line pressure SI signal is reset once NC pressure goes above 1955 psig (p-11)."*

STEP 12 Monitor for inactive loop(s) stagnation conditions as follows:

PURPOSE: To determine if the conditions for a stagnant loop exist, provide operator actions to prevent a stagnant loop condition from occurring, and provide operator actions to recover from a stagnant loop condition.

Basis: An inactive loop exists if the capability to feed or steam a SG is lost. During natural circulation cooldown with an inactive loop, the potential for flow to stop in that loop (become a stagnant loop) exists if the cooldown rate is excessive. If the symptoms of an stagnant loop occur, operator actions are necessary to restore natural

<table>
<tr><td rowspan="2">Duke Energy
McGuire Nuclear Station

Communication Of Day-To-Day Plant Issues</td><td>Document No.
OMP 5-12</td></tr>
<tr><td>Revision No.
032</td></tr>
<tr><td>Information Use</td><td>Electronic Reference No.
MP0070O9</td></tr>
</table>

Attachment 11.4
Operations Communication Matrix

Type of Communication	Communication Method to Use	OPS Target Contact
Routine Day-to-Day during dayshift	Verbal / email	As Required
Scheduled Work Items	Verbal / email	AOM - Online Staff
Current Plant Operating Issues	Verbal	SM
Recommended Procedure Changes	Procedure Revision Request	Procedure Group supporting OPS
Operability Issues	Verbal / AD-OP-ALL-0105 Process	SM
Plant Concerns	Verbal	SM
Action Register Issues	Written (per AR/PC Expectations)	OPS Action Register Distribution
Detailed Instructions or Major Guidance to the Control Room	Engineering Group Guidance Sheets	CRS
Special Requests or Minor Guidance to OPS that will extend beyond Day/Weekend Shift	OPS Work List	NA - OPS will print the Work List and review it during shift turnovers
Adverse Condition Monitoring and Contingency Planning (ACMP)	Verbal / AD-OP-ALL-1000 ACMP Process	SM
Operations Update	Initial email, then verbal with small groups	OPS Group

Information Use

NUCLEAR OPERATING FLEET

ADMINISTRATIVE PROCEDURE

AD-HS-ALL-0103

FALL PROTECTION

REVISION 5

Effective Dates:

12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017
Brunswick	Catawba	Harris (HNP)	McGuire	Oconee
12/11/2017	12/11/2017			
Robinson	NGO			

1.0 PURPOSE

1. To provide information to workers regarding Fall Prevention, and the use of Fall Protection (FP) or fall arrest equipment when working at heights of 4 feet or more.

2.0 SCOPE

1. Applies to all workers in the operating nuclear fleet.

2. Includes, but is not limited to, Fall Prevention and protection requirements while working from unguarded floor edges and platforms, incomplete scaffolds, roofs, scissor lifts, and articulating boom aerial lifts.

3.0 DEFINITIONS

1. **Anchor:** A fixed structural member providing a secure means of attachment for a Personal Fall Arrest System (PFAS). Examples include, but are not limited to beams, girders, columns, piping, hangers, or angle iron.

2. **Body Harness:** A manufactured device, secured about the worker in a manner that will distribute the fall arrest forces over the thighs, pelvis, waist, chest, and shoulders, used in conjunction with a Personal Fall Arrest System.

3. **Climbing:** The ascending, descending, or scaling of structures, such as piping, girders, columns, beams, equipment, or any other structure not specifically designed or designated as a Walking or Working Surface.

4. **Connector:** A device which is used to couple (connect) parts of the Personal Fall Arrest System or Positioning Device Systems together. It may be an independent component of the system, such as a carabiner, or it may be an integral component or part of the system, such as a buckle or D-ring sewn into a Body Harness, or a snap-hook spliced or sewn to a Lanyard or Self-Retracting Lanyard.

5. **Continuous Fall Protection:** The uninterrupted use of full Body Harness, Lanyards, and appropriate anchorage systems where there is a free-fall risk of greater than or equal to 4 feet above a Working or Walking Surface, equipment, or component. Also known as 100% tie-off.

6. **Cross Arm Straps:** Straps that wrap around I-beams and other structures and attaches to a D-ring that slips through a smaller D-ring to form a secure attachment point for Lanyards and other connecting devices (also known as Lanyard straps).

3.0 DEFINITIONS (continued)

20. **Lanyard:** An approved flexible line of rope, wire rope, or strap which generally has a Connector at each end for connecting the Body Harness to a deceleration device, Lifeline, or anchorage.

21. **Lifeline:** A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical Lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal Lifeline); and which serves as a means for connecting other components of a Personal Fall Arrest System to the anchorage.

22. **Non-Engineered Anchorage:** A secure anchor point that was not designed or manufactured specifically for a PFAS anchor attachment but meets load requirements

23. **Parapet:** Low wall or railing to protect the edge of platform, roof, or bridge.

24. **Personal Fall Arrest System (PFAS):** A system used to arrest a worker in a fall from a working level. The system consists of an anchorage, Connectors, and Body Harness, and may include a Lanyard, deceleration device, Lifeline, or suitable combinations of these.

25. **Positioning Device System:** A Body Harness system rigged to allow a worker to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning in conjunction with a PFAS. Positioning Device Systems by themselves are not suitable for fall arrest or protection.

26. **Roofing Work:** The hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

27. **Rope Grab:** A deceleration device which travels on a vertical Lifeline and automatically, by friction, engages the Lifeline and locks so as to arrest the fall of a worker. A Rope Grab usually employs the principle of inertial locking cam or lever locking, or both.

28. **Safety-Monitoring System:** A designated worker (known as Safety Monitor) responsible for recognizing and warning employees of fall hazards while working near unprotected edges, such as roofs or elevated platforms.

29. **Self-Retracting Lifeline or Lanyard (SRL):** A deceleration device containing a drum-wound line or strap which can be slowly extracted from, or retracted onto, the drum under slight tension during normal worker movement, and which after onset of a fall, automatically locks the drum and arrests the fall.

30. **Swing Fall Hazards:** The pendulum swing risk associated with moving away from directly under the tie off point of a Self-Retracting Lifeline or Lanyard.

5.0 INSTRUCTIONS

5.1 General

1. All permanent platforms and Walking or Working Surfaces which are 4 feet or more from a lower surface, should have guardrails installed.

2. Workers on Walking or Working Surfaces shall be protected from falls by use of temporary Guardrail Systems, safety net systems, or Personal Fall Arrest Systems when:

   a. Working from heights of 4 feet or more from a lower or ground level.

   b. Erecting or disassembling scaffolding 10 feet or more from a lower or ground level.

   c. Working on a roof 15 feet or less from the edge without a Parapet or wall structure that is at least 39 inches high.

   d. Working from incomplete scaffolding.

   e. Guardrails are not completely installed, fully raised, or cannot be used on a scissor lift or manually propelled work platform.

3. Workers shall utilize a PFAS when working in a boom articulating lift at any height.

4. Contact a Fall Protection Competent Person when needed to evaluate fall protection questions.

5. If a fall hazard cannot be eliminated or Continuous Fall Protection assured, then perform a Hazard Assessment by a Competent Person per Attachment 1, Fall Protection Hazard Assessment.

   a. This assessment includes effective controls and monitoring to ensure workers are protected from a fall.

5.2.6 Fall Arrest or Fall Control

1. Use of a Personal Fall Arrest System (PFAS) or equipment to control falls is considered only after determining, within reason, the fall hazard cannot be eliminated or the possibility of falling prevented.

2. Falls can be controlled by use of safety nets or Lanyards, shock absorbers, fall arresters, Lifelines, and anchorage Connectors. Fall arrest or fall control also necessitates work place assessment, work process assessment, and planning in order to select the proper equipment and install and use it correctly.

5.3 Job Planning

1. Job planning shall focus on eliminating or preventing fall hazards as described in Section 5.2.

   a. Fall Protection issues identified in job planning shall be discussed during the pre-job briefing.

   b. Verify that the worker(s) is qualified to use fall protection.

   c. Consider means of rescue in the event of fall.

2. Contact a Fall Protection Competent Person when needed to evaluate fall protection questions.

5.4 Fall Protection System Selection

5.4.1 Personal Fall Arrest System

1. Risks to workers shall be controlled by using a Personal Fall Arrest System (PFAS), and in special cases, fall protection nets when Fall Prevention systems are inappropriate, and fall hazards cannot be eliminated. A PFAS includes, but is not limited to:

   - Full Body Harness
   - Shock absorbing or self retracting Lanyard (SRL)
   - Substantial anchor points
   - Lifelines (horizontal or vertical)

2. A full-Body Harness shall be used in the PFAS.

   a. Body belts or positioning belts shall not be used as part of a PFAS.

Nomenclature: **1 VF FILTER FIRE** Window: **E3**

Setpoint: 325°F

Origin: 1 VF Exhaust Filter (1FPFU-1) Fire Protection Panel

Probable Cause: Fire in 1 VF Filter 1FPFU-1 charcoal adsorber

Automatic Action: Secures VF Exhaust Fans 1A and 1B

Immediate Action:

1. Ensure the following breakers open:
   - KXA-19 (733' AA54)
   - 1MXJ-3F (1A Fuel Handling Area Exhaust Fan Motor)
   - 1MXK-R2G (1B Fuel Handling Area Exhaust Fan Motor)
2. Open:
   - 1RY-113 (West Aux Bldg Fire Protection Deluge)
   - 1RY-114 (East Aux Bldg Fire Protection Deluge)
3. Close 1RF-1065 (Unit 1 Fuel Pool Bldg Exhaust Filter Mulsifyre RF Hdr Lo Pt Drn). (767' NN52)
4. Unlock and open:
   - 1RF-480 (Unit 1 Fuel Pool Bldg Exhaust Filter Mulsifyre RF Isol) (767' NN52)
   - 1RF-1118 (Unit 1 Fuel Pool Exhaust Filter Mulsifyre RF Isol) (767' NN52)

Supplementary Action:

1. Take appropriate action to return 1VF to service.
2. Refer to Tech Specs

References:

- Tech Specs
- MCM-1211.00-525 & 684
- MCEE-166.00-22

End Of Response

valve is opened to provide an input to control room annunciator D-3 “ Fire Protection Alert“ on 1AD-1.

2.8 Components/Areas Protected by Sprinkler System

Objective # 11

The Automatic sprinkler systems provide protection for the following major areas:

- **Selected areas in the Turbine Building (mezzanine and basement)**
- **The oil storage house**
- **The warehouse, maintenance shops, and shared equipment area (Service Building)**
- **The QA Warehouse**
- **The condenser pits**
- **The administration building (only certain storage areas)**
- **SSF Diesel Generator**
- **ND Pump Rooms (1A, 1B, 2A, 2B)**
- **CCP rooms (1A, 1B, 2A, 2B)**
- **RN Pumps (1A, 1B, 2A, 2B)**
- **Contaminated Warehouse**
- **Room 600 and 601 (RN Strainers, Motor driven CA pumps, WZ sump pumps and FDT Sump pumps**
- **Cable shaft**
- **Battery rooms**
- **KC Pumps (750, 733 elev)**
- **695 elev. corridor**
- **Equipment decon room**
- **NC Pumps 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D**
- **Lower Containment Filter Units 1A, 1B, 2A, 2B**
- **Pipe corridor Units 1 & 2**
- **Annulus Units 1 & 2**

2.9 Components/Areas Protected by Mulsifyre System

Objective # 11

The Automatic deluge (Mulsifyre) systems, which provide fixed spray patterns of water similar to a sprinkler system, are provided for:

- **Main and station oil filled power transformers (1A, 1B, 2A & 2B)**
- **Auxiliary transformers(1ATA, 1ATB, 2ATA, & 2ATB)**
- **Auxiliary Electric Boiler oil filled transformers (1ATE, 2ATE)**
- **Turbine oil reservoirs, oil piping, and bearings in Unit 1 & 2 as follows:**
- **Main Turbine piping and bearings**

- **MTOT**
- **FWPT lube oil reservoir**
- **Hydrogen seal oil unit**
- **D/G lube oil transfer storage tanks(clean and dirty)**
- **Main Turbine lube oil transfer tanks**
- **Oil Purifier areas**
- **Lube Oil house in service building**
- **Acetylene and oxygen storage in the yard**

Manually operated mulsifyre systems are provided for the unit 1 & 2 cable rooms and for the 1(2)ETA HVAC equipment rooms. These systems consist of a number of open spray nozzles with locked closed manual isolation valves. When the valve is opened, water discharges from all the nozzles in the system.

The following HVAC filters contain built in deluge systems:

- **VE filters (1A, 1B, 2A, 2B)**
- **Fuel Pool area filters Unit 1 & 2**
- **Auxiliary Building exhaust filters (1A, 1B, 2A, 2B)**
- **Reactor Building Purge Exhaust filters (1A, 1B, 2A, 2B)**
- **Control Room Ventilation Unit 1 & 2**
- **Counting Room supply unit**
- **Incore Instrumentation room purge exhaust filter Unit 1 & 2**
- **Onsite TSC filter unit**

To keep water out of the filters until absolutely necessary, the supply line to each filter is provided with two locked closed manual isolation valves and an open drain valve between the isolation valves. Both valves must be open and manual drain valve closed to operate the spray system. A rupture disk, flange set and flexible hose is provided on the fire protection inlet side of the ESF grade filters. The rupture disk will give way to RF system pressure when the two isolation valves are opened. The filter units operate at a pressure less than that of the Auxiliary Building environment. Failure of the fire protection piping would permit unfiltered air to bypass the carbon absorbers. This bypassed air would enter the units respective habitability envelope. This would tend to reduce the filters effectiveness. The rupture disc will prevent air from entering the filter through the fire protection connection. A flexible hose is connected between the filter housing and hard pipe to reduce loads to zero. This enables the disc to qualify seismically.

2.10 Activation of the Mulsifyre System

Objective # 12

The plant has various types of deluge valve arrangements. Procedure OP/1/A/6400/2A (Fire Protection System) enclosure 4.3 Figure 1 through 4 provides figures of the different arrangements. **One type is air operated and remains closed until actuated**. This type is used in the auxiliary building and reactor building headers and will be discussed later. **The other types operate with the shutoff supply open and clapper**

A loss of flow condition, as sensed by both Fuel Pool Exhaust Fans, would be required to "trip" the Supply Unit Supply Fan.

- **The Supply Fan "start" will activate Fuel Handling Area Temperature Control** (Minor Modification 7804) and **OPEN the Supply Unit Inlet Damper (D-1).**
- **Supply Fan will automatically "trip" on Inlet Air Temperature <35°F or Filter Train Inlet Air Temperature >160°F** *(Refer to Training Drawing 7.2, Fuel Handling Building Ventilation System - Composite).*

Operation of the Supply Fan activates a pressure switch (VFPS9050) **to provide:**

- **A "permissive" signal for operation of the YH Secondary Water Pumps** (YH).
- **Confirmation of operation with indication provided at the HVAC and Auxiliary Building Panels.**

Objective # 5

<u>HVAC Panel Indication</u>

The Supply Fan has a NORMAL / OFF (red / green) indication, for VF SUPPLY AIR FLOW, on the HVAC Panel. The NORMAL flow indication light will only illuminate after the Supply Fan is started and operation has been confirmed by "pressure switch" (VFPS9050) **activation.**

(Refer to Training Drawing 7.3, Fuel Handling Building Ventilation System - Unit 1 HVAC Controls).

Objective # 3

<u>Auxiliary Building Panel (AB-ECP-2A) Indication</u>

(Refer to Training Drawing 7.4, Fuel Handling Building Ventilation System - Unit 1 Auxiliary Building Controls).

The Supply Fan has ON / OFF (red / green) and FLOW / NO FLOW (red / green) status light indications on Auxiliary Building Panel AB-ECP-2A. **The OFF (green) status light will "flash" to indicate when the Supply Fan has tripped on an *overload*. The FLOW (red) status light will only illuminate after the Supply Fan is started and operation has been confirmed by "pressure switch"** (VFPS9050) **activation.**

FILTER CHANGE (red) status light (High Differential Pressure) for the Supply Unit Pre-filter. The Supply Unit Pre-filter is a roughing filter used to remove large particles from the inlet air supplied from outside the Auxiliary Building.

<u>Auxiliary Building Panel (AB-ECP-2) Indication</u>

The Supply Unit Pre-filter DIFFERENTIAL PRESSURE Gauge and Supply Fan DISCHARGE TEMPERATURE indication is on this panel.

- **"B" Exhaust Fan ON / OFF** (red / green) **status lights**.

In addition, the OFF (green) status light will "flash" to indicate when the Exhaust Fan has tripped on an *overload*.

- **Exhaust Damper** D-1 **OPEN / CLOSED** (red / green) **status lights**.
- **Exhaust Damper** D-2 **OPEN / CLOSED** (red / green) **status lights**.

In addition, Exhaust Fan operating status is provided on the OAC (Operator Aid Computer) and the Exhaust Fans will TRIP on a Filter Train FIRE (VF Filter Fire "white" status light at the HVAC Panel).

2.4 Fuel Handling Building Ventilation Pneumatic Dampers

Objective # 3

Supply Unit Inlet Damper (D-1)

The **Supply Unit Inlet Damper** (FPS-D-1) **opens automatically when the Supply Unit Fan starts**. **Operating status** is provided **indirectly through FLOW / NO FLOW** (red / green) **status light indication on Auxiliary Building Panel** AB-ECP-2A.

Objective # 5

Filter Train Unit Pneumatic Dampers (D-3, D-4, and D-5)

The **Filter Train Unit Dampers** (FPX-D-3, FPX-D-4, and FPX-D-5) **are operated by a two-position (OPEN / CLOSED) selector switch on the HVAC Panel**. This selector switch is **labeled as VF EXH BYP DMPR CNTRL**.

Placing this switch to the **OPEN** position will align the Filter Train Unit for **BYPASS MODE** of operation (normal system operation with the following damper alignments:

- **Filter Train Bypass Damper** (D-5) *** OPEN**
- **Filter Train Inlet Damper** (D-3) **CLOSED**
- **Filter Train Outlet Damper** (D-4) **CLOSED**

***Operation of the Exhaust Filter Train Bypass Damper is verified at the HVAC Panel (OPEN / CLOSED status lights).**

Placing this switch to the **CLOSED** position will align the Filter Train Unit for **FILTRATION MODE** of operation (fuel handling system operation) with the following damper alignments:

- **Filter Train Bypass Damper** (D-5) *** CLOSED**
- **Filter Train Inlet Damper** (D-3) **OPEN**
- **Filter Train Outlet Damper** (D-4) **OPEN**

***Operation of the Exhaust Filter Train Bypass Damper is verified at the HVAC Panel (OPEN / CLOSED status lights).**

Information Use

NUCLEAR DEVELOPMENT / OPERATING FLEET / DECOMMISSIONED

ADMINISTRATIVE PROCEDURE

AD-HU-ALL-0004

PROCEDURE AND WORK INSTRUCTION USE AND ADHERENCE

REVISION 10

Effective Dates:

11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Brunswick	Catawba	Crystal River	Harris (HAR/HNP)	Lee
NA	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Levy	McGuire	Oconee	Robinson	NGO

5.12.5 Non-Conditional Procedure and Work Instruction Steps (continued)

i. The work group supervisor shall document approval by initialing at the step(s) marked NA. {7.1.2}

j. If the step being marked NA would position equipment whose configuration control is the responsibility of another group, then the supervisor shall obtain an additional review and initial from the Operational Control Group before the NA occurs.

5.12.6 Verbal Approval for NA of Non-Conditional Steps

1. Approval may be obtained by verbal means as long as the following criteria (Doer/Documenter) are met:

   a. The person called for the approval is not readily available to sign the Working Copy of the procedure but is available for verbal discussion via remote means (e.g., via phone).

   b. The person called for the approval maintains full responsibility for ensuring review is adequate prior to granting approval.

   c. The person documenting the approval on the procedure shall:

      (1) Document the verbal approval by documenting the approvers initials.

      (2) Note that the approval was obtained by verbal and remote means in the margin of the procedure (e.g., via phone).

      (3) Initial in the margin of the procedure as the documenter for the approval to NA a non-conditional step.

5.13 Out of Sequence Step Performance

5.13.1 General

1. This section is not applicable to Information Use procedures.

2. Changing Step Sequence within a procedure section will be the exception, not the normal practice.

5.13.1 General (continued)

3. Ensure all of the following criteria are met for the proposed out of sequence performance:

   - The technical procedure is not a required periodic test, surveillance, special test or an infrequently performed test or evolution.

   - The technical procedure or work instruction performance does not satisfy a technical specification requirement, is not being used as a special test, or an infrequently performed test or evolution

   - The intent (method of performance, or the results) of the steps or sections does not change.

   - Personnel and equipment safety is not affected.

5.13.2 Approval for Change in Sequence

1. Supervisor reviews the change in sequence. The supervisor shall be technically cognizant or shall obtain concurrence from an individual (other than the performer) who is technically cognizant, before authorizing performance of steps out of sequence.

2. [CNS, MNS, ONS] If performing Temporary Procedures for Implementation of a Modification (TN), the TN may provide more specific requirements for approving a change in sequence of procedure steps. TN specific guidance shall be followed.

3. Document the new sequence as follows:

   a. Using dark ink, insert a note that describes the sequence change.

      Example: "Step 12.3 is to be performed before Step 12.2", or "Steps 12.2, 12.3, and 12.4 may be performed in any order."

   b. The performer and supervisor shall place their initials near the note.

   c. Using dark ink, renumber enough steps in the new sequence to ensure that the new sequence will be clearly understood. The performer and supervisor shall place their initials near each new step number or on each page if multiple steps/pages are affected.

4. Work Group Supervisor signs or initials to document approval in the body, comments section of the procedure, or on the work instruction. {7.1.2}

5.13.2 Approval for Change in Sequence (continued)

5. If a change of sequence will result in a change in technical specification equipment operability or functionality for in-service equipment, then obtain SRO approval.

   a. SRO signs or initials to document approval in the body, comments section of the procedure, or on the work instruction.

6. If a permanent change to the procedure is appropriate, then initiate a Procedure Revision Request.

5.13.3 Verbal Approval for Change of Sequence

1. Approval may be obtained by verbal means as long as the following criteria (Doer/Documenter) are met:

   a. The person approving the Change of Sequence is not readily available to sign the Working Copy of the procedure but is contacted for verbal discussion via remote means (e.g., via phone).

   b. The person approving the Change of Sequence maintains full responsibility for ensuring review is adequate prior to granting approval.

   c. The person documenting the Change of Sequence approval on the procedure shall:

      (1) Document the verbal approval by documenting the approvers initials.

      (2) Note that the approval was obtained by verbal and remote means in the margin of the procedure (e.g., via phone).

      (3) Initial in the margin of the procedure as the documenter for the approval.

5.14 Challenges During Execution

1. The performer shall stop anytime the step in a procedure or work instruction:
   - Cannot be performed as written
   - Is not clearly understood
   - Will not obtain the desired result
   - Would result in an incorrect action
   - Is in conflict with any plant or equipment signage
2. If the problem is not clearly resolved by your review of the procedure or work instruction, then contact supervision and resolve the issue using the guidance in this section.
3. If required by AD-PI-ALL-0100, Corrective Action Program, then initiate an NCR.
4. Section 5.12, Use of 'Not Applicable' (NA or N/A) and Section 5.13, Out of Sequence Step Performance, describe processes available to supervision and may be an option as long as the intent of the step(s) is not changed.
5. Review AD-OP-ALL-0204, Plant Status Control, to identify plant status control requirements for equipment remaining in the 'Off Normal' condition.
6. Evaluate the situation to determine the cause of problems encountered during Procedure or Work Instruction use.

   a. Problems with the Procedure or Work Instruction:

      (1) If the procedure or work instruction problem is an obvious typographical or editorial error as defined in Attachment 2, Field Editorial Corrections, then do not make a formal procedure revision prior to completing the procedure or work instruction.

         (a) Before continuing and with supervisor approval; correct the error, initial and date, and document the reason along with supervisor approval.

         (b) As soon as time permits, initiate a procedure revision request (PRR) or model work instruction change request. A PRR is not required for one time use procedures (e.g., TN, TT, and Special procedures used to implement Engineering Changes).

5.14 Challenges During Execution (continued)

(2) If the problem is not editorial and the procedure or work instruction cannot be completed as written using NA or Out of Sequence, then change or revise the procedure or Work Instruction per AD-DC-ALL-0201, Development and Maintenance of Controlled Procedure Manual Procedure or AD-MN-ALL-0005, Nuclear Planning, before continuing.

(a) If a procedure revision is required and will not be immediately processed, then determine if the procedure needs to be placed on TECH HOLD/ADMIN HOLD.

(b) If a work instruction change is required and will not be immediately processed, then determine if the Work Order needs to be placed in Suspend Status.

b. Problems with equipment:

(1) If equipment does not perform as expected by the Procedure or Work Instruction, then evaluate the necessary corrective actions before continuing.

(2) If necessary, then initiate a WR for repairs.

(3) Document the equipment problem as follows:

(a) In the current WO, if applicable.

(b) If initiation criteria of AD-PI-ALL-0100, Corrective Action Program is met, then initiate an NCR and include any WR number written for repair.

(4) Attachment 3, Equipment Problem Evaluation Form can be used as an additional method for documenting and tracking equipment issues impacting procedure completion.

(a) If used, then attach Attachment 3, Equipment Problem Evaluation Form, to the procedure.

(b) If steps are required to be NA'd or resequenced to complete the procedure, then use of Attachment 3, Equipment Problem Evaluation Form, is not a substitute for performance of the requirements of this procedure on use of NA and Out of Sequence.

GEN2.2 2.2.6 - GENERIC - Equipment Control

Equipment Control

Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13)

In accordance with AD-HU-ALL-004 (PROCEDURE AND WORK INSTRUCTION USE AND ADHERENCE),

1) if it is determined that an in progress PT can NOT be performed as written due to an obvious typographical error, the CRS ________ allowed to authorize a Pen and Ink change to the PT.

2) the type of procedure being performed (PT) ________ require a Procedure Revision Request be submitted as soon as time permits.

Which ONE (1) of the following completes the statements above?

A.
1. is
2. does

B.
1. is
2. does NOT

C.
1. is NOT
2. does

D.
1. is NOT
2. does NOT

General Discussion

Per AD-HU-ALL-0004 Step 5.14.6.a.1, If the procedure or work instruction problem is an obvious typographical or editorial error as defined in Attachment 2, Field Editorial Corrections, then do not make a formal procedure revision prior to completing the procedure or work instruction. Before continuing and with supervisor approval; correct the error, initial and date, and document the reason along with supervisor approval. As soon as time permits, initiate a procedure revision request (PRR) or model work instruction change request.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant confuses a Temporary Test (TT) procedure with a PT. Temporary Test proceudures do NOT require a PRR.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude that the authority to change an obvious error lies with the user, and that it is only required to keep supervision informed of field changes made during procedure use..

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude that the authority to change an obvious error lies with the user, and that it is only required to keep supervision informed of field changes made during procedure use..

Part 2 is plausible if the applicant confuses a Temporary Test (TT) procedure with a PT. Temporary Test proceudures do NOT require a PRR.

Basis for meeting the KA

K/A is matched because the operator must demonstrate knowledge of the process for making changes to procedures, specifically field changes to an in-progress procedure.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2015 RNP AUDIT (BANK 6272)

Development References

REFERENCES:
AD-HU-ALL-0004 (Procedure and Work Instruction Use and Adherence) Rev 8, Step 5.14.6.a.1

LEARNING OBJECTIVES:
NONE

Student References Provided

GEN2.2 2.2.6 - GENERIC - Equipment Control
Equipment Control
Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.9 Pressurizer

LCO 3.4.9 The pressurizer shall be OPERABLE with:

a. Pressurizer water level $\leq$ 92% (1600 ft^3); and

b. Two groups of pressurizer heaters OPERABLE with the capacity of each group $\geq$ 150 kW.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressurizer water level not within limit.	A.1 Be in MODE 3 with reactor trip breakers open. AND A.2 Be in MODE 4.	6 hours 12 hours
B. One required group of pressurizer heaters inoperable.	B.1 Restore required group of pressurizer heaters to OPERABLE status.	72 hours
C. Required Action and associated Completion Time of Condition B not met.	C.1 Be in MODE 3. AND C.2 Be in MODE 4.	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.9.1	Verify pressurizer water level is $\leq$ 92% (1600 ft^3).	In accordance with the Surveillance Frequency Control Program
SR 3.4.9.2	Verify capacity of each required group of pressurizer heaters is $\geq$ 150 kW.	In accordance with the Surveillance Frequency Control Program

FOR REVIEW ONLY - DO NOT DISTRIBUTE

EXAM BANK QUESTION: 6373 CNS **C**

Given the following conditions on Unit 2:

- Mode 3 with startup in progress

Subsequently:

- A loss of offsite power occurs
- The plant stabilizes with Pressurizer level stable at 90%, and only 2ETA powered from its Diesel Generator

Which ONE (1) of the following identifies the status of LCO 3.4.9 (PRESSURIZER)?

A. LCO 3.4.9 is met.

B. LCO 3.4.9 is NOT met, because Pzr level is too high ONLY.

C. LCO 3.4.9 is NOT met, because of insufficient Pzr Heater Capacity ONLY.

D. LCO 3.4.9 is NOT met, because of insufficient Pzr Heater Capacity AND because Pzr level is too high.

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EXAM BANK QUESTION: 6373 CNS **C**

General Discussion

According to LCO 3.4.9, in Modes 1-3, the Pzr must be OPERABLE with water level < 92% and two groups of Pzr heaters each with a capacity of 150 KW must be OPERABLE. While Pzr level meets the LCO criteria, the Pzr Heater capacity does not. According to PS-IPE, (p23, Rev 27) there are four groups of heaters. Only two of these groups receive power from safety related power supplies; Group A from 2LXI, which is available, and Group B from 2LXH which is de-energized. Groups C and D receive power from LXF, LXC and LXG respectively, and according to EL-EP (p167, Rev 41), these Load Centers are NOT safety related, and would be de-energized under these conditions. Based on this, there is only one group of Pzr Heaters that is OPERABLE, and LCO 3.4.9 is NOT met.

The KA is matched because the operator must know the thresholds for LCO 3.4.9, Pressurizer, and demonstrate the ability to apply technical specifications in a practical setting.

Answer A Discussion

INCORRECT:

PLAUSIBLE:
This is plausible because the operator may believe incorrectly that LCO 3.4.9 is NOT applicable in Mode 3, or that both criteria (Pzr level and Pzr heater capacity) are met. The Pzr level requirement is met, however the 2B set of Pzr heaters has no emergency power source and is therefor inoperable.

Answer B Discussion

INCORRECT:

PLAUSIBLE:
This is plausible because the operator may believe incorrectly that LCO 3.4.9 requires the Pzr level to remain below a lower level than 92%; the TS limit and may NOT realize that there is insufficient Pzr heater capacity. 90% Pzr level is also well above the 2AD-6, B/9 "Pzr Hi Level" alarm setpoint of 70%. This ARP refers the operators to refer to LCO 3.4.9.

Answer C Discussion

CORRECT - See discussion above.

Answer D Discussion

INCORRECT:

PLAUSIBLE:
This is plausible because the operator may believe incorrectly that LCO 3.4.9 requires the Pzr level to remain below a lower level than 92%; and realize that there is insufficient Pzr heater capacity. 90% Pzr level is also well above the 1AD-6, B/9 "Pzr Hi Level" alarm setpoint of 70%. This ARP refers the operators to refer to LCO 3.4.9.

Basis for meeting the KA

The K/A is matched because it requires the applicant to demonstrate a knowledge of the Tech Spec 3.4.9 (Pressurizer) entry requirements.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant must analyze the conditions given to determine the status of the Pressurizer heaters.

Next, the applicant must recall from memory the LCO requirements for PZR heater operability from Tech Spec 3.4.9 (Pressurizer).

Finally, the applicant must associate the two pieces of information that were recalled from memory and determine by analysis the correct response.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT16 CNS NRC Examination

Development References
Tech Spec 3.4.9 (Pressurizer)

Student References Provided

Objective 2, 6, 7

The WMT and the VUCDT are normally released to the RC Discharge through 1WP35 (WMT & VUCDT to RC Cntrl) and 1WP37 (Liquid Waste to RC Cntrl). Another flow path that is used when the normal path is unavailable is through 1WM46 (0EMF49 Outlet High Rad Shutoff Isol).

1WP35 and 1WM46 will get a "close" signal if preset radiation levels are exceeded on 0EMF49, 1EMF44, 2EMF44, or if there is less than the required number of RC pumps running (for dilution). 1WP37 will also get a "close" signal if there is less than the required number of RC pumps running.

- Verifies functionality of the discharge flow recorder that will monitor the release
- Verifies the "Recommended Release Rate" is less than or equal to the "Allowable Release Rate".
- Verifies the number of "RC Pumps Running" is greater than or equal to "RC Pumps Assigned to this Release" This will provide assurance that effluent concentration (EC) limits will not be exceeded.
- Verifies the number of "RC Pumps Running" is greater than or equal to "Total RC Pumps Required (all concurrent Releases)" .

NOTE: The RC minimum flow interlock is set to the minimum # of pumps required for the release. If the total # of RC pumps running is less than the selected number, 1WP-35, 1WP-37, and 1WM-46 will close.

- Review of Special Instructions provided on the LWR Permit.

Conduct of Operations Focus; Control
Explain *one of the behaviors for the fundamental Control for an RO is to log changes in system status to help ensure that others understand plant conditions over time.* ***Per AD-OP-ALL-0112 (Operations Log Keeping and Chart Recorders),*** Liquid or gaseous discharge, time of discharge initiation and completion shall be logged.

RO Responsibilities
The RO ensures that pertinent information about each LWR is in the Narrative Log. The purpose of the log is to maintain an account, in the control room, of all LWR/GWR releases.
The information contained in the log is:

- Release #
- Start Time & Date
- Stop Time & Date
- Volume Released

- Any unusual events encountered during the release

Objective 2, 8

Operator Fundamental Focus; Monitoring and Conservatism
Discuss *the fact that,* during the release, flow rate and the EMF reading represent the critical parameters for this evolution and they should be monitored frequently. Also, reinforce that, should equipment problems arise during the conduct of a release, the operator should take the conservative approach and secure the release. The release can be restarted or the LWR may be terminated depending on the situation.

The following items are also pertinent to the conduct of radioactive releases:

- Liquid releases are automatically halted on EMF Trip 2 signals (with the exception of a release from WU). Following a trip 2 of 1(2) EMF31 the TBS pumps trip and the LWR paperwork should be terminated. If it is desired to continue releasing the TBS through RC, new LWR paperwork is required. As described later, VUCDT and WMT releases may be reinitiated following Trip 2 signal from 0EMF49 or 1(2) EMF44 up to two times.
- If a site assembly occurs during a release, the release is secured. After the site is assembled the Recovery Manager will make a decision whether to terminate or reinitiate the release as allowed by procedures.
- In the event of any problem with an EMF, either write a work request or request that RP initiate a work request.
- Should any SLC required instrument fail or be returned to service AFTER A RELEASE IS INITIATED, the release must be terminated and a new LWR issued. This ensures that SLC remedial actions are met prior to starting the release. (See NCR 01612760)

During any release to the environment, the AO conducting the release should monitor the release rate and EMF readings to ensure the readings are as expected.

2.2 Releasing a WMT

Objective 9

Refer to Drawing 7.2, WMT Subsystem.
After a WMT is filled the tank is isolated to prevent any additional inputs. The AO performing the release is responsible for:

- Ensuring the WMT level instrument is functional. A WMT can NOT be released if the level instrument is non-functional. Either the level instrument must be repaired or the tank contents can be transferred to the other WMT for release. The WMT pump receives a trip signal on low WMT level (~10%). Additionally, the level instrument readings can be used with tank curves to calculate volume released when the flow recorder is non-functional.

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EXAM BANK QUESTION: 3754 MNS **A**

Unit 1 has initiated a liquid radioactive waste release from the Ventilation Unit Condensate Drain Tank (VUCDT) through the RC system. All lineups and authorizations have been properly made in accordance with OP/0/B/6200/35 using the normal path. Two RC pumps are the minimum required under the LWR document.

Given the following initial conditions:

- 3 RC pumps are running
- 1EMF-44 *(CONT VENT DRN TANK OUT)* correctly set for trip 1 and trip 2 activity limits
- MRIRR = 75 GPM based on boron concentration
- No other releases are in progress

If the release automatically terminates 40 seconds after initiation, which one of the following conditions could have terminated the release and what is the proper operator response?

A. 1WP-35 closing automatically if 1EMF-44 reached the trip 2 setpoint, the release may be restarted two additional times.

B. 1WM-46 closing automatically if 1EMF-44 reached the trip 2 setpoint, the release may be restarted two additional times.

C. 1WP-35 *(WMT & VUCDT TO RC CNTRL)* closing automatically if 1 RC pump tripped, and the release may not be restarted until Chemistry resamples the tank.

D. 1WM-46 *(LIQUID WASTE DISCH VALVE)* closing automatically if 1 RC pump tripped, and the release may not be restarted until Chemistry resamples the tank.

2.8 Concurrent Verification (continued)

(5) Concurrent verifier reviews the controlling document step to be performed.

(6) Concurrent verifier verifies performer is on the right component, using CCV techniques.

(7) Concurrent verifier verbalizes action to be taken by the performer.

(8) The performer and the concurrent verifier agree on the action to take, on which component, and the final condition of the component.

(9) If the step to be performed or component to be manipulated is **NOT** correct, then the concurrent verifier stops the process.

(10) The concurrent verifier observes the performer before and during execution, to confirm the performer takes the correct action on the correct component.

(11) Performer completes action.

(12) Both the performer and concurrent verifier check for expected results.

(13) Use Diverse Indications, when available, to verify condition or status during positioning and verification activities.

(14) If actual results do **NOT** agree with expected results, then stop and contact supervision.

(15) Both the performer and concurrent verifier shall initial for step performance.

2.9 Exceptions For IV and CV Requirements

1. IV or CV may be waived under any of the following situations, with appropriate supervisory approval and documentation:

   a. Result would be a significant personnel radiation exposure as follows:

      - Individual radiation exposure of greater than 10 mrem for a single verification

2.9 Exceptions For IV and CV Requirements (continued)

- Access to an area with a dose rate equal to or greater than 1 rem/hour
- If exposure from verification would exceed 100 mrem per week
    - ◊ Procedures containing several verification steps, each with high exposures but less than the previous two exposure limits, should be considered for being waived.

b. In situations that present a significant personnel safety risk

c. [CNS][MNS][ONS] Valves that receive automatic safety system actuation signals may be exempted from IV or CV except when the following conditions are met:

(1) Position/status checks are being performed for verification of return to service.

(2) The valves are removed from operability in a manner that would prevent automatic actuation.

d. General vent and drain valves which would not prevent a safety-related system from performing its safety function

e. Under emergency conditions

2.10 <u>Clear Communications and Phonetic Alphabet</u>

1. What Clear Communication and Phonetic Alphabet are:

a. Clear communication and the phonetic alphabet are used to minimize communication Errors such as misunderstanding an instruction that is stated aloud or alpha designators that sound similarly when spoken aloud.

b. Several letters in the English language sound alike and can be confused in stressful or noisy situations.

(1) The phonetic alphabet is a standard list of words used to identify letters in the English alphabet.

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EXAM BANK QUESTION: 6968 CNS

C

Given the following Unit 1 conditions:

- The NV system is being aligned for startup.
- The procedure in use requires independent verification of a single valve located in a room with a general dose rate of 130 mREM/hr.
- Estimated time to independently verify the valve's position is 10 minutes.
- There are no known hot spots in the area.
- There is no airborne activity in this room.
- The room has no surface contamination areas.

In accordance with NSD 700, (Verification Techniques), independent verification of the valve above ____(1)____ be waived because ____________(2)____________.

Which ONE of the following completes the statement above?

A. (1) may
(2) the general area dose rate is greater than 100 mREM/hr

B. (1) may NOT
(2) the general area dose rate is less than 1 REM/h

C. (1) may
(2) the radiation exposure for a single verification would exceed the allowable limit

D. (1) may NOT
(2) the radiation exposure for a single verification is within the allowable limit

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EXAM BANK QUESTION: 6968 CNS

C

General Discussion

Total dose for this IV would equal 21.7 mREM which exceeds the guideline of 10 mREM for a single verification.

Answer A Discussion

Plausible because IV may be waived if dose rates are greater than 1000 mR/hr.

Answer B Discussion

Plausible because the second part is true. However, the IV may be waived for a reason other than dose rate.

Answer C Discussion

Correct

Answer D Discussion

Plausible if the applicant miscalculates the potential exposure.

Basis for meeting the KA

The applicant is required to demonstrate knowledge of radiological safety principles related to the exception to independent verification requirements based on personnel exposure.

Basis for Hi Cog

The applicant is required to analyze information and perform a calculation in order to obtain the correct answer.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2014 NRC CNS NRC Examination

Development References
NSD-700 (Verification Techniques), Rev. 6, Section 700.8

Student References Provided

KA	KA_desc
GEN2.3 2.3.12	Radiation ControlKnowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 45.9 / 45.10)

A. **Purpose**

Identify the appropriate actions for the following events:

- Loss of operating ND pump
- ND System leak
- ND flow control valve failures.

B. Symptoms

- **ND pump tripped**
- **Known ND System leak**
- **"A (B) ND PUMP LO FLOW TO COLD LEGS" Alarm**
- **"A (B) ND PUMP DISCHARGE HI PRESS" Alarm**
- **ND pump low discharge pressure OAC alarm**
- **Core exit T/Cs high temperature OAC alarm**
- **"NC SYSTEM LO LEVEL" OAC alarm**
- **ND flow low OAC alarm**
- **Containment Sump level going up**
- **Refueling Cavity level going down**
- **ND pump flow going up or going down**
- **NC System level going down**
- **NC System pressure going down**
- **Oscillating ND pump motor amps.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

__ 1. **Check all NC pumps - OFF.**

__ **IF AT ANY TIME** number 1 seal delta P goes below 200 PSID **OR** number 1 seal leakoff flow goes below 0.2 GPM, **THEN** trip all NC pumps while maintaining seal injection flow.

CAUTION **Changes in NC pressure could result in inaccuracies in NC level indications.**

__ 2. **Check ND pumps - ANY RUNNING.**

Perform the following:

__ A. Have available operator perform Enclosure 26 (Containment Evacuation and Containment Closure).

__ B. **GO TO** Step 7.

3. **Check if ND pumps should remain running as follows:**

__ A. NC Level - GREATER THAN 4 INCHES.

A. Perform the following:

__ 1) Stop ND pumps.

2) CLOSE the following valves:

- __ CLOSE 2ND-30A (Train A ND To Hot Leg Isol).
- __ CLOSE 2ND-33 (A ND Hx Bypass).
- __ CLOSE 2ND-18 (B ND Hx Bypass).
- __ CLOSE 2ND-15B (Train B ND To Hot Leg Isol).

__ 3) **GO TO** Step 6.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. (Continued)	
__ B. Check NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	B. Perform the following: __ 1) Stop ND pumps. __ 2) Ensure all NC pumps off. 3) CLOSE the following valves: __ • CLOSE 2ND-30A (Train A ND To Hot Leg Isol). __ • CLOSE 2ND-33 (A ND Hx Bypass). __ • CLOSE 2ND-18 (B ND Hx Bypass). __ • CLOSE 2ND-15B (Train B ND To Hot Leg Isol). __ 4) **GO TO** Step 6.
C. Check the following valves - OPEN: __ • 2ND-1B (C NC Loop to ND Pumps) __ • 2ND-2AC (C NC Loop To ND Pumps).	C. Perform the following: __ 1) Stop ND pumps. __ 2) **GO TO** Step 6.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

3. (Continued)

D. **IF AT ANY TIME** NC level goes below 4 inches **OR** NC subcooling based on core exit T/Cs goes below 0°F, **THEN** perform the following:

__ 1) Stop ND pumps.

2) CLOSE the following valves:

- __ CLOSE 2ND-30A (Train A ND To Hot Leg Isol).
- __ CLOSE 2ND-33 (A ND Hx Bypass).
- __ CLOSE 2ND-18 (B ND Hx Bypass).
- __ CLOSE 2ND-15B (Train B ND To Hot Leg Isol).

__ 4. **IF AT ANY TIME NC level is less than 15 inches (top of Hot leg), THEN maintain ND flow less than 3000 GPM in subsequent steps.**

Q73 References

Duke Energy
McGuire Nuclear Station

Background Document
for

AP/1 & 2/A/5500/019 (Loss of ND or ND System Leakage)

S. Hackney / **7**/15/15
Prepared by Date

/
Reviewed by Date

/
Additional Review by Date

/
Additional Review by Date

/
Approved by Date

INTRODUCTION

AP/19 provides the actions necessary to maintain core cooling and to protect the core in the event of (1) a loss of ND pump flow or (2) a leak on the ND System or (3) failure of ND control valve.

Summary

This procedure provides guidance to the operator in responding to the above abnormal conditions. The actions do not defeat any safety functions or prevent the required operational features of any safety system from performing as required

If ND flow is rapidly restored, the operator can terminate this AP and return to the appropriate procedure for existing plant conditions. If ND flow cannot be rapidly restored, the operator starts trending core exit T/Cs and initiates contingency recovery actions while trying to return ND to service. The major action categories in this AP are:

1) Protect the ND pumps

2) Address containment related concerns

3) Check if adequate heat sink or quick restart of ND available

4) Establish alternate means of decay heat removal

5) Establish support conditions and restore ND.

ENTRY CONDITIONS

Entry to this procedure will occur if (1) there are symptoms of a leak on ND, or (2) the ND pumps have tripped, or (3) ND flow is going up or down in an uncontrolled manner, or (4) other symptoms requiring the tripping of the ND pumps.

APE025 AK1.01 - Loss of Residual Heat Removal System (RHRS)

Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System: (CFR 41.8 / 41.10 / 45.3)

Loss of RHRS during all modes of operation ....

Given the following on Unit 2:

- The unit is in MODE 5 and drained to Mid-loop
- ND Train 2A is in service
- ND system flow rate is 3300 GPM
- NC System level is (+)8 inches
- ND Low Discharge Pressure is in alarm on the OAC
- The crew has entered AP-19 (LOSS OF ND OR ND SYSTEM LEAKAGE)

In accordance with AP-19,

1) the crew will be required to _______ to mitigate this event.

2) the first MAJOR action category is to ________.

Which ONE (1) of the following completes the statements above?

A. 1. stop 2A ND pump
2. protect the ND pumps

B. 1. reduce ND flow to ≤ 3000 GPM
2. protect the ND pumps

C. 1. stop 2A ND pump
2. check if adequate heat sink is available

D. 1. reduce ND flow to ≤ 3000 GPM
2. check if adequate heat sink is available

General Discussion

AP-19 will direct the crew to maintain ND flow less than 3000 gpm any time NC level is less than 15 inches.
AP-19 will also direct the crew to secure ND pumps anytime NC level is less than or equal to 4 inches, NC subcooling is less than or equal to zero degrees or if ND-1 or ND-2 closes.

The Major Action Categories in AP-19 are:
1) Protect the ND pumps (Steps 1-4)
2) Address containment related concerns (Step 5)
3) Check if adequate heat sink or quick restart of ND available (Steps 6-14)
4) Establish alternate means of decay heat removal (Steps 15-20, 32)
5) Establish support conditions and restore ND. (Steps 21-46)

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because stopping the ND pumps would be required by AP-19 if NC level is less than or equal to 4 inches, NC subcooling is less than or equal to zero degrees or if ND-1 or ND-2 closes.

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because stopping the ND pumps would be required by AP-19 if NC level is less than or equal to 4 inches, NC subcooling is less than or equal to zero degrees or if ND-1 or ND-2 closes.

Part 2 is plausible because checking if adequate heat sink or quick restart of ND available is a major action category of AP-19 but not the first major action category.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because checking if adequate heat sink or quick restart of ND available is a major action category of AP-19 but not the first major action category.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate knowledge of the operational implications of pump runout conditions and the actions required to mitigate a loss of RHR while at mid-loop.

Basis for Hi Cog

This question is a hi cognitive question because more than one mental step is involved. First, the applicant is required to analyze the conditions given in the stem to determine the correct course of action to mitigate the event and then recall from memory the first major action category of AP-19.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
AP-19 (Loss of ND or ND System Leakage) Rev. 30
Lesson Plan OP-MC-AP-19 (LOSS OF ND OR ND SYSTEM LEAKAGE)

Student References Provided

A. Purpose

This procedure provides guidance to mitigate the effects of a fire that has the potential of causing loss of control of safeguards systems during MODEs 1-3.

B. **Symptoms**

- **Fire has caused, or has the potential of causing, loss of control of safeguards systems required to safely maintain the plant in MODEs 1-3.**
- **A Fire in one of the following areas while in MODEs 1-3:**
  - AB 695' Common Area
  - Unit 1 M/D CA Pump Room
  - Unit 2 M/D CA Pump Room
  - Unit 1 T/D CA Pump Room
  - Unit 2 T/D CA Pump Room
  - AB 716' Common Area
  - 1A D/G Room
  - 1B D/G Room
  - 2A D/G Room
  - 2B D/G Room
  - AB 733' 1ETB Room (includes 1ETB Swgr AHU Room)
  - AB 733' Unit 1 Electrical Pen Room
  - AB 733' 2ETB Room (includes 2ETB Swgr AHU Room)
  - AB 733' Unit 2 Electrical Pen Room
  - AB 733' Battery Room
  - AB 733' Common Area
  - AB 750' 1ETA Room (includes 1ETA Swgr AHU Room)
  - AB 750' Unit 1 Electrical Pen Room
  - AB 750' 2ETA Room (includes 2ETA Swgr AHU Room)
  - AB 750' Unit 2 Electrical Pen Room
  - AB 750' Unit 1 Cable Spreading Room
  - AB 750' Unit 2 Cable Spreading Room
  - AB 750' Common Area

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

. (Continued)

- AB 767' Unit 1 M/G Set Room
- AB 767' Unit 2 M/G Set Room
- Control Room
- AB 767' Common Area
- AB 778' Unit 1 Fuel Pool
- AB 778' Unit 2 Fuel Pool
- Unit 1 Interior Dog House
- Unit 2 Interior Dog House
- Unit 1 Exterior Dog House
- Unit 2 Exterior Dog House
- Unit 1 Containment
- Unit 2 Containment
- Service Bldg
- Unit 1 Turbine Bldg
- Unit 2 Turbine Bldg.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

NOTE
- An "ACTIVE" fire is one in which flames are present.
- If fire suppression has quickly reduced the fire to smoke or cables with glowing embers, then the fire is **NOT** active.
- Alternate indications of an active fire in containment are containment pressure and temperature going up.

__ 1. **Dispatch operator to determine if fire is "ACTIVE".**

__ 2. **Ensure Fire Brigade dispatched PER RP/0/A/5700/025 (Fire Brigade Response).**

__ 3. **Check either Unit - IN MODE 1, 2, OR 3.** — __ **GO TO Step 5.**

4. **Select fire area, and GO TO appropriate enclosure:**

Fire Area	Enclosure(s)	Assured Shutdown Train
AB 695' Common Area (EFA Zones 61, 62, 63, 64, 66, 67, 68, 69) Fire Area 1	Enclosure 1 (AB 695' Common Area Fire Unit 1 and 2 Actions)	SSS

__ CHART CONTINUES ON NEXT PAGE

Reference Use

MCGUIRE UNIT 0

TECHNICAL PROCEDURE (OPERATING)

SAFETY RELATED

RP/0/A/5700/025

FIRE BRIGADE RESPONSE

REVISION 022

<< Fire Brigade Response Quick List >>

NOTE

- This attachment is located in both units RO information book and may be used immediately to make notifications with place keeping to be performed later. .... ☐
- Step 2 - Step 13 may be performed concurrently and in any order .... ☐

1. **Turn** ON Outside PA Speakers .... ☐
2. **Announce** occurrence on PA: .... ☐

   There is a fire at ___"fire location"___ Fire Brigade Respond.
   All non-fire brigade personnel evacuate ___"fire location"___

3. **Announce** occurrence on OPS channel: .... ☐

   There is a fire at ___"fire location"___ Fire Brigade Respond.

4. **Activate** Fire Brigade Pagers .... ☐
   - **Access** 'Corporate Paging Application' via DAE .... ☐
   - **Enter** Pager # 777-5822 .... ☐
   - **Enter** Message: .... ☐

   There is a fire at ___"fire location"___ Fire Brigade Respond.

5. **Determine** Assembly Location .... ☐
6. **Announce** assembly point on PA .... ☐

   Fire Brigade assemble at __"assembly point"__ Fire Brigade Respond.
   All non-fire brigade personnel evacuate ________________

7. **Announce** assembly point on OPS channel: .... ☐

   Fire Brigade assemble at __"assembly point"__ Fire Brigade Respond.
   All non-fire brigade personnel evacuate ________________

<< Fire Brigade Response Quick List >>

8. **Activate** Fire Brigade Pagers ☐
   - ◊ **Access** 'Corporate Paging Application' via DAE ☐
   - ◊ **Enter** Pager # 777-5822 ☐
   - ◊ **Enter** Message: ☐

   Fire Brigade assemble at "assembly point"

9. **Announce** important information on PA as required ☐
10. **Activate** RP voice pagers ☐
    - **Dial** 75-911 ☐
    - At beep, **state** message. ☐

    Radiation Protection respond to: "assembly point"

11. **Notify** RP at 4282 ☐
12. **Notify** Security at 4900 **<u>OR</u>** Ringdown phone ☐
13. **<u>IF</u>** Offsite Fire Department assistance needed,
    <u>THEN</u> perform the following: ☐
    - **Dial** 9-911. ☐
    - **Request** Fire Department dispatch. ☐
    - **Request** 911 Dispatcher have Fire Department enter McGuire Nuclear Station Road at traffic light on Highway 73. ☐
    - **Call** Security (4900 **<u>OR</u>** Ringdown phone). ☐
    - **Request** a Security Officer to meet AND escort Fire Department to Checkpoint Charlie. ☐
14. **Turn** OFF Outside Speakers ☐

End of Attachment

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EXAM BANK QUESTION: 6672 CNS **C**

Given the following:

- A Fire alarm has actuated in the Unit 1 CA Pump Room
- An Operator dispatched to the area reports that there is smoke and some cables with glowing embers but, **NO** visible flames

In accordance with AP/1/A/5500/045 (Plant Fire), this _____(1)_____ classified as an ACTIVE fire.

In accordance with RP/0/B/5000/029 (Fire Brigade Response), in addition to making an announcement on the Fire Brigade Radio and activating the Fire Brigade Pagers, a Plant PA announcement _____(2)_____ required when dispatching the Fire Brigade.

A. 1. is
 2. is

B. 1. is
 2. is NOT

C. 1. is NOT
 2. is

D. 1. is NOT
 2. is NOT

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EXAM BANK QUESTION: 6672 CNS

C

General Discussion

In accordance with RP-29, the fire brigade is dispatched via a Plant PA announcement, activating the Fire Brigade pagers, and making an announcement on the Fire Brigade radio system.

In accordance with AP-45 (Plant Fire) visible flames are required to classify a fire as ACTIVE.

Answer A Discussion

Part 1 is plausible because the presence of smoke and glowing embers means that the fire may have been active at one time.

Part 2 is correct.

Answer B Discussion

Part 1 is plausible because the presence of smoke and glowing embers means that the fire may have been active at one time.

Part 2 is plausible because the announcement on the Fire Brigade Radio and activating the Fire Brigade Pagers is more than adequate to dispatch the Fire Brigade. Making an announcement on the PA does not necessarily provide any additional assurance that all Fire Brigade members will respond. However, it does ensure that personnel not on the Fire Brigade stay clear of the area and it is required by RP-29.

Answer C Discussion

CORRECT. See explanation above.

Answer D Discussion

Part 1 is correct.

Part 2 is plausible because the announcement on the Fire Brigade Radio and activating the Fire Brigade Pagers is more than adequate to dispatch the Fire Brigade. Making an announcement on the PA does not necessarily provide any additional assurance that all Fire Brigade members will respond. However, it does ensure that personnel not on the Fire Brigade stay clear of the area and it is required by RP-29.

Basis for meeting the KA

The applicant is required to demonstrate knowledge of the fire response emergency procedure and plant fire abnormal procedure.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	ILT15 CNS NRC Examination

Development References
RP/0/B/5000/029 (Fire Brigade Response), Rev. 031, Step 1.4 AP/0/A/5500/045 (Plant Fire), Rev. 009, Section B "Symptoms" NOTE

Student References Provided

KA	KA_desc
GEN2.4	Emergency Procedures / PlanKnowledge of fire protection procedures. (CFR: 41.10 / 43.5 / 45.13)
2.4.25	

Information Use

NUCLEAR OPERATING FLEET

ADMINISTRATIVE PROCEDURE

AD-OP-ALL-1001

CONDUCT OF ABNORMAL OPERATIONS

REVISION 2

Effective Dates:

07/26/2018	07/26/2018	07/26/2018	07/26/2018	07/26/2018
Brunswick	Catawba	Harris (HNP)	McGuire	Oconee
07/26/2018	07/26/2018			
Robinson	NGO			

5.1.2 Shift Technical Advisor (STA) (continued)

4. [CNS, HNP, MNS, RNP] The STA periodically monitors Critical Safety Function status.

    a. Periodically is defined as at least every 15 minutes unless the function is RED or ORANGE, then the monitoring is continuous.

    b. Status tree monitoring can be done automatically by computer. However, Operators should validate the computer generated status tree using control board indication prior to transitioning to the indicated functional restoration procedure.

5. The STA shall not operate controls or acknowledge alarms during abnormal or emergency conditions other than computer driven alarms that impact the ability of the STA to monitor Safety Parameter Display System (SPDS).

    a. [CNS] The STA may acknowledge/silence monitor light panel alarms.

    b. [ONS] The STA may change Inadequate Core Cooling Monitor (ICCM) displays to obtain information while performing the Core Thermal Hydraulic Assessment.

6. The STA ensures correct procedure transitions are made in Event Procedures.

5.1.3 Control Room Supervisor (CRS)

1. The CRS shall not operate controls or acknowledge alarms, unless directed by procedure, during abnormal or emergency conditions.

2. The CRS shall not provide control board Peer Checks during abnormal or emergency conditions.

5.1.4 Reactor Operator (RO)

1. Perform all Immediate Actions from memory.

2. Perform manipulations as necessary to carry out actions as directed by the CRS.

3. Perform Hard Card/Hard Rules, as applicable.

4. Dispatch Auxiliary Operators (AO).

    a. Use Attachment 2, Resource Management, or similar method, to track the availability of resources and task status.

5.1.5 Auxiliary Operator (AO)

1. Report to affected unit Control Room or [RNP] WCC for the following:

   a. Upon entry into specified APs

   b. Upon entry into the EPs

2. The AO shall pursue tasks to completion.

   a. If a task cannot be completed, then Control Room or WCC notification is required.

5.2 <u>Procedure Compliance Standards During Abnormal and Emergency Operations</u>

[7.3.4]

1. Placekeeping expectations:

   a. Use placekeeping for all Notes, Cautions, and Steps.

   b. While the manner of placekeeping is not specified, the manner must be clear to a reviewer that the step was reviewed by the Operator placekeeping the procedure.

2. Actions outside the Control Room:

   a. The requirement is for a copy of the governing procedure steps to be in hand wherever possible.

      (1) If doing so would unduly delay completion of the action, then the actions may be performed by verbal direction.

         (a) The person providing the direction must recognize the error potential and limit the number of steps directed to three or less, if possible.

      (2) Components may be manipulated without the controlling document in hand when the procedure step is read to the operator.

      (3) In these situations, active listening and 3-way communication are crucial to the successful completion of the task.

   b. If possible, then pre-stage procedure sections or Hard Cards/Hard Rules to support having a copy in hand.

   c. The person completing steps outside the Control Room shall report completion so placekeeping can be performed on the master copy in the Control Room.

5.2 Procedure Compliance Standards During Abnormal and Emergency Operations (continued)

3. Previously Completed Steps (e.g., Stop Reactor Coolant Pumps on loss of power):

   a. Previously completed steps may be dispositioned as complete without reading the entire step to the ROs, or re-performing the actions.

   b. The CRS, or person completing the procedure section, is responsible to ensure the intent of the step is completed.

   c. Example:

      (1) The high level step checks if it is necessary to secure Reactor Coolant Pumps. The sub-steps contain detailed parameter checks that support the decision.

      (2) If Reactor Coolant Pumps have already been secured by previous procedure steps or plant conditions such as loss of offsite power, then the CRS may disposition the step as complete.

4. [PWR] Event Procedure Transition Expectations:

   a. Obtain concurrence from a second SRO, if available, for Event Procedure transitions.

5. [PWR] Prudent Actions:

   a. Each site shall establish an approved list of Prudent Actions within a site specific procedure. Prudent Actions must be subject to a 10 CFR 50.59 review to ensure operator response is maintained within the assumptions of the licensing basis. Prudent Actions may be completed as soon as the condition is present.

   b. SRO concurrence is not required to take the steps.

   c. The Operator shall provide a Crew Update to announce the condition and the intended action. The Crew Update is only required for the initial performance of the Prudent Action.

      (1) The Crew Update may be performed prior to taking the action or after the action is taken per operator discretion.

5.7 Procedure Entry Conditions (continued)

b. If a crew member recognizes entry conditions or symptoms are present, then a crew update is the tool of choice to alert the CRS and the crew.

(1) The crew update is only necessary when the crew member makes the discovery and the crew is not aware.

2. The CRS shall enter at the beginning of the procedure unless another approved procedure specifically directs otherwise.

3. Perform Immediate Actions without direction upon entry into a procedure that contains Immediate Actions.

a. Do **<u>NOT</u>** delay Immediate Actions while waiting on formal entry into the Event Procedure.

b. Take actions when conditions warrant.

4. When conditions allow or when specified in the AP, then make a plant announcement to communicate AP entry.

5. Document entry into an AP or EP in the Unit Log as soon as conditions allow.

6. Document entry into an AP or EP in an NCR as soon as conditions allow.

5.8 <u>[PWR] Procedure Relationship</u>

[7.3.4]

1. Parallel use of APs:

a. The CRS will determine how many procedures can be implemented at a time and their priority based on manpower availability and the particular event in progress.

b. Do **<u>NOT</u>** run more than one EP concurrently unless directed by procedure.

c. Generally, the use of APs in conjunction with EPs should be avoided.

(1) EPs always have a higher priority than APs unless otherwise directed by procedure.

(2) In some instances, it would be proper to use an AP concurrently during a major accident which is being addressed by the EPs.

(3) An example of this is upon loss of all Nuclear Service Water in the middle of an accident, the Operators would need to utilize the AP for Nuclear Service Water also.

5.8 [PWR] Procedure Relationship (continued)

(4) If an AP is used during a safety injection event, then use caution.

(a) APs are generally written assuming a safety injection has not occurred.

(b) Evaluate any AP steps in post safety injection events to ensure the steps do not conflict with any EP in effect.

(5) When APs and EPs or multiple APs are in effect at the same time, then the CRS may delegate procedure performance to other licensed crew members.

2. Use of Enclosures or Attachments:

a. Enclosures or Attachments may be delegated to other crew members for performance.

(1) The crew member receiving the enclosure must continue to pursue the actions contained therein.

(2) If at any time the crew member determines the actions will not be completed or will be delayed, then notify the CRS.

b. The decision on whether to read or hand-off an enclosure will be based on CRS judgment depending on the event.

(1) The following are some general guidelines to help the CRS make this decision:

(a) If any of the following are met, then the preference is for the CRS to read the enclosure:

- The crew must wait for the enclosure to be completed in order to continue in the EP/AP.
- No more ROs are available to continue in the EP/AP, unless an RO can perform the enclosure concurrent with performing other steps.
- There are no more Time Critical Operator Actions to be performed.

5.8 [PWR] Procedure Relationship (continued)

(b) If any of the following are met, then the preference is usually for SRO to hand-off the enclosure:

- It is critical for the crew to continue in the body of the procedure in a timely manner.
- The enclosure is a valve checklist.
- Actions are outside the Control Room OATC Area or Surveillance Area.

(c) When specified by a procedure or when the enclosure is the Foldout Page, then hand-off an enclosure.

3. Step Sequencing:

a. If sequence of performance is important, then the subtasks are designated by letters or numbers.

(1) Perform lettered or numbered steps in order.

b. If sequence of performance is not important, the subtasks are designated by bullets (•).

(1) Bulleted steps may be performed in any order.

c. Do **NOT** perform early actions or early steps unless authorized via a Prudent Action, Deviation, or Variance.

d. Any exception shall be approved using the Deviation or Variance process.

4. Step in Progress:

a. Unless otherwise specified, a required task does not need be fully completed before proceeding to the next instruction.

(1) It is sufficient to begin a task and have assurance that it is progressing satisfactorily which ensures efficient implementation where steps are very time-consuming.

(2) When the present step has been initiated, the action is in progress, and the CRS judges there is no adverse consequence to proceeding forward, then the CRS may proceed to the next step in the procedure.

5.8 [PWR] Procedure Relationship (continued)

b. If a particular task must be complete prior to proceeding, then the step containing the task will explicitly state that requirement.

5. [CNS, HNP, MNS, RNP] Foldout Pages - [ONS] Carryover Steps:

a. Performance or review of Foldout Page actions/Carryover Steps shall not interfere with completion of Immediate Actions or Time Critical Operator Actions.

b. Carryover steps only apply to the AP/EP section in use.

(1) When transitioning to another section or procedure, then all carryover steps from the previous section are no longer applicable.

c. Foldout Page copies will be distributed to ROs.

d. Foldout Pages/Carryover Steps shall remain visible at all times during performance of the EP/AP.

e. CRS will review High Level steps for each item on the Foldout Page with ROs. Repeat backs are not required.

(1) Exceptions: Sites may establish exceptions to the CRS review of High Level steps requirement for specific events such as ATWS.

(a) Exceptions shall be documented and approved by the Operations Manager.

f. The CRS will review Carryover Steps for applicability.

g. When all applicable Foldout Page/Carryover Steps have been reviewed and crew members' questions resolved, then the CRS may continue in the procedure.

h. When any condition is met that requires performance of a Foldout Page/Carryover Step item, then immediately notify the CRS.

i. CRS shall verify that conditions are met before giving concurrence for the RO to perform any required actions.

j. If available, then the STA should provide independent backup that conditions are met and that correct actions are being taken.

A. Purpose

This procedure provides actions for a loss of secondary coolant which affects all S/Gs.

B. Symptoms or Entry Conditions

This procedure is entered from EP/1/A/5000/E-2 (Faulted Steam Generator Isolation) Step 4, when an uncontrolled depressurization of all S/Gs occurs.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
__ 1. **Monitor Foldout page.**	
2. **Check secondary pressure boundary:**	
a. For 1A S/G:	
__ 1) Check 1A S/G MSIV - CLOSED.	1) Perform the following: __ a) CLOSE valve. __ b) **IF** MSIV cannot be closed, **THEN** dispatch operator to CLOSE valve **PER** Enclosure 2 (Local Closure Of MSIVs).
__ 2) Check 1A S/G MSIV bypass valve - CLOSED.	2) Perform the following: __ a) CLOSE valve. __ b) **IF** MSIV bypass valve cannot be closed, **THEN** dispatch operator to fail air to valve.
__ 3) Check 1A S/G SM PORV - CLOSED.	3) Perform the following: __ a) CLOSE SM PORV. b) **IF** SM PORV cannot be closed, **THEN** perform the following: __ (1) CLOSE SM PORV isolation valve. __ (2) **IF** SM PORV isolation valve cannot be closed, **THEN** dispatch operator to CLOSE valve.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
__ 4) Check "S/G A FDW ISOLATED" status light (1SI-4) - LIT.	4) Perform the following: a) Ensure the following valve(s) - CLOSED: __ • CLOSE 1CF-35AB (1A S/G CF Cont Outside Isol). __ • CLOSE 1CF-32AB (1A S/G CF Control). __ • CLOSE 1CF-104AB (1A S/G CF Control Bypass). __ • CLOSE 1CF-126B (1A S/G CF To CA Nozzle Isol). __ b) **IF** more than one Feedwater Isolation valve above is open, **AND** CM is still aligned to feed faulted S/G, **THEN** evaluate alternate means to stop CM flow to faulted S/G.
5) Check the following BB valves - CLOSED: __ • 1BB-1B (1A S/G Blowdown Cont Outside Isol Control) __ • 1BB-5A (A S/G BB Cont Inside Isol).	5) Perform the following: __ a) CLOSE valve(s). __ b) CLOSE 1BB-123 (1A S/G Blowdown Throttle Control).
__ 6) CLOSE 1SM-83 (A SM Line Drain Isol).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
b. For 1B S/G:	
__ 1) Check 1B S/G MSIV - CLOSED.	1) Perform the following: __ a) CLOSE valve. __ b) **IF** MSIV cannot be closed, **THEN** dispatch operator to CLOSE valve **PER** Enclosure 2 (Local Closure Of MSIVs).
__ 2) Check 1B S/G MSIV bypass valve - CLOSED.	2) Perform the following: __ a) CLOSE valve. __ b) **IF** MSIV bypass valve cannot be closed, **THEN** dispatch operator to fail air to valve.
__ 3) Check 1B S/G SM PORV - CLOSED.	3) Perform the following: __ a) CLOSE SM PORV. b) **IF** SM PORV cannot be closed, **THEN** perform the following: __ (1) CLOSE SM PORV isolation valve. __ (2) **IF** SM PORV isolation valve cannot be closed, **THEN** dispatch operator to CLOSE valve.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
__ 4) Check "S/G B FDW ISOLATED" status light (1SI-4) - LIT.	4) Perform the following: a) Ensure the following valve(s) - CLOSED: __ • CLOSE 1CF-30AB (1B S/G CF Cont Outside Isol). __ • CLOSE 1CF-23AB (1B S/G CF Control). __ • CLOSE 1CF-105AB (1B S/G CF Control Bypass). __ • CLOSE 1CF-127B (1B S/G CF To CA Nozzle Isol). __ b) **IF** more than one Feedwater Isolation valve above is open, **AND** CM is still aligned to feed faulted S/G, **THEN** evaluate alternate means to stop CM flow to faulted S/G.
5) Check the following BB valves - CLOSED: __ • 1BB-2B (1B S/G Blowdown Cont Outside Isol Control) __ • 1BB-6A (B S/G BB Cont Inside Isol).	5) Perform the following: __ a) CLOSE valve(s). __ b) CLOSE 1BB-124 (1B S/G Blowdown Throttle Control).
__ 6) CLOSE 1SM-89 (B SM Line Drain Isol).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2. (Continued)

__ 7) Check 1A or 1B CA pump - AVAILABLE.

7) **IF** TD CA pump is the only source of feedwater, **THEN** perform the following:

__ a) Maintain steam flow to TD CA pump from at least one S/G.

b) **IF** desired to isolate steam supply to TD CA pump from 1B S/G, **THEN** dispatch operator to unlock and CLOSE the following valves:

- __ 1SA-2 (1B S/G SM Supply to Unit 1 TD CA Pump Turb Maint Isol) (Unit 1 interior doghouse, 767+12, FF-53)
- __ 1SA-78 (1B S/G SM Supply to Unit 1 TD CA Pump Turb Loop Seal Isol) (Unit 1 interior doghouse, 767+10, FF-53).

__ c) **GO TO** Step 2.c.

__ 8) Dispatch operator to trip Unit 1 TD CA pump stop valve.

9) Dispatch operator to unlock and CLOSE the following valves:

- __ 1SA-2 (1B S/G SM Supply to Unit 1 TD CA Pump Turb Maint Isol) (Unit 1 interior doghouse, 767+12, FF-53)
- __ 1SA-78 (1B S/G SM Supply to Unit 1 TD CA Pump Turb Loop Seal Isol) (Unit 1 interior doghouse, 767+10, FF-53).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
c. For 1C S/G:	
__ 1) Check 1C S/G MSIV - CLOSED.	1) Perform the following: __ a) CLOSE valve. __ b) **IF** MSIV cannot be closed, **THEN** dispatch operator to CLOSE valve **PER** Enclosure 2 (Local Closure Of MSIVs).
__ 2) Check 1C S/G MSIV bypass valve - CLOSED.	2) Perform the following: __ a) CLOSE valve. __ b) **IF** MSIV bypass valve cannot be closed, **THEN** dispatch operator to fail air to valve.
__ 3) Check 1C S/G SM PORV - CLOSED.	3) Perform the following: __ a) CLOSE SM PORV. b) **IF** SM PORV cannot be closed, **THEN** perform the following: __ (1) CLOSE SM PORV isolation valve. __ (2) **IF** SM PORV isolation valve cannot be closed, **THEN** dispatch operator to CLOSE valve.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
__ 4) Check "S/G C FDW ISOLATED" status light (1SI-4) - LIT.	4) Perform the following: a) Ensure the following valve(s) - CLOSED: __ • CLOSE 1CF-28AB (1C S/G CF Cont Outside Isol). __ • CLOSE 1CF-20AB (1C S/G CF Control). __ • CLOSE 1CF-106AB (1C S/G CF Control Bypass). __ • CLOSE 1CF-128B (1C S/G CF To CA Nozzle Isol). __ b) **IF** more than one Feedwater Isolation valve above is open, **AND** CM is still aligned to feed faulted S/G, **THEN** evaluate alternate means to stop CM flow to faulted S/G.
5) Check the following BB valves - CLOSED: __ • 1BB-3B (1C S/G Blowdown Cont Outside Isol Control) __ • 1BB-7A (C S/G BB Cont Inside Isol).	5) Perform the following: __ a) CLOSE valve(s). __ b) CLOSE 1BB-125 (1C S/G Blowdown Throttle Control).
__ 6) CLOSE 1SM-95 (C SM Line Drain Isol).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2. (Continued)

__ 7) Check 1A or 1B CA pump - AVAILABLE.

7) **IF** TD CA pump is the only source of feedwater, **THEN** perform the following:

__ a) Maintain steam flow to TD CA pump from at least one S/G.

b) **IF** desired to isolate steam supply to TD CA pump from 1C S/G, **THEN** dispatch operator to unlock and CLOSE the following valves:

- __ 1SA-1 (1C S/G SM Supply to Unit 1 TD CA Pump Turb Maint Isol) (Unit 1 interior doghouse, 767+10, FF-53, above ladder)
- __ 1SA-77 (1C S/G SM Supply to Unit 1 TD CA Pump Turb Loop Seal Isol) (Unit 1 interior doghouse, 767+10, FF-53).

__ c) **GO TO** step 2.d.

__ 8) Dispatch operator to trip Unit 1 TD CA pump stop valve.

9) Dispatch operator to unlock and CLOSE the following valves:

- __ 1SA-1 (1C S/G SM Supply to Unit 1 TD CA Pump Turb Maint Isol) (Unit 1 interior doghouse, 767+10, FF-53, above ladder)
- __ 1SA-77 (1C S/G SM Supply to Unit 1 TD CA Pump Turb Loop Seal Isol) (Unit 1 interior doghouse, 767+10, FF-53).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
d. For 1D S/G:	
__ 1) Check 1D S/G MSIV - CLOSED.	1) Perform the following: __ a) CLOSE valve. __ b) **IF** MSIV cannot be closed, **THEN** dispatch operator to CLOSE valve **PER** Enclosure 2 (Local Closure Of MSIVs).
__ 2) Check 1D S/G MSIV bypass valve - CLOSED.	2) Perform the following: __ a) CLOSE valve. __ b) **IF** MSIV bypass valve cannot be closed, **THEN** dispatch operator to fail air to valve.
__ 3) Check 1D S/G SM PORV - CLOSED.	3) Perform the following: __ a) CLOSE SM PORV. b) **IF** SM PORV cannot be closed, **THEN** perform the following: __ (1) CLOSE SM PORV isolation valve. __ (2) **IF** SM PORV isolation valve cannot be closed, **THEN** dispatch operator to CLOSE valve.

Q76 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2. (Continued)	
__ 4) Check "S/G D FDW ISOLATED" status light (1SI-4) - LIT.	4) Perform the following: a) Ensure the following valve(s) - CLOSED: __ • CLOSE 1CF-26AB (1D S/G CF Cont Outside Isol). __ • CLOSE 1CF-17AB (1D S/G CF Control). __ • CLOSE 1CF-107AB (1D S/G CF Control Bypass). __ • CLOSE 1CF-129B (1D S/G CF To CA Nozzle Isol). __ b) **IF** more than one Feedwater Isolation valve above is open, **AND** CM is still aligned to feed faulted S/G, **THEN** evaluate alternate means to stop CM flow to faulted S/G.
5) Check the following BB valves - CLOSED: __ • 1BB-4B (1D S/G Blowdown Cont Outside Isol Control) __ • 1BB-8A (D S/G BB Cont Inside Isol).	5) Perform the following: __ a) CLOSE valve(s). __ b) CLOSE 1BB-126 (1D S/G Blowdown Throttle Control).
__ 6) CLOSE 1SM-101 (D SM Line Drain Isol).	
__ e. **WHEN** any S/G pressure boundary restored, **THEN** ensure "E-2 Transition Criteria" on foldout page is evaluated.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. **Reset the following:**	
__ a. S/I.	__ a. Reset S/I **PER** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 23 (Local Reset of S/I Signal).
__ b. Sequencers.	b. Dispatch operator to OPEN affected sequencer control power breaker: __ • A Train - 1EVDA Breaker 6 __ • B Train - 1EVDD Breaker 8.
__ c. Phase A Isolation.	
__ d. Phase B Isolation.	
__ e. **IF AT ANY TIME** a B/O signal occurs, **THEN** restart S/I equipment previously on.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. **Establish VI to containment as follows:**	
a. OPEN the following valves:	
__ 1) 1VI-129B (VI Supply to A Cont Ess VI Hdr Outside Isol).	__ 1) OPEN 1NI-430A (Emerg N2 From CLA To 1NC-34A).
__ 2) 1VI-160B (VI Supply to B Cont Ess VI Hdr Outside Isol).	__ 2) OPEN 1NI-431B (Emerg N2 From CLA To 1NC-32B & 36B).
__ 3) 1VI-150B (Lwr Cont Non-Ess Cont Outside Isol).	
__ b. Check VI header pressure - GREATER THAN 85 PSIG.	b. Perform the following: 1) Align N_2 to all Pzr PORVs as follows: __ • OPEN 1NI-430A (Emerg N2 From CLA To 1NC-34A). __ • OPEN 1NI-431B (Emerg N2 From CLA To 1NC-32B & 36B). __ 2) **IF** CA control valves cannot be throttled in subsequent steps, **THEN** control flow **PER** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 16 (CA Flow Control With Loss Of VI). __ 3) Restore VI **PER** AP/1/A/5500/22 (Loss Of VI).

Q76 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. **WHEN TSC is staffed, THEN request TSC to evaluate obtaining samples and monitor shutdown margin during cooldown as follows:**	
a. Evaluate obtaining samples as follows:	
1) Consider available cooling of sample Hxs as follows:	
__ • KC will remain isolated to normal sample Hxs for 10 hours, until KC is realigned to normal sample Hx's and KF per AP/1/A/5500/41 (Loss Of Spent Fuel Cooling or Level).	
__ • **IF** sample is desired prior to aligning KC to KC aux bldg non-essential header, **AND** fuel damage is not expected, **THEN** evaluate obtaining sample **PER** OP/1/A/6200/128 (Unit 1 Primary Systems Emergency Response Sampling), Enclosure 4.4 (1NC Hot Leg with KC Non-Essential Header Isolated).	
__ 2) Evaluate obtaining periodic NC System boron sample to check shutdown margin during cooldown.	
b. **WHEN** each NC boron sample obtained, **THEN** perform the following:	
__ 1) Perform shutdown margin calculation for Cold Shutdown **PER** OP/0/A/6100/006 (Reactivity Balance Calculation).	
__ 2) Check shutdown margin - ADEQUATE.	__ 2) Notify station management.

Q76 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. Control feed flow to minimize NC System cooldown as follows:	
__ a. Check all S/G N/R levels - GREATER THAN 11% (32% ACC).	__ a. Maintain at least 25 GPM feed flow to any S/G with a N/R level less than 11% (32% ACC).
__ b. Check cooldown rate in NC T-Colds - LESS THAN 100°F IN AN HOUR.	b. Perform the following: __ 1) Reduce feed flow to 25 GPM to each S/G. __ 2) <u>**GO TO**</u> Step 6.d.
__ c. Check N/R level in all S/Gs - LESS THAN 50%.	__ c. THROTTLE feed flow to maintain N/R level less than 50% in all S/Gs.
__ d. Check NC T-Hots - STABLE OR GOING DOWN.	__ d. THROTTLE feed flow or dump steam to stabilize NC T-Hots.
__ **7. Check NC subcooling based on core exit T/Cs - GREATER THAN 0°F.**	**<u>IF</u> at least one NV <u>OR</u> NI pump on, <u>THEN</u> perform the following:** __ a. Ensure all NC pumps - OFF. __ b. Maintain seal injection flow.

Q76 References

Title:	E-2, FAULTED STEAM GENERATOR ISOLATION						
Number: OP-MC-EP-E2			Revision: 13				Program: RO/SRO/LOCT
Time Required:	AO	AOCT	RO	SRO	LOCT		Prerequisites: None
	N/A	N/A	0.75	0.75	0.75	Hrs.	

Overview: This lesson will discuss the Emergency Procedures in the E-2 series including:

- E-2 Faulted Steam Generator Isolation.
- ECA-2.1 Uncontrolled Depressurization of All Steam Generators.

References:

1. Background Information for Westinghouse Owners Group Emergency Response Guideline, HP Rev. 1C
2. McGuire Deviation Document
3. MNS Operating Procedures

- EP/1/A/5000/E-2, Faulted Steam Generator Isolation, Rev. 10
- EP/1A/5000/ECA-2.1, Uncontrolled Depressurization of All Steam Generators, Rev. 22

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Operating Experience:
OEDB #426525, Harris MSR Relief Valve Failure

Recommended Evaluation Method:
Written Exam

Commitments Tracking:
None

Training Aids:

Listing of classroom audio-visual resources needed to stage and conduct the training

- Classroom projector
- Smartboards (optional)

3.7 E-2 Summary/Review

3.7.1 The objective of the recovery/restoration technique incorporated into procedure E-2 is to first check for main steamline isolation and then identify and isolate any faulted S/Gs. A check for SGTR is also performed.

3.7.2 E-2 includes the following four major action categories.

- Check main steamline isolation.
- Check for at least one non-faulted S/G.
- Identify and isolate faulted S/G(s).
- Check for S/G tube rupture.

INSTRUCTOR NOTE

Using current copy of ECA-2.1, Uncontrolled Depressurization of All Steam Generators, Instructor will discuss the following :

- Procedure entry/exit point
- Foldout Page Actions
- Bases for any caution, note or step
- Continuous action steps
- Required operator actions
- Procedure transition points
- Major Actions

4.0 <u>ECA-2.1, UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS</u>

4.1 Purpose

4.1.1 This procedure provides actions for a loss of secondary coolant that affects all S/Gs.

4.2 Symptoms/Conditions

4.2.1 ECA-2.1 is entered from E-2 (Faulted Steam Generator Isolation), Step 4, when an uncontrolled depressurization of all S/Gs occurs.

4.3 Major Actions

The recovery/restoration technique of ECA-2.1 includes the following five major action categories.

- Reestablish any secondary pressure boundary
- Control feed flow
- Terminate S/I flow
- Cool down and place ND system in operation
- Cool down to cold shutdown conditions

The following subsections provide a more detailed discussion of each major action category.

4.3.1 Reestablish Any Secondary Pressure Boundary

An attempt is made to restore a secondary pressure boundary to the S/Gs. If this attempt fails, an operator is dispatched to close valves, one loop at a time, while the procedure is continued.

4.3.2 Control Feed Flow

Feed flow (main feedwater or auxiliary feedwater) is controlled, as appropriate, to provide the following four effects:

- To minimize the NC cooldown rate (if necessary)
- To prevent overfilling the S/Gs
- To control NC temperatures when the NC cooldown stops
- To prevent S/G tube dryout

4.3.3 Terminate S/I Flow

For cases where a significant cooldown initially occurs, this prevents repressurization of the NC.

4.3.4 Cool Down And Place ND System In Operation

This establishes an alternate heat sink to the faulted S/Gs and provides an adequate heat sink for the next action.

4.3.5 Cool Down To Cold Shutdown Conditions

This brings NC and secondary temperatures to the point where steam generation in the S/Gs stops, discontinuing the steam releases to the containment or the environment.

4.4 Detailed Description of Procedural Steps

STEP 1 Monitor foldout page.

PURPOSE: *To remind the operator that the ECA-2.1 Foldout page should be open.*

BASIS: **The Foldout page, included as Enclosure 1, provides a list of important items that should be continuously monitored. If any of the parameters exceed their limits, the appropriate operations should be initiated.**

NOTE, S/Gs may be done in any order in next step. If local actions are required, it is preferable to concentrate on one S/G at a time, to quickly restore integrity to at least one S/G.

STEP 2 Check secondary pressure boundary:

PURPOSE: *To warn the operator that the steamline to the TD CA pump must not be isolated if it is the only source of feed flow to the S/Gs.*

To reestablish a secondary pressure boundary in any S/G to allow controlled use of a S/G.

BASIS: **Feedwater isolation status lights for each S/G receive inputs from all the valves that close on a feedwater isolation. By checking the status lights lit, then all feedwater isolation valves can be assured closed for a S/G as required. If proper status light indication is not confirmed, then valves are individually closed in RNO.**

The valves that close on a feedwater isolation provide double isolation verifiable from the control room. The RNO will provide control room and, if necessary, local actions if isolation can not be checked from the control room. Other lines that are automatically isolated will not have local actions (some can not be locally isolated, i.e., CF Containment Isolation hydraulic valves).

The steamline drain upstream of the MSIVs is isolated as additional secondary piping that could cause S/G depressurization.

The operator should check that all valves providing isolation to other systems (such as feedwater and S/G blowdown systems) are closed and not responsible for the uncontrolled depressurization of all S/Gs. If the valves cannot be closed manually, then an operator is dispatched to locally close the valves in one loop, before continuing to the next loop. Valves are closed one loop at a time in order to ensure a complete, local check of the valves for each S/G to restore integrity to at least one S/G as early as possible. Even if integrity cannot be restored, the isolation process minimizes the cooldown of the NC and the mass and energy release from the S/Gs.

If the TD CA pump is the only operable source of feed flow to the S/Gs (i.e., <u>no other MD CA pumps or other operable pumps</u> are capable of providing feed flow to the S/Gs), then isolation of its steam supply line in Step 2 may degrade system conditions and result in a transition to FR-H.1. Therefore, this isolation must not be performed.

STEP 3 Reset S/I, Sequencers, Phase A and B (CONTINUOUS ACTION)

PURPOSE:

To alert the operator of a possible configuration which would not provide automatic start of safeguards equipment.

To utilize the reset function which is part of the safeguards actuation logic such that equipment can be realigned or stopped.

To remove the "locked-in" Containment Isolation Phase A and Phase B signals such that equipment can be realigned.

BASIS:

With the S/I signal reset, no further automatic signal will be generated to restart safeguards equipment. Normal sequencing of safeguards loads onto the emergency bus after diesel-generator startup will not occur. However, a "blackout" sequencer actuation is possible.

In order to realign safeguards equipment, a deliberate action must be taken to reset the S/I signal.

The load sequencer must be reset to allow the operator control over various plant equipment. If the sequencer reset fails, then control power is removed from the sequencer to allow operator control of various pumps needed for future recovery actions.

Containment Isolation Phase A and Phase B logic requires a deliberate operator action to remove the "close" signal. No valve will reposition upon actuation of the resets, but separate control actions will subsequently open the valves.

STEP 4 **Establish VI to containment:**

PURPOSE: *To restore a sustained, compressed air supply to allow control of air-operated equipment inside containment (e.g., charging and letdown valves, Pzr PORVs, etc).*

BASIS: **Opening the VI system containment isolation valves provides a flow path. If VI header rises is less than 85 PSIG, however, the operator is directed to restore VI per procedure AP/1/A/5500/22, Loss of VI.**

Aligning backup N_2 to the Pzr PORVs will ensure they are available to limit potential NC pressure increases and to ensure they are available to depressurize the NC system if required.

STEP 5 **Monitor shutdown margin during cooldown as follows:**

PURPOSE: *To determine if shutdown margin is adequate for NC cooldown*

BASIS: **Chemistry is notified to monitor shutdown margin during the cooldown to verify adequate NC boron concentration. Note that since S/I is in service, boron concentration is expected to be sufficient.**

STEP 6 **Control feed flow to minimize cooldown as follows:**

PURPOSE: *To alert the operator to maintain a minimum feed flow to minimize any subsequent thermal shock to S/G components.*

To control feed flow to minimize the effects of the cooldown due to the secondary depressurization and to subsequently control the transient.

BASIS: **Depending upon the size of the effective break areas for the S/Gs, the cooldown rate experienced after a reactor trip could exceed 100°F/hr. A reduction of feed flow to the S/Gs has three primary effects:**

- **To minimize any additional cooldown resulting from the addition of feedwater,**
- **To prevent S/G tube dryout by maintaining a minimum feed flow of 25 GPM to the S/Gs, and**
- **To minimize the water inventory in the S/Gs that eventually is the source of additional steam flow to containment or the environment.**

The 25 GPM value is the minimum measurable feed flow to a S/G.

As steam flow rate drops, the feed flow will eventually raise the S/G inventory. Feed flow is controlled to maintain S/G N/R level less than 50% to prevent overfeeding the S/Gs.

In addition, as S/G pressure and steam flow rate drop, NC hot leg temperatures will stabilize and start to go up. The operator controls feed flow or dumps steam to stabilize the NC hot leg temperatures. This allows the S/I flow to establish conditions for S/I termination and minimizes thermal stresses that may be generated.

If feed flow to a S/G is isolated and the S/G is allowed to dry out, subsequent reinitiation of feed flow to the S/G could create significant thermal stress conditions on S/G components. Maintaining a minimum verifiable feed flow to the S/G allows the components to remain in a "wet" condition, thereby minimizing any thermal shock effects if feed flow is raised.

Operator Fundamental Focus; Monitoring and Control

***Reinforce** the importance of monitoring SG level. Minimum feed flow should be maintained until NC is cooled to less than 200°F. Attempts should be made to maintain level 11% (32% ACC) - 50% until S/Gs are no longer steaming. **Emphasize** the attribute for the CRS in fundamental of **Control**, "The CRS has responsibility to "Establish limits for systems and parameters to ensure that systems are **NOT** operated outside of the intended design and that operating margins are **NOT** eroded".*

STEP 7 **Check NC subcooling based on core exit T/Cs - GREATER THAN 0°F.**

PURPOSE: *To trip NC pumps if required conditions are satisfied and to ensure seal cooling flow is continued even if NC pumps are stopped.*

BASIS: **This step is a redundant check of the NC pump trip criteria found on the Foldout page.**

The effectiveness of the NC pump Number 1 seal is not affected by pump rotation. To ensure continued performance of the seal, cool filtered water should be continuously supplied. The operator should not isolate the seal injection lines unless directed to per procedure.

STEP 8 **Check Pzr PORVs and Isolation valves (CONTINUOUS ACTION)**

PURPOSE: *To alert the operator of the potential for a PORV sticking open after a pressure transient.*

To specifically note the status of PORVs and block valves.

BASIS: **To ensure operability of the block valves, their power supplies are checked to be available. Pzr PORVs are closed to preclude the possibility of an undetected stuck open valve. At least one block valve is left open to ensure availability of at least one PORV for pressure excursions in the NC (due to degraded situations such as inadequate core cooling, an event misdiagnosed, or a SGTR). Also, it is desirable to have at least one PORV available to preclude the use of Pzr safety valves.**

Aligning N_2 to the Pzr PORVs will provide a backup closure means, if required.

SYS059 A2.04 - Main Feedwater (MFW) System

Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Feeding a dry S/G ....

Given the following sequence of events:

1400 - Crew implements E-0 (REACTOR TRIP OR SAFETY INJECTION) due to a main steam line break

1405 - The following indications are observed:

- Feed flow to each S/G = 125 GPM
- All S/G NR Levels = 0%
- NC T-Colds = 535°F and lowering

1430 - Crew transitions to E-2 (FAULTED S/G ISOLATION)

1435 - Crew transitions to ECA-2.1 (UNCONTROLLED DEPRESSURIZATION OF ALL S/Gs) because all MSIVs are failed OPEN

1505 - The following indications are observed:

- Feed flow to each S/G = 125 GPM
- All S/G NR Levels = 0%
- All S/G WR Levels = 20%
- NC T-Colds = 410°F and lowering

Based on the conditions above, and in accordance with ECA-2.1, the crew will throttle feed flow to a MAXIMUM flowrate of ___(1)___ GPM to each S/G.

A thermal shock concern due to restoring feed flow to the S/Gs following dry out ___(2)___ a reason for the action taken by the crew.

Which ONE (1) of the following completes the statements above?

A. 1. 25
   2. is

B. 1. 25
   2. is NOT

C. 1. 100
   2. is

D. 1. 100
   2. is NOT

General Discussion

When the step in ECA-2.1 is reached that determines if S/G feed flow should be reduced, several parameters are checked. First, all NR S/G levels are checked greater than 11%. If not, the operator is sent to the RNO where they are directed to maintain at least 25 GPM flow to the S/G until level is greater than 11%.

Next, the operator checks cooldown rate less than 100°F in one hour. If the cooldown rate is excessive, the operator is directed to the RNO where they will reduce feed flow to 25 GPM. If cooldown is not excessive, they will maintain the current feed flow until NR S/G levels approach 50%. They will then throttle flow to maintain NR S/G levels less than 50%.

A reduction of feed flow to the S/Gs has three primary effects:

1.To minimize any additional cooldown resulting from the addition of feedwater,
2.To prevent S/G tube dryout by maintaining a minimum feed flow of 25 GPM to the S/Gs, (and prevent thermal shock in a dry S/G if feed flow is subsequently raised)
AND
3.To minimize the water inventory in the S/Gs that eventually is the source of additional steam flow to containment or the environment.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the primary reason for feed flow reduction and overall mitigation strategy of ECA-2.1 is to address the extensive cooldown caused by this event.

Answer C Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is plausible because FR-H.1 will direct this flowrate if S/G level is less than 12%.

Part 2 is correct.

Answer D Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:

Part 1 is plausible because FR-H.1 will direct this flowrate if S/G level is less than 12%

Part 2 is plausible because the primary reason for feed flow reduction and overall mitigation strategy of ECA-2.1 is to address the extensive cooldown caused by this event.

Basis for meeting the KA

The K/A is matched because the applicant is presented with a set of conditions where feed flow to all S/Gs could potentially be isolated (i.e. All S/Gs are faulted and the applicant therefore concludes that all feedflow to the S/Gs should be isolated). The applicant is then asked to predict the impact and use procedures (ECA-2.1) to correct, control, or mitigate the consequences of the event.

NOTE: As written, the K/A seems to be asking the impact of feeding a dry S/G and using procedures to control feeding a dry S/G. However, Westinghouse procedures do not address feeding a dry S/G. Westinghouse procedures are written to take actions to prevent S/G dryout. If S/G dryout does occur (i.e. minimum flow cannot be established to prevent dryout), AFW flow is NOT re-established after dryout until plant engineering performs an evaluation as part of the long-term plant recovery operation.

Basis for Hi Cog

This is a higher cognitive level question because it requires multiple mental steps. First, the applicant must recall from memory the requirements of ECA-2.1 for reducing S/G feed flow. Next, the applicant must evaluate the information provided to determine current conditions and the cooldown rate since the event started. Finally, the applicant must associate the recalled information to the evaluated information to determine the correct response.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification

Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):
1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)? NO. No part of this question is associated with systems level knowledge.

2) Can the question be answered solely by knowing immediate operator actions? NO. There are no immediate actions associated with ECA-2.1.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs? NO. The question has nothing to do with procedure entry conditions.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure? NO. Part of the mitigation strategy of ECA-2.1 is to control feed flow. However, this doesn't not tell the operator the specific requirement for controlling feed flow.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
YES. The applicant must evaluate the conditions given and based on that evaluation determine which section of the procedure should be performed (i.e. reduce feed flow or maintain current feed flow until S/Gs are at least greater than 11%)

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
NO.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References

REFERENCES:
ECA-2.1 (Uncontrolled Depressurization of All S/Gs) Rev. 21
ECA-2.1 Background Document Rev. 12B

LEARNING OBJECTIVES:
OP-MC-EP-E2 Objective 4

Student References Provided

SYS059 A2.04 - Main Feedwater (MFW) System
Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)
Feeding a dry S/G ....

Remarks/Status

401-9 Review Comments: UNSAT
SYS059 A2.04
C seems non plausible, it seems to be a correct choice

suggest
1) Based on the conditions above and in accordance with ECA-2.1,
the crew will throttle feed flow to 100/25 GPM to each S/G
2) The basis for the action taken by the crew was/was not done because a thermal shock concern would exist if the SG's were allowed to dry out.

Facility Response:
Revised as suggested with following exceptions:
Changed The basis to a reason to ensure that the question cannot be argued as all-encompassing since this is testing only one of the three reasons

listed for this action.
Also modified question 2 wording for clarification since the act of drying out (only) does not present a thermal shock concern. Rearranged Q2 for correct grammar. Suggestion by CE is improper grammar and difficult to read. SLM 02/27/18

Response 1:
Incorporated
Q now SAT

Title:	REACTOR PROTECTION SYSTEM (IPE)						
Number: OP-MC-IC-IPE		Revision: 35			Program: AO/AOCT/RO/SRO/LOCT		
Time Required:	AO	AOCT	RO	SRO	LOCT		Prerequisites: None
	N/A	N/A	3.0	3.0	3.0	Hrs.	

Overview:

This lesson will describe the purpose, operation and a general description of the Reactor Protection System.

References:

1. Westinghouse Solid State Protection System Technical Manual, MCM-1399.08-0090-001.
2. Westinghouse DS-416 Trip Breaker Technical Manual, MCM-1399.40-0024 001.
3. Westinghouse Nuclear Instrumentation System Technical Manual, MCM-1399.04-92.
4. Westinghouse Process Instrumentation and Control System Technical Manual, MCM-1399.03-0284.001.
5. MNS FSAR, Section 7.2, Reactor Protection System.
6. MNS Technical Specifications.
7. MNS MCM-1399.40-0005, Reactor Trip Switchgear.
8. MNS MCM-1399.40-0006, Reactor Trip Switchgear.
9. MNS MCM-1399.40-0009, Reactor Trip Switchgear Elementary.
10. MNS Operating Procedures OP/1/A/6150/008, Rod Control.
11. MNS Performance Test Procedure PT/1/A/4600/080, Reactor Trip Bypass Breakers Shunt Trip Verification.
12. Engineering Support Program - Reactor Trip Breaker System (IRE).
13. Engineering Support Program - Rod Control System (IRE).
14. Engineering Support Program - Solid State Protection System (IPE).
15. Design Basis Document MCS-1399.03-RPS-0001, Reactor Protection System.
16. EC 105124 Unit 2 HP Turbine Replacement - Instrumentation and Controls

Operating Experience:

- SOER 83-8, Reactor Trip Breaker Failures.
- McGuire Unit 2 Post-Trip Review (7/19/84)
- NCR 1712122, Reactor Trip Breaker Charging Motor Running Continuously During Testing
- NCR 1699340, Reactor Trip Bypass Breaker 2A Does Not Open Electrically (Chipped/Damaged Secondary Contact Block).
- NCR 1586295, Assessment of Reactor Trip Breaker Testing
- NCR 1594916, Reactor Trip Closed Lamp Burned Out
- NCR 1581661, Reactor Trip on McGuire Unit 2
- NCR 1567946, Multiple annunciators and status lights illuminated with no apparent cause.

Objective # 10

NC Pump Bus Under Frequency (2/4 busses = 56 Hz) - this anticipatory loss of coolant flow trip protects against DNB. The trip also trips open all four NC pump breakers to prevent electrical braking of the pump motors during frequency decay. A reduction in pump speed would reduce fly wheel inertia and pump coast down flow capability. This "at-power" trip protection is auto-blocked < 10% power (P-7) and is automatically reinstated > P-7.

SG Lo-Lo Level (2/4 channels on 1/4 SGs = 17%) - protects against a loss of heat sink. This protection also causes an auto-start of the CA motor driven pumps (2/4 channels on 1/4 SGs) and the CA turbine driven Pump (2/4 channels on 2/4 SGs).

Single Loop Loss of Flow (2/3 channels in 1/4 loops = 88%) - protects against DNB. This protection is auto-blocked < 48% (P-8) and automatically reinstated > P-8.

Two Loop Loss of Flow (2/3 channels in 2/4 loops = 88%) - protects against DNB. This protection is auto-blocked < 10% (P-7) and automatically reinstated > P-7.

Safety Injection (any SI signal 1/2 Trains) - initiates a reactor trip during LOCA events.

Turbine Trip (2/3 channels ASO < 45psig, 4/4 stop valves closed) - protects against loss of integrity by preventing Pressurizer PORVs from opening on turbine trip at high power. This protection is auto-blocked < 48% (P-8) and automatically reinstated > P-8.

Objective # 4, 10

General Warning (2/2 Trains) - protects against a loss of both protection trains. Anytime a General Warning is present on both SSPS trains a reactor trip will occur. General Warning is caused by: loose circuit board card; loss of voltage (AC or DC); SSPS train in "Test"; a Reactor Trip By-pass breaker in the Connected position and Closed; a Logic Ground Return fuse blown.

3.1.3 Protection Permissive Interlocks

Objective # 11

P-4 (Reactor Trip Breaker and Bypass Breaker Open for a given train) - initiates: Turbine Trip; Feedwater Isolation (coincident with low Tavg of 553 °F); Allows reset of SI signal after one minute time-out; Inputs to Steam Dump Control System for plant trip mode.

P-6 (1/2 IR instruments > 10^{-5}%) - allows Manual Block of SR reactor trip. On a power reduction, provides automatic reinstatement of SR reactor trip when 2/2 IR channels < 10^{-5} %.

P-7 (2/4 PR instruments > 10% or Turbine Inlet Pressures > 10%) - Enables (unblocks) the "at power" reactor trips: Pzr Hi-Level, Pzr Lo-Pressure, 2 Loop Loss of Flow, NCP UV, and NCP UF. The above trips are automatically blocked when below P-7, 3/4 PR < 10% and Turbine Inlet Pressure < 10%.

Objective # 11

P-8 (2/4 PR instruments > 48% power) - enables Single Loop Loss of Flow and Reactor Trip upon Turbine Trip.

P-10 (2/4 PR instruments > 10%) - allows Manual Block of PR High Flux / Low Setpoint reactor trip. Allows Manual block of IR High Flux Rod Stop (C-1) and Reactor Trip. BlockSR HI Flux Trip. P-10 provides an input to P-7. Below P-10 (3/4 PR instruments < 10%) - allows Manual reset of SR Reactor trip. This is used if one IR channel does not decrease below P-6 to Auto energize the SR circuit.

P-11 (2/3 Presurizer Pressure instruments < 1955 psig) - allows Manual Block of Lo-Pzr pressure SI (Auto instate > P-11); allows Manual block of Lo Press Stm Line Isol (Auto instate > P-11); Allows Manual block of motor driven CA pump Auto-start (Auto instate > P-11); and initiates opening of Cold Leg Accumulator isolation valves when > P-11.

P-12 (2/4 Lo-Lo TAVG < 553°F) - provides Auto-block of steam dumps preventing excessive cooldown by the steam dumps.

P-13 (Turbine Inlet Pressure > 10%) - this turbine at power permissive provides an input to P-7. Signal is developed using a 1/2 Logic from Channels 1 and 2 Turbine Inlet Pressure.

P-14 (2/3 Hi-Hi level instruments on 1/4 SGs > 83%) - actuates a Turbine Trip, CFPT Trip and Feedwater Isolation.

3.1.4 Control Interlocks

Objective # 12

C-1 (1/2 IR channels > 20%) - blocks Auto and Manual rod withdrawal.

C-2 (1/4 PR channels > 103%) - blocks Auto and Manual rod withdrawal.

C-3 (2/4 ΔT channels within 2% of OTΔT setpoint) - blocks Auto and Manual rod withdrawal plus actuates a turbine runback at 200%/min for 2.3 seconds out of 30 seconds.

C-4 (2/4 ΔT channels within 2% of OPΔT setpoint) - blocks Auto and Manual rod withdrawal plus actuates a turbine runback at 200%/min for 2.3 seconds out of 30 seconds.

C-5 (1/1 {Ch.1} Turbine Inlet Pressure < 15%) - blocks Auto rod withdrawal.

C-7A (Turbine Inlet Pressure step change decrease > 10%.) - arms condenser dump valves on a load rejection. Signal is developed using a 2/3 Logic from Channels 1, 2, and 3 Turbine Inlet Pressure.

C-9 (1/1 condenser pressure < 20” Hg VAC AND 2/4 RC pump breakers closed) - arms condenser dump valves.

C-11 (1/1 control rod Bank D > 200 steps) - blocks Auto rod withdrawal.

7.5 Reactor Trips (04/26/2013)

REACTOR TRIP	SETPOINT	LOGIC	PERMISSIVES	BASES
MANUAL	Sw. turned 45°	1/2 sw.		operator judgment
S.R. NI HIGH	10^5 CPS	1/2 ch.	P6, P10	uncontrolled rod withdrawal/ startup accidents
I.R. NI HIGH	25% power	1/2 ch.	P10	uncontrolled rod withdrawal/ startup accidents
P.R. NI LOW	25% power	2/4 ch.	P10	reactivity excursion from low powers
P.R. NI HIGH	109% power	2/4 ch.		reactivity excursion from all powers DNB
P.R. POS RATE	+5%/2 sec	2/4 ch.		DNB (rod ejection)
PZR HIGH PRESS	2385 psig	2/4 ch.		coolant system integrity
PZR LOW PRESS	1945 psig	2/4 ch.	P7	DNB
PZR HIGH LEVEL	92%	2/3 ch.	P7	water through safeties (system integrity)
OTΔT	ΔT $\geq$ OTΔTsp	2/4/ ch.		DNB
OPΔT	ΔT$\geq$ OPΔTsp	2/4 ch.		KW/FT
NCP BUS LOW VOLT	74% of normal	2/4 ch.	P7	DNB (anticipatory loss of flow)
NCP BUS LOW FREQ	56 Hz	2/4 ch.	P7	DNB (anticipatory loss of flow)
S/G LO-LO LVL	17%	2/4 in 1/4 s/g		loss of heat sink
1 LOOP LOSS OF FLOW	88%	2/3 in 1/4 loops	P8	DNB
2 LOOP LOSS OF FLOW	88%	2/3 in 2/4 loops	P7	DNB
SAFETY INJECTION	any S/I signal actuated	1/2 S/I trains		trip reactor if trip not generated by trip instrumentation
GENERAL WARNING ALARM	loose card, loss of voltage, train in test, by-pass bkr connected/closed, logic ground return fuse blown	2/2 alarms		loss of protection
TURBINE TRIP	low Auto-stop oil press <45 psig or all 4 stop valves closed	2/3 ASO Press switches 4/4 valves	P8	trip reactor on turbine trip

7.6 Protection Permissive Interlocks (04/26/2013)

INTERLOCKS	LOGIC	FUNCTION
P-4	Train A or B Reactor Trip	• *Turbine Trip* • Feedwater Isolation< Low T_{ave} • Arms condenser dumps • Allows reset of Safety Injection Signal after time delay
P-6	1/2 I.R. > 10^{-5} %	Allows manual block of S.R. Reactor Trip. On decreasing power, Source Range Level trips are automatically reactivated.
P-7	2/4 P.R. > 10% FP (P-10) or Turbine Inlet Pressure > 10% (P-13)	On increasing power P-7 automatically enables the following trips: • Pzr High Level • Pzr Low Pressure • Low NC Flow 2/4 Loops • NCP Undervoltage • NCP Underfrequency On decreasing power the above listed trips are automatically blocked.
P-8	2/4 P.R. > 48% FP	On increasing power P-8 enables the 1/4 loop loss of flow Reactor Trip and Reactor Trip on Turbine Trip. On decreasing power, P-8 automatically blocks the above listed trip.

7.7 Protection Permissive Interlocks (02/28/2017)

INTERLOCKS	LOGIC	FUNCTION
P-10	2/4 P.R. > 10% FP	On increasing power P-10 allows manual block of the Intermediate Range trip and rod stop (C-1). Allows block of the Power Range High Flux Low Setpoint trip. Blocks SR HI flux trip. Also provides an input to P-7. On decreasing power, the Intermediate Range trip and the Power Range trip are automatically reactivated. Allows manual unblock of SR trip.
P-11	2/3 Pzr Press < 1955	On decreasing pressure (<1955 #) P-11 allows manual block of Low Pzr Pressure Safety Injection, Lo Press Stm Line Isol and CA Pump Auto start. Enables High Steam Rate Main Steam Isolation.
P-12	2/4 Lo-Lo Tave < 553 °F	Blocks steam dumps
P-13	1/2 Turb Inlet Press > 10% *(Note: There are 3 Turb Inlet Press Channels, but only 2 of them input into P-13)*	Input to P-7
P-14	2/3 Level on 1/4 S/G Hi-Hi Level > 83%	• *Turbine Trip* • FWPT Trip • Feedwater Isolation

Q77 References

Duke Energy McGuire Nuclear Station **Use Of Emergency And Abnormal Procedures And FLEX Support Guidelines**	Document No. **OMP 4-3**
	Revision No. 047
Information Use	Electronic Reference No. MP0070PK

7.16 Usage of Status Trees

There are six different trees, each one evaluating a separate Critical Safety Function (CSF) of the plant. Color-coding of the status tree end points will be either red, orange, yellow, or green, with green representing a "satisfied" safety status. Each non-green color represents an action level that should be addressed according to the Rules of Priority as discussed below.

The six Status Trees are always evaluated in the sequence:

- Subcriticality
- Core Cooling
- Heat Sink
- Integrity
- Containment
- Inventory

IF identical color priorities are found on different trees during monitoring, the required action priority is determined by this sequence.

Initial monitoring of the status trees should begin on either of the following conditions:

- As directed by an action step in EP/1,2/A/5000/E-0 (Reactor Trip or Safety Injection).

- **WHEN** a transfer is made out of the Safety Injection procedure to another EP.

  An exception to this is that CSF procedures are **NOT** required to be implemented during the Loss of All AC Power EP since none of the electrically powered safeguards equipment can be used. **WHEN** power is subsequently restored, EP/1,2/A/5000/ECA-0.1 or 0.2 (Loss of All AC Power Recovery procedures) will direct the operator when implementing CSF procedures is required.

7.16.1 Implementing CSF Path Procedures

7.16.1.1 CSF procedures are **NOT** to be implemented prior to transition from EP/1,2/A/5000/E-0 (Reactor Trip or Safety Injection). **IF** a CSF path is red or orange while the operating crew is in EP/1,2/A/5000/E-0, but has turned to green upon transition from E-0, the CSF procedure which was in alarm shall **NOT** be implemented. **IF** the CSF path is yellow, it shall be handled as any other yellow path procedure per Section 7.16.1.7. **IF** there are any valid red or orange path CSFs on transition from E-0 (unless transition is to EP/1,2/A/5000/ECA-0.0 (Loss of All AC Power), the associated CSF procedure shall be implemented.

7.16.1.2 **IF** a valid red or orange path flickers into alarm on SPDS but returns to green prior to the crew validating the condition and implementing the procedure (implementation of procedure being that the SRO either hands out fold-out pages or starts reading from the procedure, or crew implements immediate action of FR-S.1), the CSF procedure shall **NOT** be implemented. **IF** the CSF path is yellow, it shall be handled as any other yellow path procedure per Section 7.16.1.7. Likewise, if a valid red path or orange path goes into alarm during performance of a higher priority CSF procedure, but returns to green prior to transition from the higher priority CSF path procedure to the lower priority CSF procedure, the associated CSF procedure shall **NOT** be implemented.

7.16.1.3 **IF** a CSF procedure directs the operator to return to the procedure and step in effect, **AND** the corresponding status tree continues to display the off-normal conditions, the corresponding CSF procedure does **NOT** have to be implemented again, since all recovery actions have been completed. However, if the same status tree subsequently changes to a valid higher priority condition, **OR** if it changes to lower condition and returns to higher priority condition again, the corresponding CSF procedure shall be implemented as required by its priority.

7.16.1.4 Red Path

IF any valid red path is encountered during monitoring, the operator is required to immediately implement the corresponding EP. Any recovery EP previously in progress shall be discontinued. **IF** during the performance of any red path procedure, a valid red condition of higher priority arises, the higher priority condition should be addressed first, and the lower priority red path procedure suspended.

7.16.1.5 Orange Path

IF any valid orange path is encountered, the operator is expected to scan all of the remaining trees, and then, if no valid red is encountered, promptly implement the corresponding EP. **IF** during the performance of an orange path procedure, any valid red condition or higher priority valid orange condition arises, the red or higher priority orange condition is to be addressed first, and the original orange path procedure suspended.

7.16.1.6 Completion of Red or Orange Path Procedure

Once procedure is entered due to a red or orange condition, that procedure should be performed to completion, unless preempted by some higher priority condition. It is expected that the actions in the procedure will clear the red or orange condition before all the operator actions are complete. However, these procedures should be performed to the point of the defined transition to a specific procedure or to the "procedure and step in effect" to ensure the condition remains clear. At this point any lower priority red or orange paths currently indicating or previously started but **NOT** completed shall be addressed.

FR-S.1, P.1 and Z.1 can be entered from either an orange or red path status. **IF** the color changes from orange to red while you are in one of these EPs, the crew should continue and complete the EP from where they are. Crew does **NOT** have to backup and restart the EP. **IF** the orange path is exited, and it subsequently turns red, the EP must be re-entered at Step 1.
Upon continuation of recovery actions in Optimal Recovery procedure, some judgment may be required by the operator to avoid inadvertent reinstatement of a Red or Orange condition by undoing some critical step in the Function Recovery procedure. The Optimal Recovery procedures are optimal assuming that safety equipment is available. The appearance of a Red or Orange condition in most cases implies that some equipment or function required for safety is **NOT** available, and by implication some adjustment may be required in the Optimal Recovery procedure.

7.16.1.7 Yellow Path

A yellow path does **NOT** require immediate operator attention. Frequently, it is indicative of an off-normal and/or temporary condition which will be restored to normal status by actions already in progress. In other cases, the yellow status might provide an early indication of a developing red or orange condition. The operator is allowed to decide whether or **NOT** to implement any yellow path procedure.

Implementation of a yellow path function restoration guideline is based on operator judgment when it is determined that adequate time exists to implement it. In other words, the operator does **NOT** have to implement a yellow path guideline if a judgment has been made that it is inappropriate based on available time or current plant state; and if an event of higher priority is in progress, the operator should attend to the more important matters prior to implementing a yellow path function restoration guideline. In the prioritization scheme in the EPs, the Optimal Recovery procedures (including applicable foldout pages) have priority over the yellow path function restoration procedures. The yellow path procedure can be considered as a supplementary set of actions that were provided to address one parameter being in an off-normal state. The controlling guideline in effect is the Optimal Recovery procedure that the operator is in when he decides that he has enough time to perform the yellow path procedure actions. **While performing the actions of the yellow path, continuous actions or foldout page items of the optimal recovery procedure in effect are still applicable and should be monitored by the operator.** This concurrent procedure usage should **NOT** cause the operator any difficulties since yellow path procedures are only performed when adequate time exists.

For example, if the operator is in ES-1.1 (Safety Injection Termination) and decides to implement FR-H.5 because of low SG level and NC subcooling is lost while in FR-H.5, the operator should terminate FR-H.5 and implement the action of the ES-1.1 foldout page to re-initiate S/I flow.

SYS012 A2.01 - Reactor Protection System (RPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

Faulty bistable operation ....

Given the following initial conditions on Unit 1:

- The unit is increasing power following a Refueling Outage
- At 42% reactor power, the P-8 permissive bistable fails "AS IS"

Subsequently,

- Reactor power is currently 52%
- 1A NCP trips

Based on the conditions above, an automatic Reactor trip signal ___(1)___ be generated.

If subsequent conditions require implementation of FR-S.1 (RESPONSE TO NUCLEAR GENERATION / ATWS), the crew will transition from FR-S.1 to E-0 (REACTOR TRIP OR SAFETY INJECTION) ___(2)___.

Which ONE (1) of the following completes the statements above? (CONSIDER EACH SEPARATELY)

A. 1. will
   2. after FR-S.1 is performed to completion

B. 1. will NOT
   2. after FR-S.1 is performed to completion

C. 1. will
   2. immediately upon a successful Reactor trip

D. 1. will NOT
   2. immediately upon a successful Reactor trip

General Discussion

On increasing power P-8 enables the 1/4 loop loss of flow Reactor Trip and Reactor Trip on Turbine Trip. On decreasing power, P-8 automatically blocks the above listed trip. For the conditions given, because P-8 failed "as is" below the setpoint (48%), a single-loop loss of flow will NOT initiate a reactor trip. In this case, loss of flow would have to occur on a second loop for the reactor trip to occur.

Per the EOP Rules of Usage, once the conditions have been met to implement FR-S.1, it must be entered and performed to completion.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if applicant confuses operation of the faulty P-8 bistable and concludes the single-loop loss of flow trip is functional.

Second part is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if applicant confuses operation of the faulty P-8 bistable and concludes the single-loop loss of flow trip is functional.

The second part is plausible since it is logical to conclude that when the entry conditions for FR-S.1 are no longer met, that transition back to E-0 is allowed. Additionally, it is also plausible since it is a common misconception and a common mistake made by Licensed SROs that transition back to E-0 is permissible as soon as the reactor trip is successful.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct.

The second part is plausible since it is logical to conclude that when the entry conditions for FR-S.1 are no longer met, that transition back to E-0 is allowed. Additionally, it is also plausible since it is a common misconception and a common mistake made by Licensed SROs that transition back to E-0 is permissible as soon as the reactor trip is successful.

Basis for meeting the K

The K/A is matched since the applicant must be able to predict the impact of the faulty P-8 permissive bistable on current plant conditions and have knowledge of the Emergency Procedure rules of usage to determine what procedure flowpath is required.

Basis for Hi Cog

This question is a High Cognitive question because the applicant must be able to analyze plant conditions to determine the status of the P-8 permissive when it failed and based on current plant conditions determine the impact this failure will have.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 10, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) The question can NOT be answered solely by knowing systems knowledge.
Part 1 of this question can be answered using only systems knowledge and is therefore RO knowledge. However, it is included to meet the "predict the impacts of" part of the K/A.

Part 2 of the question can NOT be answered using system knowledge.

2) The question can NOT be answered by knowing immediate operator actions.
Neither part of this question can be answered by knowing the immediate actions of either E-0 or FR-S.1.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.
Neither part of this question can be answered by knowing the entry conditions of E-0 or FR-S.1. It is related to transition from FR-S.1 back to E-0.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.

5) The question requires knowledge of the EOP rules of usage to determine when procedure transition is allowed. Therefore, it is SRO knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
REFERENCES: Lesson Plan OP-MC-IC-IPE Rev. 32A OMP 4-3 Rev. 40 LEARNING OBJECTIVES: ICIPE011 OP-MC-ADM-OMP Objective 6

Student References Provided

SYS012 A2.01 - Reactor Protection System (RPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

Faulty bistable operation ....

401-9 Comments:

Remarks/Status

Q78 References

SURVEILLANCE REQUIREMENTS (continued)

3.7 PLANT SYSTEMS

3.7.8 Standby Nuclear Service Water Pond (SNSWP)

LCO 3.7.8 The SNSWP shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SNSWP inoperable.	A.1 Be in MODE 3. AND A.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.8.1	Verify water level of SNSWP is ≥ 739.5 ft mean sea level.	In accordance with the Surveillance Frequency Control Program
SR 3.7.8.2	-------------------------------NOTE------------------------------- Only required to be performed during the months of July, August, and September. -- Verify average water temperature of SNSWP is ≤ 82°F at an elevation of 722 ft. in SNSWP.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.8.3	Verify, by visual inspection, no abnormal degradation, erosion, or excessive seepage of the SNSWP dam.	In accordance with the Surveillance Frequency Control Program

B 3.7 PLANT SYSTEMS

B 3.7.8 Standby Nuclear Service Water Pond (SNSWP)

BASES

BACKGROUND	The SNSWP functions as the ultimate heat sink and performs two principal safety functions: (1) dissipation of residual heat after reactor shutdown and (2) dissipation of residual heat after an accident. This is done by utilizing the Nuclear Service Water System (NSWS) and the Component Cooling Water (CCW) System. The ultimate heat sink (UHS) is comprised of cooling water from the SNSWP, necessary retaining structures, and the canals or conduits connecting the water sources with, but not including, the cooling water system intake structures as discussed in the UFSAR, Section 9.2 (Ref. 1). For McGuire, the SNSWP is the only cooling water source qualified as the ultimate heat sink. The SNSWP can be aligned to dissipate sensible heat during normal operation. The basic performance requirements are that a 30 day supply of water be available, and that the design basis temperatures of safety related equipment not be exceeded. Additional information on the design and operation of the system, along with a list of components served, can be found in Reference 1.
APPLICABLE SAFETY ANALYSES	The SNSWP provides the Ultimate Heat Sink safety function to dissipate residual heat from the reactor core following all accidents and anticipated operational occurrences in which the unit is cooled down and placed on residual heat removal (RHR) operation. The maximum post accident heat load occurs approximately 3 hours after a design basis loss of coolant accident (LOCA). Prior to this time, the unit switches from injection to recirculation and the containment cooling systems and RHR are required to remove the core decay heat. The SNSWP is designed in accordance with Regulatory Guide 1.27 (Ref. 2), which requires a 30 day supply of cooling water in the SNSWP. Reference 1 provides the details of the assumptions used in the analysis. The SNSWP satisfies Criterion 3 of 10 CFR 50.36 (Ref. 3).

Q78 References

BASES

LCO	The SNSWP is required to be OPERABLE and is considered OPERABLE if it contains a sufficient volume of water at or below the maximum temperature that would allow the NSWS to operate for at least 30 days following the design basis LOCA without the loss of net positive suction head (NPSH), and without exceeding the maximum design temperature of the equipment served by the NSWS. To meet this condition, the SNSWP temperature should not exceed 82°F at 722 ft mean sea level and the level should not fall below 739.5 ft mean sea level during normal unit operation.
APPLICABILITY	In MODES 1, 2, 3, and 4, the SNSWP is required to support the OPERABILITY of the equipment serviced by the SNSWP and required to be OPERABLE in these MODES. In MODE 5 or 6, the requirements of the SNSWP are determined by the systems it supports.
ACTIONS	A.1 If the SNSWP is inoperable the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.
SURVEILLANCE REQUIREMENTS	SR 3.7.8.1 This SR verifies that adequate long term (30 day) cooling can be maintained. The specified level also ensures that sufficient NPSH is available to operate the NSWS pumps. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. This SR verifies that the SNSWP water level is ≥ 739.5 ft mean sea level.

Q78 References

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.2

This SR verifies that the NSWS is available to cool the CCW System to at least its maximum design temperature with the maximum accident or normal design heat loads for 30 days following a Design Basis Accident. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. This SR verifies that the average water temperature of the SNSWP is ≤ 82°F at an elevation of 722 ft. The SR is modified by a Note that states the Surveillance is only required to be performed during the months of July, August, and September. During other months, the ambient temperature is below the surveillance limit.

SR 3.7.8.3

This SR verifies dam integrity by inspection to detect degradation, erosion, or excessive seepage. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. UFSAR, Section 9.2.
2. Regulatory Guide 1.27.
3. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).
4. Regulatory Guide 1.127.

Q78 References

Duke Energy McGuire Nuclear Station **Annunciator Response For Panel 1AD-12**	Procedure No. OP/**1**/A/6100/010 M
	Revision No. 056
Continuous Use	Electronic Reference No. MC004737

Q78 References

Nomenclature: **SNSWP LO LEVEL** Window: **B3**

Setpoint: 739.75 ft. mean sea level elevation

Origin: SNSWP level transmitter 0RNLT-6000

Probable Cause:
- Low SNSWP level
- Misaligned RN System

Automatic Action: None

Immediate Action: None

Supplementary Action:

1. Refer to OP/1/A/6400/006 (Nuclear Service Water System) for filling SNSWP.

2. Refer to Tech Specs for minimum level and required actions.

> **NOTE:**
> - Unit 1 Non-Essential Header discharges to A Train RN discharge header.
> - Unit 2 Non-Essential Header discharges to B Train RN discharge header.

3. **IF** any RN Train aligned to SNSWP, evaluate performing one or both of the following to makeup to SNSWP:
   - Run RV Pump
   - Isolate Non-Essential Headers per OP/1/A/6400/006 or OP/2/A/6400/006 (Nuclear Service Water System).

> **CAUTION:** The next step isolates cooling water to both units 6900V Switchgear rooms, Turbine Building, Service Building areas and suction to RF Jockey Pumps.

> **NOTE:** **IF** the RN Train supplying the RN Non-Essential Headers is aligned to the SNSWP **AND** RV is **NOT** supplying the Non-Essential Headers, 500 - 1000 gpm SNSWP inventory may be lost to RC piping through RL header.

4. **IF** SNSWP level **CANNOT** be restored, evaluate isolating RN to RL Header.

Continue On Next Page

Duke Energy McGuire Nuclear Station **DAILY SURVEILLANCE ITEMS**	Procedure No. PT/1/A/4600/003 B
	Revision No. 171
Continuous Use	Electronic Reference No. MC00483E

Surveillance Item	Acceptance Criteria	Applicable Mode(s)							Notes	Initials	Tech Spec / SLC
		1	2	3	4	5	6	No Mode			
CA Storage Tank Level (Control Room Indication)	The following instruments indicate greater than or equal to 20 feet: CAST Level Ch 1: ___________ ft (1CAP-5610) CAST Level Ch 2: ___________ ft (1CAP-5620)	1	2	3					9		SLC 16.9.7
VCT Level	Control Room indicators 1NVP5760 and 1NVP5763 within 5% of each other 1NVP5760: ___________ % 1NVP5763 ___________ %	1	2	3	4	5	6				{SOER 97-1}
Standby Nuclear Service Water Pond (SNSWP) Level	Greater than or equal to 739.75 ft (739' + 9") SNSWP Level: ___________ ft	1	2	3	4				10, 11		TS SR 3.7.8.1

9 **IF** 1CAP-5610 or 1CAP-5620 is **NOT** available, **THEN** it is acceptable to use OAC points M1A1368 (U1 CA Storage Tank Level Channel 1) or M1A1699 (U1 CA Storage Tank Level Channel 2) to satisfy surveillance.

10 Tech Spec limit for SNSWP level is 739.5 ft (739' + 6"). Due to process instrument loop inaccuracy, if indicated SNSWP level is less than 739.75 ft, manually determine SNSWP level per Note 11. [NCR01661933]

11 **IF** instrument 0RNP-6000 (Standby NSW Pond Level) is inoperable **OR** manual determination of SNSWP level desired, **THEN** local observation of overflow from the SNSWP at the north end of the dam can be used to determine level. Overflow occurs at 740'. **IF** SNSWP is **NOT** overflowing, **THEN** level can also be determined using local level gauge at overflow enclosure. Go to SNSWP overflow enclosure (Located SE of plant at intersection of old front entrance road **AND** normal entrance road at pond. There is a concrete housing with steel mesh rebar **AND** a steel grate walkway around enclosure). Using the walkway, go to south side of enclosure. At end of walkway is the level gauge made of flat steel that has elevation increments in fluorescent orange. The bottom increment indicates 740 ft. **IF** SNSWP level is less than 740', **THEN** measure from the top of water surface to the 740 ft mark. Subtract this measure from 740 ft to obtain actual level of SNSWP. Notify CRS of measurement.

Unit 1

Surveillance Item	Acceptance Criteria	Applicable Mode(s)							Notes	Initials	Tech Spec / SLC
		1	2	3	4	5	6	No Mode			
SNSWP Temperature (Minimum)	Greater than **OR** equal to 36°F (Applicable in Jan, Feb, & March) SNSWP Temperature: ___________ °F	1	2	3	4				12		TAC MCTC-1574-RN.S001-01
SNSWP Temperature (Maximum)	Less than **OR** equal to 78°F (Applicable in July, Aug, & Sept) SNSWP Temperature: ___________ °F	1	2	3	4				13, 14		TS SR 3.7.8.2
SNSWP Temperature (Maximum)	Less than **OR** equal to 78°F when RN is aligned to SNSWP (Applicable from June through October) SNSWP Temperature: ___________ °F	1	2	3	4				14		TAC MCTC-1574-RN.S001-01

12 TAC Sheet limit for SNSWP temperature is 32°F. **IF** SNSWP temperature is 36°F or less **OR** SNSWP temperature indication **NOT** available, **THEN** dispatch operator to verify SNSWP water surface is clear of ice. **IF** ice formed on surface of SNSWP, **THEN** notify Engineering **AND** take action to increase SNSWP temperature. [NCR01651168, CA#19, 22, 30]

13 Tech Spec limit for SNSWP temperature is 82°F. Due to process instrument loop inaccuracy, **IF** indicated SNSWP temperature **NOT** available **OR** SNSWP temperature is 78°F or greater, **THEN** notify Maintenance to manually determine SNSWP temperature per IP/0/A/3004/007 (Standby Nuclear Service Water Pond Temperature Loop Calibration And Manual Temperature Measurement) **AND** that it must be complete prior to 0100 hours. [NCR01651168, CA#19, 22]

14 **IF** SNSWP temperature indicates greater than or equal to 76 °F, **THEN** ensure Engineering notified to evaluate if aligning to LLI for SNSWP cooling is needed. {NCR 02146843-02} Purpose of this notification is to evaluate actions needed to cool SNSWP prior to requiring Maintenance to obtain local indication of SNSWP temperature.

Unit 1

Title:	INSTRUMENT AIR (VI) STATION AIR (VS) BREATHING AIR (VB)						
Number:	OP-MC-SS-VI	Revision:	40	Program:	AO/AOCT/RO/SRO/LOCT		
Time Required:	AO	AOCT	RO	SRO	LOCT		Prerequisites: None
	3.0	3.0	4.0	4.0	3.0	Hrs.	

Overview:

This lesson will describe the purpose, operation and general description for three of the compressed air systems at McGuire Nuclear Station; Instrument Air System, Station Air System and the Breathing Air System.

References:

1. MSCD-1223.55-01, Instrument Air System, MSCD-1223.55-02, Station Air (High and Low Pressure) System, and MSCD-1223.55-03, Breathing Air System,
2. MCS-1605.VS-00-0001, Station Air System and MCS-1605.VI-00-0001, Instrument Air System.
3. MC-1605-01.00 through MC-1605-01.23, MC-2605-01.03 through MC-2605-01.09, and MC-2605-01.13 through MC-2605-01.17.
4. MNS FSAR Volume 5, Section 9.3.1, Compressed Air Systems
5. MNS Technical Specifications 3/4.3/2 Engineered Safety Features Actuation System Instrumentation (Phase A and B Isolation), 3/4.6.1.2, Containment Leakage, 3/4.6.3, Containment Isolation Valves.
6. MNS MCEE 24, 111, 211, and 224 Series.
7. MNS Operating Procedures OP/0/A/6450/005
   - OP/0/A/6450/005A
   - OP/0/A/6450/006
   - OP/0/A/6450/013

Operating Experience:

- SOER 88-1, Instrument Air System Failures
- Instrument Air System Usage at McGuire
- NCR1599714 VB Receiver Tank Relief Valve Lifted
- NCR 1598167 Unit 1 entered AP/1/A/5500/022 (Loss of VI)
- NCR 1622687 Inaccurate Risk Color Communication during risk assessment of an emergent activity
- NCR 1669663 Unit 1 and 2 entered AP/1(2)/5500/022 Loss of VI) as result of B VI Receiver drain pipe failure

- *Maximum VI Air Dryer D/P is 12 PSID.*

Basis: This is to insure sufficient airflow through each individual Air Dryer to allow proper drying. This also insures that the Dryer Pre and Post filters are operating properly and no excessive pressure drops are occurring across the filters.

- *Maximum VI Air Dryer Pre-filter D/P is 10 psid.*

Basis: This is to insure that the Dryer Pre-filters are operating properly and no excessive pressure drops are occurring across the filters.

- *Maximum VI Air Dryer After-Filter D/P is 10 psid.*

Basis: This is to insure that the Dryer Post-filters are operating properly and no excessive pressure drops are occurring across the filters.

- *Maximum VI Air Dryer Bypass Filter D/P is 10 psid.*

Basis: This is to insure that the Dryer bypass filter is operating properly and no excessive pressure drops are occurring across the filter.

- *Maximum VI Dryer dewpoint is 0°F.*

Basis: This is to insure that there is no excessive moisture buildup in the VI System.

- *Maintaining desiccant VI Dryer valved in for more than 1 hour with Control Power De-energized may saturate desiccant bed.*

Basis: Self-Explanatory

Objective # 14

- *Red alarm on "VI Dryer Control Panel" halts dryer cycle and may saturate desiccant bed.*

Basis: Self-Explanatory

- *Minimum operating VI Air Dryer inlet pressure is 65 PSIG for proper purge and control valve operation).*

Basis: Self-Explanatory

- *Right side of "VI Dryer Reflash Module" panel is for operation of 1VI-1812 only. This portion of the panel is used during AP/1(2)/5500/022 (Loss of VI) or when VI pressure is less than 85 psig. 1VI-1812 will automatically open when VI pressure is less than 85 psig. This portion of the panel will allow manual opening of 1VI-1812 or, using yellow "RESET", allow closing of 1VI-1812 if air pressure is greater than 85 psig.*

Basis: Self-Explanatory

- *Left side of "VI Dryer Reflash Module" panel is for operation of "Purge Exhaust Valves" only. This portion of the panel is used during AP/1(2)/5500/022 (Loss of VI) or when VI pressure is less than 90 psig. The three "Purge Exhaust Valves" operate together and will automatically close when VI pressure is less than 90 psig. This portion of the panel will allow manual closing of "Purge Exhaust Valves" or, using yellow "RESET", allow opening of these valves if air pressure is greater than 90 psig.*

  Basis: Self-Explanatory

- *Maximum diesel Air-Oil Separator DP is 10 psid. Greater than 10 psid could rupture separator element flooding VI System with compressor oil.*

  Basis: Self-Explanatory

- *All spills from Diesel VI Compressors shall be cleaned up per RP/0/A/5700/022 (Spill Response Procedure)*

  Basis: Use of this procedure insures the oil is cleaned up properly and all environmental concerns are addressed.

- *Radiator cap should be cooled enough to be touched by bare hands for removal.*

  Basis: Safety Concern of burns to the operator when checking fluid levels.

- *Diesel access doors should remain closed during starting and stopping of diesels.*

  Basis: Safety concern of personnel injuries due to diesel compressor and engine rotating parts coming into contact with operators.

- *Smoking or open flame near the diesel compressors when filling any fluids is prohibited.*

  Basis: Fire/explosion hazards

- *VI Compressors G and H are capable of continuous operation for approximately13 hours on a full tank of fuel. This limit requires refueling of these compressors at aminimum of every 12 hours of continuous operation. {NCR 1675410}*

  Basis: Self-Explanatory

A. Purpose

The purpose of this procedure is to identify operator actions in the event of a loss of VI.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

B. <u>Symptoms</u>

- **Abnormally low VI pressure**
- **VI pressure - GOING DOWN**
- **"VI COMP PNL TROUBLE" alarm**
- **"VI/VS LO PRESS" alarm**
- **"VI/VS LO LO PRESS" alarm**
- **Erratic plant instrumentation and/or control**
- **Loss of KR flow to VI compressors.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. <u>Operator Actions</u>

<u>NOTE</u>

- If normal VI supply is lost, the VI Blackout Header FLEX Air Tank should automatically maintain normal control of CA flow, charging flow, letdown, and SM PORVs.
- All checks of VI pressure in this AP are for the main VI header (Control Room gauge, 0VIP-5090) unless specifically requested to check VI Blackout Header FLEX Air Tank pressure.
- If VI is lost to control room CA manual loaders prior to losing air to valves, the CA control valves may fail closed first instead of open.

1. **<u>IF AT ANY TIME</u> more than one CA control valve fails closed, <u>AND</u> S/G N/R levels are approaching 11% (32% ACC), <u>THEN</u> perform the following as required to control CA flow:**

   __ A. Depress "REL" button on CA modulating control valve circuit for affected pump(s), to fail control valves open.

   B. **<u>WHEN</u>** throttling CA is required, **<u>THEN</u>** perform the following:

   __ 1) Reset modulating valves (to fail CA control valves close and/or allow control).

   __ 2) Control CA flow using control valves.

   RESPONSE NOT OBTAINED: __ 2) **<u>IF</u>** CA control valves fail open, **<u>THEN</u>** control CA flow **<u>PER</u>** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 16 (CA Flow Control With Loss Of VI).

   __ 3) **<u>IF</u>** CA valves fail closed, **<u>THEN</u>** repeat Step 1.A and 1.B as necessary to control S/G levels.

__ 2. **<u>IF AT ANY TIME</u> VI pressure is less than 60 PSIG, <u>THEN</u> align RN <u>PER</u> Enclosure 2 (RN Alignment During Loss of VI Event).**

Q79 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 3. **Announce occurrence on page.**	
__ 4. **Ensure at least 2 KC pumps running.**	

NOTE Step 5 to restore VI is the same in both Unit 1 and Unit 2 AP/22 and only has to be performed by one unit.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. **Restore VI as follows:**	
__ A. Ensure at least 2 KR pumps running.	
__ B. Check VI header pressure - GREATER THAN 70 PSIG.	B. Perform the following: __ 1) Dispatch operator to perform Enclosure 6 (D, E and F VI Compressor Operation with Low Control Air) using copy located beside Service Bldg Lube Oil Station door. __ 2) **GO TO** Step 5.D.
__ C. Dispatch operator(s) to start VI compressors as necessary to restore VI using copy of Enclosure 3 (Startup of D, E and F VI Compressors) located beside Service Bldg Lube Oil Station door.	
__ D. Dispatch operator to search for possible leaks.	
__ E. **IF AT ANY TIME** VI header pressure is 90 PSIG **AND** going down ("VI/VS LO PRESS" alarm), **THEN** dispatch operator to ensure Diesel VI compressors running **PER** Enclosure 4 (Diesel VI Compressor Operation), using copy of procedure located on column 2B32, Unit 2 TB, near exit door leading to Diesel VI compressors.	

Q79 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
__ F. **IF AT ANY TIME** VI header pressure goes below 82 PSIG ("VI/VS LO-LO PRESS" alarm), **THEN** dispatch operator to bypass VI dryers and isolate VS **PER** Enclosure 5 (VI Dryer and VI to VS System Isolation) using copy of procedure located beside Service Bldg Lube Oil Station door.	
__ G. **IF AT ANY TIME** an air leak is identified on A, B, or C VI Receiver Tank, **THEN** isolate the leak **PER** OP/0/A/6450/005 (Instrument Air System), Enclosure 4.9 (Isolation and Restoration of VI Receiver Tanks).	
__ 6. **Ensure Unit 2 implements AP/2/A/5500/22 (Loss Of VI).**	
7. **Check VI pressure:** __ • GREATER THAN 80 PSIG __ • STABLE OR GOING UP.	**Perform the following:** A. **IF AT ANY TIME** the following VI pressure conditions are met, **THEN GO TO** Step 36: __ • GREATER THAN 80 PSIG __ • STABLE OR GOING UP. __ B. Observe Note prior to Step 9 and **GO TO** Step 9.
__ 8. **GO TO Step 36.**	

NOTE Some Control Room gauges may fail at low VI pressure. Alternate indications should be used as necessary.

__ 9. **Monitor Foldout page.**	
__ 10. **Check ND System - IN RHR MODE.**	__ **GO TO Step 13.**

Q80 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

__ **1. Have STA monitor Foldout page.**

NOTE
- CSF procedures should not be implemented until directed by this procedure.
- Double 3-way communication is not required.

2. Check at least one of the following alarms - LIT:

__ • "CONT SUMP LEVEL GREATER THAN 2.5 FT" on 1AD-14 - LIT

OR

__ • "CONT SUMP LEVEL GREATER THAN 2.5 FT" on 1AD-15 - LIT.

IF both alarms are dark, THEN perform the following:

__ a. Reset S/I.

__ b. Reset Sequencer.

__ c. Ensure ND pumps are off.

__ d. **IF** either ND pump continues to run, **THEN** have another licensed operator perform Enclosure 2 (Contingency if ND Pump Will Not Stop) while continuing in this RNO.

e. **IF** LOCA inside containment has occurred, **THEN** perform the following:

__ 1) Do not start ND pump until at least one sump level alarm is lit.

__ 2) **GO TO** Step 3.

__ f. Enable power disconnect and CLOSE 1FW-27A (Unit 1 FWST to ND Pumps Isol).

__ g. EP/1/A/5000/F-0 (Critical Safety Function Status Trees) may now be implemented.

__ h. **GO TO** EP/1/A/5000/ECA-1.1 (Loss of Emergency Coolant Recirc).

Q80 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. **Reset the following:**	
__ a. S/I.	__ a. Reset S/I **PER** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 23 (Local Reset of S/I Signal), while continuing in this procedure.
__ b. Sequencers.	b. Dispatch operator to OPEN affected sequencer control power breaker: __ • A Train - 1EVDA Breaker 6 __ • B Train - 1EVDD Breaker 8.

Q80 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. **Align ND System for recirc as follows:**	
a. Check the following valves - OPEN: __ • 1NI-185A (1A ND Pump Suction From Cont Sump Isol) __ • 1NI-184B (1B ND Pump Suction From Cont Sump Isol).	a. Perform the following: __ 1) Place control permissive in "BYPASS" and OPEN affected valve(s). __ 2) **IF** valve opening, **THEN** wait up to 30 seconds to allow valve to open. __ 3) **IF** valve is closed **OR** intermediate, **THEN** stop associated ND pump.
__ b. Enable power disconnect and CLOSE 1FW-27A (Unit 1 FWST to ND Pumps Isol).	
c. Check the following valves - CLOSED: __ • 1ND-19A (1A ND Pump Suction From FWST or NC Isol) __ • 1ND-4B (1B ND Pump Suction From FWST or NC Isol).	__ c. CLOSE valves.
__ d. Check any ND pump - ON.	d. Perform the following: __ 1) **IF** any ND pump is aligned to sump, **AND** is available to start after adequate sump level exists, **THEN GO TO** Step 5. 2) **IF** no ND pump is available, **OR** no ND pump can be aligned for Cold Leg Recirc, **THEN** perform the following: __ a) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ b) **GO TO** EP/1/A/5000/ECA-1.1 (Loss of Emergency Coolant Recirc).

Q80 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 5. **Check "FWST LEVEL LO-LO" alarm (20 inches) - LIT.**	**Perform the following:**
	<u>CAUTION</u> **The following step takes priority over any other EP guidance.**
	__ a. **<u>WHEN</u>** "FWST LEVEL LO-LO" alarm setpoint (20 inches) is reached, **<u>THEN</u>** immediately **<u>GO</u> <u>TO</u>** Step 6 to align NV and NI pumps to Cold Leg Recirc.
	__ b. Ensure this page is flagged to complete later.
	__ c. **<u>GO</u> <u>TO</u>** Step 7.
6. **<u>WHEN</u> "FWST LEVEL LO-LO" alarm (20 inches) is lit, <u>THEN</u> align NV and NI Systems for Cold Leg Recirc as follows:**	
__ a. Ensure STA continues to monitor foldout page.	

<u>NOTE</u> CSF procedures should not be implemented until directed by this procedure.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
b. Check at least one of the following alarms - LIT:	b. **<u>IF</u>** both alarms are dark, **<u>THEN</u>** perform the following:
__ • "CONT SUMP LEVEL GREATER THAN 2.5 FT" on 1AD-14 - LIT	__ 1) Trip all NV and NI pumps.
OR	__ 2) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).
__ • "CONT SUMP LEVEL GREATER THAN 2.5 FT" on 1AD-15 - LIT.	__ 3) **<u>GO</u> <u>TO</u>** EP/1/A/5000/ECA-1.1 (Loss of Emergency Coolant Recirc).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. (Continued)	
__ c. Check both ND pumps - ON.	c. Perform the following: __ 1) **IF** 1NI-185A (1A ND Pump Suction From Cont Sump Isol) is open, **THEN** start 1A ND pump. __ 2) **IF** 1NI-184B (1B ND Pump Suction From Cont Sump Isol) is open, **THEN** start 1B ND pump. __ 3) **IF** any ND pump running with suction on sump, **THEN GO TO** Step 6.d. 4) **IF** no ND pump is running with suction on sump, **THEN** perform the following: __ a) Trip all NV and NI pumps. __ b) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees). __ c) **GO TO** EP/1/A/5000/ECA-1.1 (Loss of Emergency Coolant Recirc).
d. CLOSE the following valves: __ • 1ND-30A (1A ND To 1B & 1C NC Hotlegs Isol) __ • 1ND-15B (1B ND To 1B & 1C NC Hot Legs Isol).	
__ e. Check NC pressure - LESS THAN 1600 PSIG.	__ e. Stop NI pumps.
f. CLOSE the following valves: __ • 1NI-115B (A NI Pump Miniflow) __ • 1NI-144B (B NI Pump Miniflow).	
__ g. Enable power disconnect and CLOSE 1NI-147A (NI Pumps Miniflow Hdr Isol).	

Q80 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. (Continued)	
h. Check either NV pump miniflow valve - CLOSED: __ • 1NV-150B (U1 NV Pump Recirc Isol) OR __ • 1NV-151A (U1 NV Pump Recirc Isol).	h. Perform the following: 1) **IF** 1NI-9A (NC Cold Leg Inj From NV) **AND** 1NI-10B (NC Cold Leg Inj From NV) both closed, **THEN** perform the following: __ a) Ensure charging flow is greater than 80 GPM. __ b) Maintain charging flow above 80 GPM in all subsequent EPs to ensure NV pump miniflow. 2) CLOSE the following valves: __ • 1NV-150B (U1 NV Pump Recirc Isol) __ • 1NV-151A (U1 NV Pump Recirc Isol).
__ i. Check 1NI-334B (NV & NI Pumps Suct X-Over Blk) - OPEN.	__ i. OPEN valve.
j. OPEN the following valves: __ • 1NI-332A (NV & NI Pumps Suction X-Over) __ • 1NI-333B (NV & NI Pumps Suction X-over).	
k. Align ND discharge to suction of NI and NV pumps as follows: __ 1) OPEN 1ND-58A (1A ND to NV & NI Pumps Isol). __ 2) OPEN 1NI-136B (1B NI Pump Suction From ND Isol).	

Q80 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

6. (Continued)

l. Check at least one ND train aligned to provide suction to NV and NI as follows:

- A train:
  - __ 1A ND pump - RUNNING
  - __ 1ND-58A (1A ND to NV & NI Pumps Isol) - OPEN.

  OR
- B train:
  - __ 1B ND pump - RUNNING
  - __ 1NI-136B (1B NI Pump Suction From ND Isol) - OPEN.

l. Perform the following:

__ 1) **IF** either valve is intermediate, **THEN** allow 20 seconds for valve to open.

__ 2) **IF** either valve open, **AND** its associated train ND pump on, **THEN GO TO** Step 6.m.

__ 3) **IF** both A train **AND** B train unavailable, **THEN** trip all NV and NI pumps.

m. Isolate FWST from NV and NI pumps as follows:

__ 1) Enable power disconnect and CLOSE 1NI-100B (FWST To NI Pumps).

2) CLOSE the following valves:

- __ 1NV-221A (U1 NV Pump Suct From FWST Isol)
- __ 1NV-222B (U1 NV Pump Suct From FWST Isol).

__ **7. Check both NS pumps - OFF.**

Perform the following:

__ a. **IF** Step 8 was previously completed, **THEN** observe Cautions prior to Step 10 and **GO TO** Step 10.

__ b. **IF** any NS pump is running **AND** its suction is aligned to FWST, **THEN** stop NS pump.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. **Align NS for recirc as follows:**	
a. CLOSE the following valves:	
__ • 1NS-20A (1A NS Pump Suction From FWST Isol)	
__ • 1NS-3B (1B NS Pump Suction From FWST Isol).	
__ b. Check containment pressure - GREATER THAN 3 PSIG.	b. Perform the following: __ 1) Wait up to 30 seconds for 1NS-20A and 1NS-3B to close. __ 2) OPEN 1NS-18A (1A NS Pump Suction From Cont Sump Isol). __ 3) OPEN 1NS-1B (1B NS Pump Suction From Cont Sump Isol). __ 4) **IF AT ANY TIME** containment pressure goes above 3 PSIG, **THEN** perform Step 8. __ 5) **GO TO** Step 9.
c. Check at least one of the following alarms - LIT: __ • "CONT SUMP LEVEL GREATER THAN 3 FT" on 1AD-14 - LIT OR __ • "CONT SUMP LEVEL GREATER THAN 3 FT" on 1AD-15 - LIT.	c. Perform the following: __ 1) **WHEN** either 3 ft sump alarm is lit, **THEN** perform Step 8. __ 2) **GO TO** Step 9.
__ d. Check 1A NS pump - AVAILABLE TO RUN.	__ d. **GO TO** Step 8.f.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. (Continued)	
e. Align A Train NS to containment sump as follows:	
__ 1) Check 1NI-185A (1A ND Pump Suction From Cont Sump Isol) - OPEN.	__ 1) **GO TO** Step 8.f.
__ 2) Check 1B NS pump - OFF.	__ 2) **IF** 1B NS pump is running, **THEN GO TO** Step 8.g.
__ 3) Check 1A RN pump - ON.	__ 3) **GO TO** Step 8.f.
__ 4) OPEN 1NS-32A (1A NS Hx Outlet Cont Outside Isol).	__ 4) **GO TO** Step 8.f.
__ 5) OPEN 1NS-29A (1A NS Hx Outlet Cont Outside Isol).	__ 5) **GO TO** Step 8.f.
__ 6) Check 1NS-20A (1A NS Pump Suction From FWST Isol) - CLOSED.	__ 6) **GO TO** Step 8.f.
__ 7) OPEN 1NS-18A (1A NS Pump Suction From Cont Sump Isol).	__ 7) **GO TO** Step 8.f.
8) Wait up to 30 seconds for the following valves to open: __ • 1NS-32A __ • 1NS-29A __ • 1NS-18A.	__ 8) **IF** any valve remains closed or intermediate for over 30 seconds, **THEN GO TO** Step 8.f.
__ 9) Start 1A NS pump.	__ 9) **GO TO** Step 8.f.
__ 10) OPEN 1RN-134A (A NS Hx Inlet Isol).	10) Perform the following: __ a) Stop 1A NS pump. __ b) **GO TO** Step 8.f.
__ 11) **WHEN** 1RN-134A begins to open, **THEN** THROTTLE OPEN 1RN-137A (A NS Hx Outlet Isol) to establish 3600 GPM to 1A NS Hx.	__ 11) **IF** RN flow cannot be established to 1A NS Hx, **THEN** stop 1A NS pump.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. (Continued)	
f. Align B Train NS to containment sump as follows:	
__ 1) Check 1NI-184B (1B ND Pump Suction From Cont Sump Isol) - OPEN.	__ 1) **GO TO** Step 8.g.
__ 2) Check 1A NS pump - OFF.	__ 2) **IF** 1A NS pump is running, **THEN GO TO** Step 8.g.
__ 3) Check 1B RN pump - ON.	__ 3) **GO TO** Step 8.g.
__ 4) OPEN 1NS-12B (1B NS Hx Outlet Cont Outside Isol).	__ 4) **GO TO** Step 8.g.
__ 5) OPEN 1NS-15B (1B NS Hx Outlet Cont Outside Isol).	__ 5) **GO TO** Step 8.g.
__ 6) Check 1NS-3B (1B NS Pump Suction From FWST Isol) - CLOSED.	__ 6) **GO TO** Step 8.g.
__ 7) OPEN 1NS-1B (1B NS Pump Suction From Cont Sump Isol).	__ 7) **GO TO** Step 8.g.
8) Wait up to 30 seconds for the following valves to open: __ • 1NS-12B __ • 1NS-15B __ • 1NS-1B.	__ 8) **IF** any valve remains closed or intermediate for over 30 seconds, **THEN GO TO** Step 8.g.
__ 9) Start 1B NS pump.	__ 9) **GO TO** Step 8.g.
__ 10) OPEN 1RN-235B (B NS HX Inlet Isol).	10) Perform the following: __ a) Stop 1B NS pump. __ b) **GO TO** Step 8.g.
__ 11) **WHEN** 1RN-235B begins to open, **THEN** THROTTLE OPEN 1RN-238B (B NS Hx Outlet Isol) to establish 3600 GPM to 1B NS Hx.	__ 11) **IF** RN flow cannot be established to 1B NS Hx, **THEN** stop 1B NS pump.

Q80 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. (Continued)	
g. Check NS alignment as follows:	
__ 1) Check 1NS-18A (1A NS Pump Suction From Cont Sump Isol) - OPEN.	1) Perform the following: __ a) **IF** 1NI-185A is open, **AND** 1NS-20A is closed, **THEN** OPEN 1NS-18A. __ b) **IF** 1NS-18A is closed, **THEN** place INFO sticker on 1A NS pump switch stating "Do not start until aligned to sump".
__ 2) Check 1NS-1B (1B NS Pump Suction From Cont Sump Isol) - OPEN.	2) Perform the following: __ a) **IF** 1NI-184B is open, **AND** 1NS-3B is closed, **THEN** OPEN 1NS-1B. __ b) **IF** 1NS-1B is closed, **THEN** place INFO sticker on 1B NS pump switch stating "Do not start until aligned to sump".
__ 3) Check 1A NS pump - ON.	3) CLOSE the following valves: __ • 1NS-32A (1A NS Hx Outlet Cont Outside Isol) __ • 1NS-29A (1A NS Hx Outlet Cont Outside Isol).
__ 4) Check 1B NS pump - ON.	4) CLOSE the following valves: __ • 1NS-12B (1B NS Hx Outlet Cont Outside Isol) __ • 1NS-15B (1B NS Hx Outlet Cont Outside Isol).

8. (Continued)

NOTE A failure of NS with containment pressure greater than 3 PSIG will cause a containment orange path. The following step should be performed prior to implementing FR-Z.1.

h. **IF AT ANY TIME** NS flow lost, **OR** RN is lost to operating train, **THEN** start available NS pump as follows:

__ 1) Ensure affected NS pump is off.

NOTE If the following steps clear the containment orange path, FR-Z.1 does not require performance as an orange path unless previously implemented.

2) Check at least one of the following alarms - LIT:

__ • "CONT SUMP LEVEL GREATER THAN 3 FT" on 1AD-14 - LIT

OR

__ • "CONT SUMP LEVEL GREATER THAN 3 FT" on 1AD-15 - LIT.

RNO 2) Perform the following:

__ a) **WHEN** either 3 ft sump alarm is lit, **THEN** align and start other NS pump **PER** Steps 8.d through 8.g.

__ b) **RETURN TO** procedure and step in effect.

__ 3) Check containment pressure - GREATER THAN 1 PSIG.

RNO 3) **IF** NS stopped due to pressure below CPCS interlock, **THEN** perform the following:

__ a) **WHEN** containment pressure is greater than 1 PSIG, **THEN** align and start either NS pump **PER** Steps 8.d through 8.g.

__ b) **RETURN TO** procedure and step in effect.

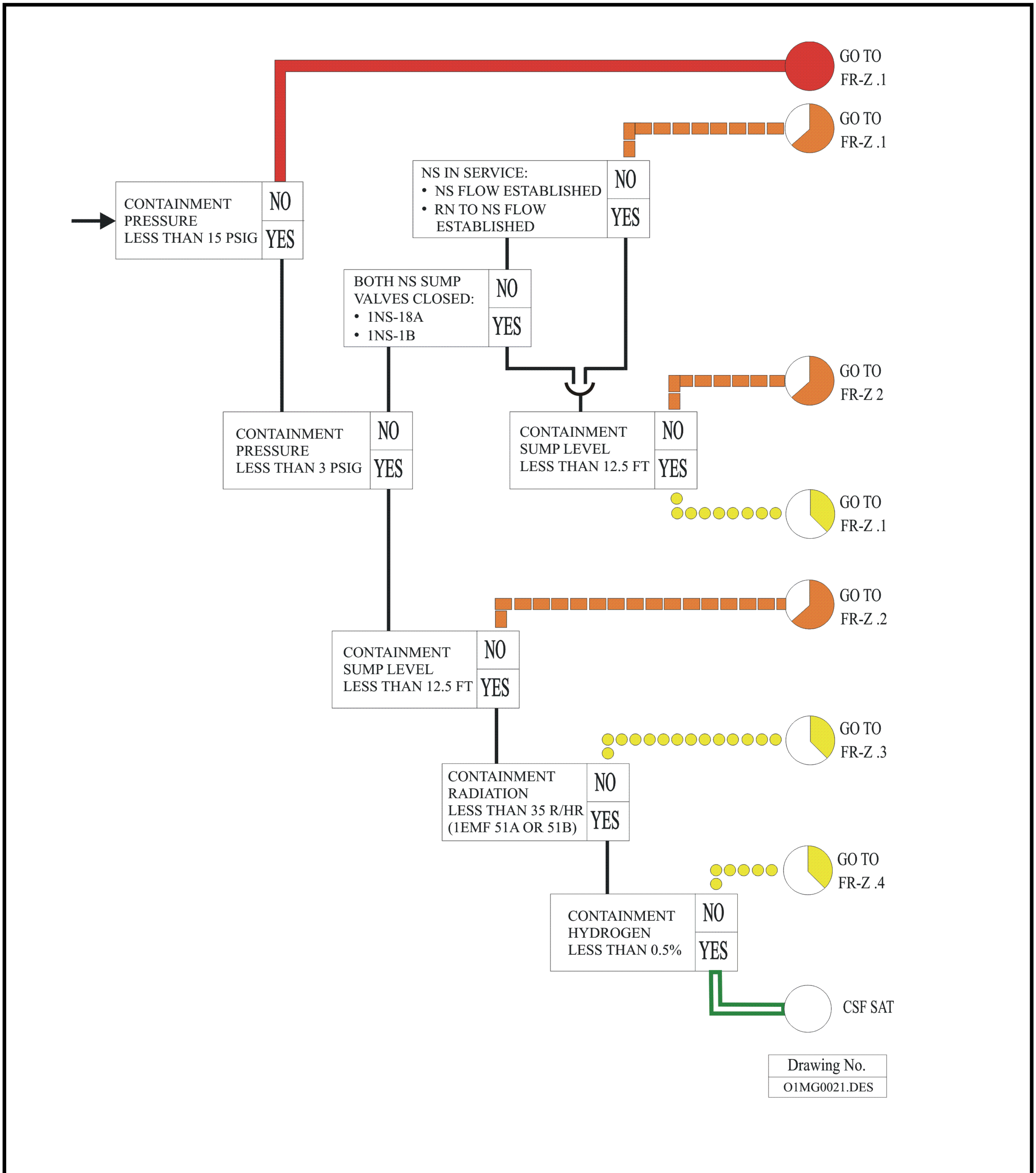
__ 4) Perform Steps 8.d through 8.g.

Q80 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
__ **1. Monitor Foldout Page.**	
2. Check NS System in operation as follows:	
__ a. Check containment pressure - GREATER THAN 3 PSIG.	__ a. **GO TO** Step 3.
__ b. Check "FWST LEVEL LO" alarm (95 inches) - LIT.	b. Perform the following: __ 1) **IF** FWST level has previously gone below 95 inches ("FWST LEVEL LO" alarm), **THEN GO TO** Step 2.c. __ 2) **IF AT ANY TIME** containment pressure is greater than 20 PSIG prior to reaching "FWST LEVEL LO" alarm setpoint (95 inches), **THEN** contact TSC to evaluate guidance to mitigate high containment pressure. __ 3) **GO TO** Step 3.
__ c. Check one train of NS operating with RN cooling established.	c. Perform the following: __ 1) **IF** either NS train had been previously started in EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirc), **THEN** ensure EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirc), Step 8.h is performed. __ 2) **IF** NS has remained off during this event, **THEN** ensure EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirc), Step 8 is performed.

Q80 References

MNS EP/1/A/5000/F-0 **UNIT 1**	CRITICAL SAFETY FUNCTION STATUS TREES Containment - Page 1 of 1	PAGE NO. 9 of 11 Rev. 6



Given the following:

- A LOCA has occurred on Unit 1 inside Containment
- Containment pressure is 11 PSIG
- ES-1.3 (Transfer to Cold Leg Recirc), has been implemented
- The 1A NS pump has been started

Subsequently:

- The 1A NS pump trips.

Based on the conditions above, which ONE of the following completes the statements below?

the current condition of the Containment Critical Safety Function is _____(1)_____.

alignment of 1B NS will be performed per _____(2)_____ .

PROCEDURE LEGEND:

FR-Z.1 (Response to High Containment Pressure)
ES-1.3 (Transfer to Cold Leg Recirc)

A. 1. RED
2. ES-1.3

B. 1. ORANGE
2. ES-1.3

C. 1. RED
2. FR-Z.1

D. 1. ORANGE
2. FR-Z.1

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EXAM BANK QUESTION: 6580 CNS

B

General Discussion

In accordance with ES-1.3 (TRANSFER TO COLD LEG RECIRC), a failure of NS with Containment pressure greater than 3 PSIG will cause a Containment orange path. However, ES-1.3 directs the operators to attempt to restore NS by performing actions in ES-1.3 prior to implementing FR-Z.1. If FR-Z.1 is entered, the procedure will direct operators back to ES-1.3 for the conditions given.

Answer A Discussion

The first part is plausible if the applicant confuses the Containment Critical Safety Function for a RED and ORANGE path. They could conclude that a loss of NS with Containment pressure greater than 3 PSIG would result in a RED path instead of an ORANGE path. This is plausible since the Containment CSF is one of the cases where both a RED path and ORANGE path lead to the same Functional Restoration Procedure.

The second part is correct.

Answer B Discussion

CORRECT. See explanation above.

Answer C Discussion

The first part is plausible if the applicant confuses the Containment Critical Safety Function for a RED and ORANGE path. They could conclude that a loss of NS with Containment pressure greater than 3 PSIG would result in a RED path instead of an ORANGE path. This is plausible since the Containment CSF is one of the cases where both a RED path and ORANGE path lead to the same Functional Restoration Procedure.

The second part is plausible because in most cases if a RED or ORANGE path is received, transition to FR-Z.1 would be the correct response. And, if the actions performed in ES-1.3 were unsuccessful, transition to FR-Z.1 would be required.

Answer D Discussion

The first part is correct.

The second part is plausible because in most cases if a RED or ORANGE path is received, transition to FR-Z.1 would be the correct response. And, if the actions performed in ES-1.3 were unsuccessful, transition to FR-Z.1 would be required.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge what type of alarm is going to be received (i.e. RED or ORANGE path on Containment) and the correct procedural response based on those conditions.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant must analyze the conditions given to determine the effect on the Containment Critical Safety Function.

Next, the applicant must recall from memory the required procedural actions based on the conditions given.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in the Clarification Guidance for SRO-only Questions Rev 1dated 03/11/2010 for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):
1) The question can NOT be answered solely by knowing systems knowledge. This question requires detail procedure knowledge and assessment of plant conditions related to procedure selection.
2) The question can NOT be answered by knowing immediate operator actions. This question is related to knowledge of procedure selection criteria within the body of the procedure.
3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs. These are not related to entry conditions for an EOP. This is related to differentiation between two procedures which would perform the same recovery actions and selection of the appropriate procedure based on plant conditions and specific procedural guidance.
4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure. This is detailed knowledge of procedure step guidance for appropriate procedure selection.
5) The question requires detailed knowledge of procedure content. It requires the applicant to assess plant conditions based on given information and select the appropriate procedure based on guidance within the body of the proceudre. Therefore, it is SRO knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	ILT15 CNS Audit Examination

Development References

References:
Z.1, Step 3.c
ES-1.3, Encl. 2, Step 8

Student References Provided

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EXAM BANK QUESTION: 6580 CNS

B

F-0, Containment Status Tree

KA	KA_desc
SYS026 2.4.31	SYS026 GENERICKnowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

A. Purpose

This procedure provides guidance on monitoring the Critical Safety Functions.

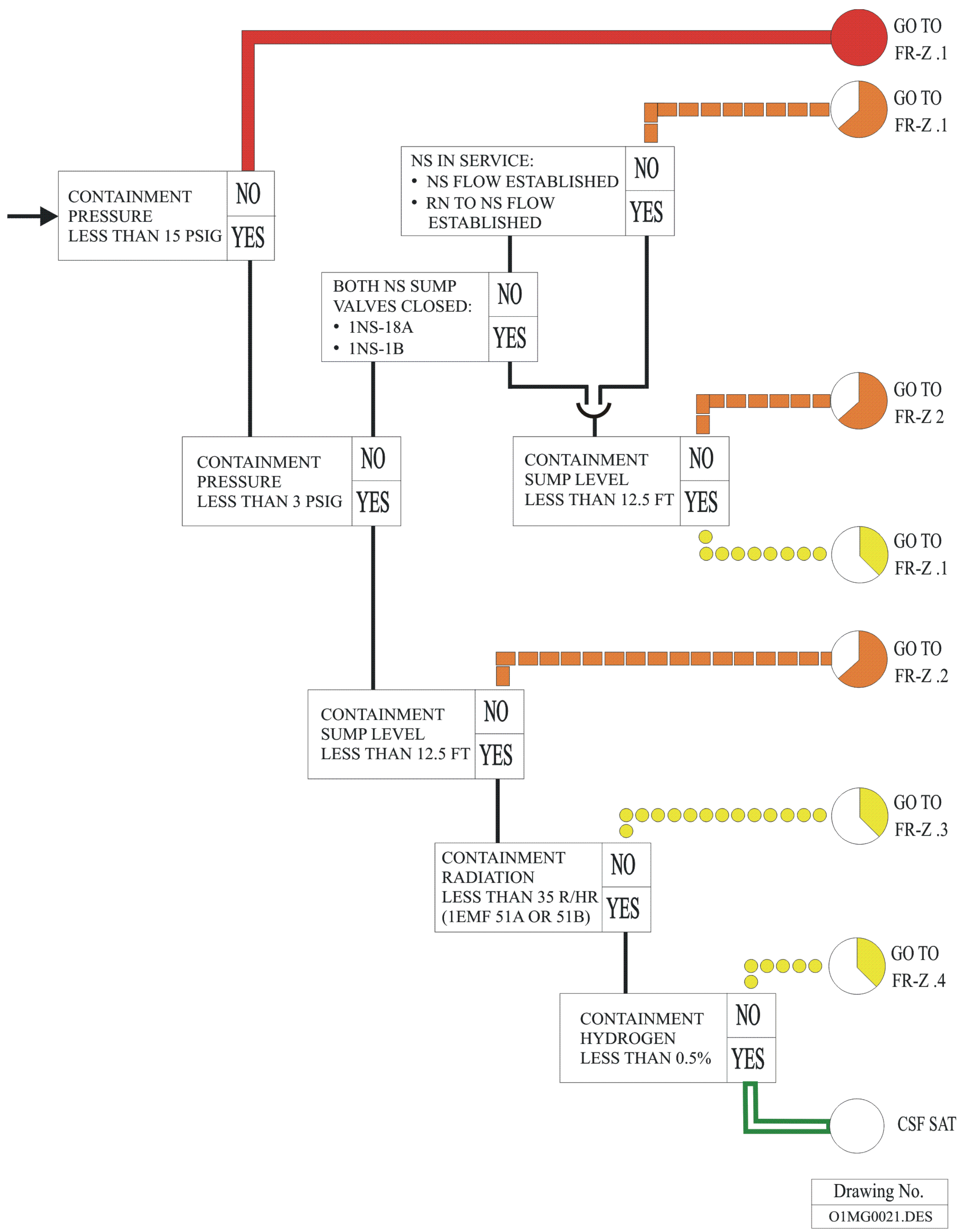
B. Symptoms or Entry Conditions

This procedure is entered from:

- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), when S/I cannot be terminated and cause has not been determined.
- On any transition out of EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).

Q81 References

MNS EP/1/A/5000/F-0 **UNIT 1**	CRITICAL SAFETY FUNCTION STATUS TREES Containment - Page 1 of 1	PAGE NO. 9 of 11 Rev. 6



MNS EP/1/A/5000/FR-Z.4 **UNIT 1**	RESPONSE TO HIGH CONTAINMENT HYDROGEN	PAGE NO. 1 of 2 Rev. 2

A. Purpose

This procedure provides actions to respond to a high containment H_2 concentration.

B. Symptoms or Entry Conditions

This procedure is entered from EP/1/A/5000/F-0 (Critical Safety Function Status Trees) (Containment), on a yellow condition.

Q81 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
__ 1. **Ensure operator dispatched to stop Unit 1 NF AHUs PER EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 28 (De-energizing Ice Condenser AHUs).**	
__ 2. **Check H_2 concentration - LESS THAN 6%.**	**Perform the following:** __ a. Obtain recommendation from station management to reduce H_2 concentration. __ b. **GO TO** Step 4.
__ 3. **Check H_2 igniters - ON.**	**WHEN the following conditions met, THEN place H_2 igniters in service:** __ • NF AHUs off __ • H_2 concentration less than 6%.
__ 4. **IF AT ANY TIME a significant change in H_2 concentration occurs, THEN ensure station management is informed.**	
__ 5. **RETURN TO procedure and step in effect.**	

END

A. Purpose

This procedure provides actions to recover from a loss of reactor or secondary coolant.

B. Symptoms or Entry Conditions

This procedure is entered from:

- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Step 20, EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink) Step 43, EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink) Step 45, and EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink) Step 46 when a Pzr PORV is stuck open and its isolation valve cannot be closed.
- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Step 24, with any of the following symptoms: high containment radiation, high containment pressure, or high containment sump level.
- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Step 44, EP/1/A/5000/ECA-2.1 (Uncontrolled Depressurization of All Steam Generators) Step 10 and EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink) Step 49, when NC pressure is less than the shutoff head pressure of the ND pumps.
- EP/1/A/5000/ES-1.1 (Safety Injection Termination) Step 11, EP/1/A/5000/ES-1.1 (Safety Injection Termination) Step 28, EP/1/A/5000/ES-1.1 (Safety Injection Termination), Foldout page, EP/1/A/5000/ECA-1.2 (LOCA Outside Containment) Step 18, and EP/1/A/5000/FR-I.2 (Response to Low Pzr Level) Step 7, if S/I has to be reinitiated.
- EP/1/A/5000/E-2 (Faulted Steam Generator Isolation) Step 13, after identification and isolation of a faulted S/G.
- EP/1/A/5000/ECA-0.2 (Loss of All AC Power Recovery With S/I Required) Step 24, after normal injection mode conditions are established.
- EP/1/A/5000/ECA-1.2 (LOCA Outside Containment) Step 5, EP/1/A/5000/ECA-1.2 (LOCA Outside Containment) Step 6, and EP/1/A/5000/ECA-1.2 (LOCA Outside Containment) Step 7, when a LOCA outside containment is isolated.
- EP/1/A/5000/FR-C.1 (Response to Inadequate Core Cooling), Step 23, EP/1/A/5000/FR-C.1 (Response to Inadequate Core Cooling), Step 33, and EP/1/A/5000/FR-C.2 (Response to Degraded Core Cooling) Step 24, after core cooling has been reestablished.
- EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink) Step 43, after secondary heat sink has been reestablished and all Pzr PORVs are closed.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

__ 1. **Monitor Foldout page.**

__ 2. **Check NC subcooling based on core exit T/Cs - GREATER THAN 0°F.**

IF any NV OR NI pump is on, THEN perform the following:

__ a. Ensure all NC pumps are off.

__ b. Maintain seal injection flow.

3. **Check main steamlines intact as follows:**

__ • All S/G pressures - STABLE OR GOING UP

__ • All S/Gs - PRESSURIZED.

IF any S/G pressure going down in an uncontrolled manner OR depressurized, THEN perform the following:

__ a. **IF** EP/1/A/5000/E-2 (Faulted Steam Generator Isolation) has been implemented for all faulted S/G(s), **THEN GO TO** Step 4.

__ b. **IF** any S/G is faulted, **THEN GO TO** EP/1/A/5000/E-2 (Faulted Steam Generator Isolation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. **Control intact S/G levels as follows:**	
__ a. Check N/R level in any intact S/G - GREATER THAN 11% (32% ACC).	__ a. Maintain total feed flow greater than 450 GPM until at least one intact S/G N/R level greater than 11% (32% ACC).
__ b. Check VI header pressure - GREATER THAN 60 PSIG.	__ b. **IF** CA control valves cannot be throttled in subsequent steps, **THEN** control flow **PER** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 16 (CA Flow Control With Loss Of VI).
__ c. THROTTLE feed flow to maintain all intact S/G N/R levels between 11% (32% ACC) and 50%.	__ c. **IF** N/R level in any intact S/G continues to go up in an uncontrolled manner, **THEN GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).
5. **Check secondary radiation normal as follows:**	
__ a. Check all S/Gs - INTACT.	a. **IF** any S/G(s) is faulted outside containment, **THEN** notify RP to perform the following: __ 1) Monitor area of steam fault for radiation. __ 2) Notify Control Room of survey results.
b. Notify RP to perform the following: __ • Frisk all Unit 1 S/G cation columns to determine if activity level is significantly higher for any S/G. __ • Notify Control Room of survey results.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
c. **WHEN** all survey results reported, **THEN** perform the following:	
__ 1) Check all S/G(s) activity levels - NORMAL.	1) Perform the following: __ a) Notify station management to evaluate S/G(s) survey results. __ b) **IF** S/G(s) activity indicate SGTR, **THEN GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).
d. Check secondary EMFs - NORMAL: __ • 1EMF-33 (Condenser Air Ejector Exhaust) __ • 1EMF-34(L) (S/G Sample (Lo Range)) __ • 1EMF-24 (S/G A) __ • 1EMF-25 (S/G B) __ • 1EMF-26 (S/G C) __ • 1EMF-27 (S/G D).	__ d. **GO TO** EP/1/A/5000/E-3 (Steam Generator Tube Rupture).

Q81 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. **Check Pzr PORVs and isolation valves:**	
__ a. Check all Pzr PORV isolation valves - ENERGIZED.	__ a. Evaluate cause of power loss and initiate actions to restore power to affected isolation valve(s).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

6. (Continued)

__ b. Check All Pzr PORVs - CLOSED.

b. **IF** Pzr pressure less than 2315 PSIG, **THEN** perform the following:

__ 1) CLOSE Pzr PORV(s).

2) **IF** any Pzr PORV cannot be closed, **THEN** perform the following:

__ a) CLOSE its isolation valve.

b) CLOSE the following valve(s):

__ • **IF** 1NC-32B failed, **THEN** CLOSE 1NC-271 (PZR PORV Drn Isol For 1NC-32B).

__ • **IF** 1NC-34A failed, **THEN** CLOSE 1NC-270 (PZR PORV Drn Isol For 1NC-34A).

__ • **IF** 1NC-36B failed, **THEN** CLOSE 1NC-269 (PZR PORV Drn Isol For 1NC-36B).

c) **IF** Pzr PORV isolation valve cannot be closed, **THEN** perform the following:

(1) Align N_2 to all Pzr PORVs as follows:

__ • OPEN 1NI-430A (Emerg N2 From CLA To 1NC-34A).

__ • OPEN 1NI-431B (Emerg N2 From CLA To 1NC-32B & 36B).

__ (2) CLOSE Pzr PORV.

Q81 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6. (Continued)	
__ c. Check at least one Pzr PORV isolation valve - OPEN.	__ c. OPEN one Pzr PORV isolation valve unless it was closed to isolate an open Pzr PORV.
__ d. **IF AT ANY TIME** any Pzr PORV opens due to high pressure, **THEN** after pressure goes below 2315 PSIG, ensure Pzr PORV CLOSES or is isolated.	
7. **Check S/I termination criteria:**	
__ a. NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	__ a. **GO TO** Step 7.f.
b. Secondary heat sink:	__ b. **GO TO** Step 7.f.
__ • N/R level in at least one intact S/G - GREATER THAN 11% (32% ACC)	
OR	
__ • Total feed flow to intact S/Gs - GREATER THAN 450 GPM.	
__ c. NC pressure - STABLE OR GOING UP.	__ c. **GO TO** Step 7.f.
__ d. Pzr level - GREATER THAN 11% (29% ACC).	d. Perform the following:
	__ 1) **IF** NC pressure going up, **AND** Pzr spray available, **THEN** try to stabilize NC pressure using normal Pzr spray.
	__ 2) **GO TO** Step 7.f.
__ e. **GO TO** EP/1/A/5000/ES-1.1 (Safety Injection Termination).	
__ f. Monitor S/I termination criteria **PER** Enclosure 2 (S/I Termination Criteria) while in this procedure.	
__ g. **IF AT ANY TIME** while in this procedure S/I termination criteria are met, **THEN RETURN TO** Step 7.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8. **Check if ND pumps should be stopped:**	
__ a. NC pressure - GREATER THAN 275 PSIG.	__ a. **GO TO** Step 10.
__ b. NC pressure - STABLE OR GOING UP.	__ b. **GO TO** Step 9.
__ c. Any ND pump - ON.	__ c. **GO TO** Step 8.h.
__ d. Running ND pumps suction - ALIGNED TO FWST.	__ d. **GO TO** Step 9.
e. Reset the following:	
__ 1) S/I.	__ 1) Reset S/I **PER** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 23 (Local Reset of S/I Signal).
__ 2) Sequencers.	2) Dispatch operator to OPEN affected sequencer control power breaker: __ • A Train - 1EVDA Breaker 6 __ • B Train - 1EVDD Breaker 8.
__ f. Stop ND pumps.	
__ g. **IF AT ANY TIME** a B/O signal occurs, **THEN** restart S/I equipment previously on.	
__ h. **IF AT ANY TIME** NC pressure goes below 275 PSIG in an uncontrolled manner, **THEN** restart ND pumps.	

Q81 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. **Check NC and S/G pressures:**	
__ a. All S/G pressures - STABLE OR GOING UP.	__ a. **IF** any S/G pressure going down due to a faulted S/G, **THEN RETURN TO** Step 1.
__ b. NC pressure - STABLE OR GOING DOWN.	__ b. **RETURN TO** Step 1.

Q81 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. **Check if D/Gs should be stopped:**	
__ a. Any D/G - ON.	__ a. **GO TO** Step 11.
b. Check 1ETA energized by offsite power as follows: __ • 1ETA Emergency Breaker - OPEN __ • 1ETA - ENERGIZED.	__ b. Attempt to restore offsite power to affected switchgear **PER** AP/1/A/5500/07 (Loss of Electrical Power).
c. Check 1ETB energized by offsite power as follows: __ • 1ETB Emergency Breaker - OPEN __ • 1ETB - ENERGIZED.	__ c. Attempt to restore offsite power to affected switchgear **PER** AP/1/A/5500/07 (Loss of Electrical Power).
d. Reset the following:	
__ 1) S/I.	__ 1) Reset S/I **PER** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 23 (Local Reset of S/I Signal).
__ 2) Sequencers.	2) Dispatch operator to OPEN affected sequencer control power breaker: __ • A Train - 1EVDA Breaker 6 __ • B Train - 1EVDD Breaker 8.
__ e. **IF AT ANY TIME** a B/O signal occurs, **THEN** restart S/I equipment previously on.	
f. Dispatch operator to stop unloaded D/G(s) and place in standby readiness **PER** OP/1/A/6350/002 (Diesel Generator): __ • Enclosure 4.3 (1A D/G Shutdown) __ • Enclosure 4.4 (1B D/G Shutdown).	

Q81 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. **Check containment H_2 concentration:**	
__ a. Ensure operator dispatched to stop Unit 1 NF AHUs **PER** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 28 (De-energizing Ice Condenser AHUs).	
__ b. Check H_2 analyzers - IN SERVICE.	b. Perform the following: __ 1) Dispatch operator to place H_2 analyzers in service **PER** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 5 (Placing H_2 Analyzers In Service). __ 2) **WHEN** H_2 analyzers in service, **THEN** complete Steps 11.c and 11.d. __ 3) **GO TO** Step 12.
__ c. Check H_2 concentration - LESS THAN 6%.	c. Perform the following: __ 1) Obtain recommendation from station management to reduce H_2 concentration. __ 2) **GO TO** Step 12.
__ d. Check H_2 Igniters - ON.	d. **WHEN** the following conditions met, **THEN** place H_2 igniters in service: __ • NF AHUs off __ • H_2 concentration less than 6%.

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EXAM BANK QUESTION: 7188 CNS **B**

Given the following Unit 1 conditions:

- The crew is performing steps in EP/1/A/5000/E-1 (Loss of Reactor or Secondary Coolant) following LOCA
- Containment Pressure is 2.2 psig
- Containment Sump Level is 10.6 ft
- Containment Radiation is 28 R/Hr
- Containment Hydrogen Concentration is 6.8%

Per the Containment CSF status tree, MINIMUM requirements for entry into EP/1/A/5000/FR-Z.4 (Response to High Containment Hydrogen Concentration) _____(1)_____ met.

Based on above listed conditions, the crew _____(2)_____ energize Hydrogen Ignitors.

Which ONE of the following completes the statements above?

A. 1. are
   2. will

B. 1. are
   2. will NOT

C. 1. are NOT
   2. will

D. 1. are NOT
   2. will NOT

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EXAM BANK QUESTION: 7188 CNS **B**

General Discussion

Per F-0, the following parameters are required for entry into FR-Z.4:
Containment Pressure < 3 psig
Containment Sump Level < 15.5 ft
Containment Radiation Level < 35 R/hr
Containment Hydrogen > 0.5%

E-1 and FR-Z.4 will only direct energizing hydrogen ignitors if Containment Hydrogen concentration is < 6%. Otherwise, station management will be consulted for recommendation of other methods.

Answer A Discussion

Part 1 is correct.

Part 2 is plausible if the applicant is unaware of the high Containment Hydrogen limit and the applicant reasons that a higher concentration would require use of the Hydrogen Ignitors.

Answer B Discussion

CORRECT. See explanation above.

Answer C Discussion

Part 1 is plausible if the applicant is unaware of the additional parameters (beyond H2 concentration) required in order to meet FR-Z.4 entry. For example, Containment Radiation >35 would result in FR-Z.2 entry and bypass this CSF function. Additionally, multiple EPs provide H2 control guidance following a LOCA which could lead one to reason this procedure would not necessarily be required for mitigation.

Part 2 is plausible if the applicant is unaware of the high Containment Hydrogen limit and the applicant reasons that a higher concentration would require use of the Hydrogen Ignitors.

Answer D Discussion

Part 1 is plausible if the applicant is unaware of the additional parameters (beyond H2 concentration) required in order to meet FR-Z.4 entry. For example, Containment Radiation >35 would result in FR-Z.2 entry and bypass this CSF function. Additionally, multiple EPs provide H2 control guidance following a LOCA which could lead one to reason this procedure would not necessarily be required for mitigation.

Part 2 is correct.

Basis for meeting the KA

The applicant is required to demonstrate the ability to use procedures to mitigate the actions of a high containment hydrogen concentration through knowledge of the operation of the HRPS system.

Basis for Hi Cog

This question requires more than one mental step:
1. The applicant must compare provided information with that recalled from memory in order to determine entry requirements for a CSF recovery procedure.
2. The applicant must compare provided information with that recalled from memory in order to determine proper operation of the Hydrogen Ignitor system.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG 1021, Rev. 10, ES-401, Attachment 2 (Assessment and selection of procedures):
1) This question can NOT be answered solely by knowing systems knowledge.
2) This question can NOT be answered by knowing immediate operator actions.
3) This question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.
4) This question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure.

This question requires knowledge of yellow path CSF entry criteria (SRO only) and detailed knowledge of the associated procedure.

CSF Yellow Path entry criteria (with no reference provided) is considered SRO ONLY knowledge at CNS. CNS Operations line representative concurs with this statement.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	ILT-17 NRC Written Exam CNS NRC Examination

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EXAM BANK QUESTION: 7188 CNS

B

Development References
EP/1A/5000/F-0 (Critical Safety Function Status Trees), Rev. 9, Pg. 9 EP/1/A/5000/FR-Z.4 (Response to High Containment Hydrogen Concentration), Rev. 2, Step 2 EP/1/A/5000/E-1 (Loss of Reactor or Secondary Coolant), Rev. 30, Step 13

Student References Provided

KA	KA_desc
SYS028 A2.03	Malfunctions or operations on the HRPS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)The hydrogen air concentration in excess of limit flame propagation or detonation with resulting equipment damage in containment ....

Duke Energy McGuire Nuclear Station **CONTAINMENT PURGE SYSTEM**	Procedure No. OP/**1**/A/6450/015
	Revision No. 041
Continuous Use	Electronic Reference No. MC00475D

1. Limits and Precautions

1.1 When all Reactor Missile Shields are installed, the "Normal - Refuel Selector Switch" shall be in "NORM" to prevent over pressurizing upper Containment.

1.2 Maximum VP exhaust rate shall be below recommended release rate of GWR. [NCR1691812]

1.3 In Modes 5 and 6, 1EMF-39(L) shall be operable during VP releases.

1.4 VP System may be operated in No Mode with 1EMF-39 inoperable.

2. Initial Conditions

None

3. Procedure

☐ 3.1 Evaluate all outstanding Clearances that may impact performance of this procedure.

NOTE:	For Containment Airlock doors to be secured the door is either positioned open or closed and movement or operation of the door is restricted by use of chain and lock or designated personnel in position if opened. If closed with seals inflated, then operation of the door shall be restricted by designated personnel.

_____ 3.2 **<u>IF</u>** securing VP with airlock doors closed **<u>OR</u>** will be closed,
<u>THEN</u> perform the following: [NCR01572661]

_____ SRO 3.2.1 Evaluate effect on containment pressure due to continuous air input from outage related activities including use of VS, VB **<u>AND</u>** portable air compressors.

_____ SRO 3.2.2 Ensure VQ GWR paperwork prepared for anticipated VQ releases.

_____ 3.3 **<u>IF</u>** VP Supply Cooling Coil in service,
<u>THEN</u> notify HVAC to secure per MP/0/B/7450/023 (Service Building / Computer Room Ventilation System Startup and Shutdown) **<u>OR</u>** MP/0/A/7450/047 (Operation of Waste Handling Ventilation Units).

____________________________ ______/______
Person Notified Date Time

_____ CCC 3.4 Notify Containment Closure Coordinator of Unit 1 VP System shutdown.

_____ 3.5 **IF** Reactor Building YH required due to outside temperature,
THEN check in "AUTO" on 1RB-ECP-1 Control Panel: (AB, 767', PP-54)

- ☐ RB1-P-1 (A Reactor Bldg Heating Water Secondary Pump)
- ☐ RB1-P-1A (B Reactor Bldg Heating Water Secondary Pump)
- ☐ RB1-P-2 (C Reactor Bldg Heating Water Secondary Pump)
- ☐ RB1-P-2A (D Reactor Bldg Heating Water Secondary Pump)

_____ 3.6 Place "Unit 1 VP Sup & Exh Fan Mode Select" to "OFF". (Control Rm HVAC Panel)

3.7 Check the following dark:

- ☐ VP to Upper Cont Supply #1 Open
- ☐ VP to Upper Cont Supply #2 Open
- ☐ VP from Upper Cont Exh #1 Open
- ☐ VP from Upper Cont Exh #2 Open
- ☐ VP from Lower Cont Exh Open
- ☐ VP to Lower Cont Supply #1 Open
- ☐ VP to Lower Cont Supply #2 Open

3.8 Check "Unit 1 VP Cont Otsd Isol" lit:

- ☐ Upper Clsd
- ☐ Lower Clsd

3.9 Check "Unit 1 VP Cont Insd Isol" lit:

- ☐ Upper Clsd
- ☐ Lower Clsd

_____ 3.10 Place 1VPMSS-1 (Normal-Refuel Selector Switch) to "NORM" on local control panel 1RB-CP-1. (AB, 767', NN-54)

☐ 3.11 Record release stop date / time on GWR.

☐ 3.12 Record **AND** CV "Total Vol. Rel" on GWR.

_____ 3.13 Notify RP to evaluate 1EMF-38, 39, **AND** 40 setpoints due to VP release being secured. [NCR01691638]

_____ 3.14 **IF** VP being shutdown following an outage, prior to Mode 4,
THEN open the following:

- _____ 1MXJ-4E (1A Containment Purge Exhaust Fan Motor)
- _____ 1MXJ-5F (1A Containment Purge Supply AHU Motor)
- _____ 1MXK-F3C (1B Containment Purge Exhaust Fan Motor)
- _____ 1MXK-F1D (1B Containment Purge Supply AHU Motor)

3.15 Using key #178, place to "CLOSED": (Control Room HVAC Panel)

_____ • 1A VP Lower Cont Purge Isol
_____ • 1B VP Lower Cont Purge Isol

3.16 Remove Info Stickers from the following valves that state "Do **NOT** close while VP System in service."

☐ 1VI-362A (VI Supply to VP Inside Isol)
☐ 1VI-148B (VI Supply Hdr to Unit 1 Cont Bldg Outside Isol)

NOTE:	Steps 3.17 and 3.18 may be performed concurrently or in any order

_____ 3.17 Notify SRO in charge of testing to complete PT/1/A/4200/001 N (VP Valve Leak Rate Test) on associated valve penetrations.

_____ 3.18 Ensure Lower Ice Condenser Inlet Door blocks removed, model WO #00396786.
SRO

End of Enclosure

1. Limits and Precautions

1.1 When all Reactor Missile Shields are installed, the "Normal - Refuel Selector Switch" shall be in "NORM" to prevent over pressurizing upper Containment.

1.2 Maximum VP exhaust rate shall be below recommended release rate of GWR. [NCR1691812]

1.3 In Modes 5 and 6, 1EMF-39(L) shall be operable during VP releases.

1.4 VP System may be operated in No Mode with 1EMF-39 inoperable.

1.5 Starting VP System with both Airlock doors open and flange removed at 1FW-76 (Unit 1 Refueling Cavity Flush Drn) may increase contamination levels around "A" CFAE Sump.

2. Initial Conditions

_____ 2.1 VP in operation.

3. Procedure

☐ 3.1 Evaluate all outstanding Clearances that may impact performance of this procedure.

NOTE:	• At this point, the GWR paperwork for the VP System is valid. The VP System can be started and stopped as often as desired as long as the GWR paperwork remains valid. • Phone mail message is acceptable for HVAC notification.

_____ 3.2 Notify HVAC of temporary shutdown of Unit 1 VP.

_______________________ _____/_____
Person Notified Date Time

_____ 3.3 Notify RP of temporary shutdown of Unit 1 VP, **AND** to evaluate the need for new GWR paperwork.

_______________________ _____/_____
Person Notified Date Time

_____ 3.4 Notify Containment Closure Coordinator that Unit 1 VP will be temporarily shutdown.
CCC

☐ 3.5 Record "as found" position of "Unit 1 VP Sup & Exh Fan Mode Select": ____________.

_____ 3.6 Place "Unit 1 VP Sup & Exh Fan Mode Select" to "OFF".

3.7 Check "OFF" lit:

- ☐ 1A VP Exhaust Fan
- ☐ 1B VP Exhaust Fan
- ☐ 1A VP Supply Fan
- ☐ 1B VP Supply Fan

☐ 3.8 Record time VP shutdown on GWR paperwork.

______ 3.9 **IF** VP will **NOT** be restarted **OR** is being secured due to 1EMF 38/39/40 package being inoperable,
THEN shutdown per Enclosure 4.3 (VP System Shutdown).

______ 3.10 **HOLD** until VP to be restarted, then perform the following:

______ 3.10.1 Notify RP to ensure GWR paperwork will allow restart of Unit 1 VP.

______________________________ ______/______
Person Notified Date Time

______ 3.10.2 Notify Containment Closure Coordinator that Unit 1 VP will be restarted.
CCC

______ 3.10.3 Return "Unit 1 VP Sup & Exh Fan Mode Select" to position recorded in Step 3.5.

3.10.4 Check "ON" lit for selected train:

- ☐ VP Supply Fan
- ☐ VP Exhaust Fan

______ 3.10.5 **IF** necessary,
THEN adjust the following to desired flow rate of GWR paperwork:

______ ______ • 1VPMPS-5 (1RBPS-D-5 & 1RBPS-D-6 Normal Operation)
CV

______ ______ • 1VPMPS-6 (1RBPE-D-4 & 1RBPE-D-5 Normal Operation)
CV

☐ 3.10.6 Record VP start time on GWR paperwork.

End of Enclosure

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.3 Dose - Liquid Effluents

COMMITMENT

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released from each unit to UNRESTRICTED AREAS (see Figure16.11.1-1) shall be limited:

a. During any calendar quarter, to $\leq$ 1.5 mrem to the total body and to $\leq$ 5 mrem to any organ, and

b. During any calendar year, to $\leq$ 3 mrem to the total body and to $\leq$ 10 mrem to any organ.

APPLICABILITY

At all times.

REMEDIAL ACTIONS

---NOTES---

Enter applicable Conditions and Required Actions of SLC 16.11.12, "Total Dose," when the limits of this SLC are exceeded by twice the specified limit.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Calculated dose from release of radioactive materials in liquid effluents exceeding above limits.	---------------------NOTE-------------- The Special Report shall include the results of radiological analyses of the drinking water source, and the radiological impact on finished drinking water supplies with regard to the requirements of 40 CFR 141, Safe Drinking Water Act, as applicable. --	
	A.1 Prepare and submit a Special Report to the NRC which identifies the causes for exceeding the limits, corrective actions taken to reduce releases, and actions taken to ensure that subsequent releases are within limits.	30 days

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.3.1 Determine cumulative dose contributions from liquid effluents for current calendar quarter and current calendar year in accordance with the methodology and parameters in the ODCM.	31 days

BASES

This commitment is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10 CFR Part 50. The commitment implements the guides set forth in Section II.A of Appendix I. The REMEDIAL ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." Also, for fresh water sites with drinking water supplies that can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are in excess of the requirements of 40 CFR Part 141. These requirements are applicable only if the drinking water supply is taken from the river 3 miles downstream of the plant discharge.

The dose calculation methodology and parameters in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

This commitment applies to the release of liquid effluents from each unit at the site. For units with shared Radwaste Treatment Systems, the liquid effluents from the shared system are to be proportioned among the units sharing that system in accordance with the guidance given in NUREG-0133, Chapter 3.1.

REFERENCES

1. McGuire Nuclear Station, Off site Dose Calculation Manual

2. 40 CFR Part 141, Safe Drinking Water Act

3. 10 CFR Part 50, Appendix I

4. Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977.

5. Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

Reference Use

MCGUIRE UNIT 0

TECHNICAL PROCEDURE (RESPONSE)

RP/0/A/5700/010

NRC IMMEDIATE NOTIFICATION REQUIREMENTS

REVISION 031

Special Considerations:

AP/EP/FSG Support Procedure: Requires additional EP/AP/FSG support review

Q83 References

<< Events Requiring NRC Notification >>

4.1.1	**Events Requiring Immediate Notifications: Reportable Events Corresponding 10CFR Section in Brackets [ ]**	**Reporting Time Requirements**	
4.1.1.1 [50.72(a)(l)(i)]	The declaration of any of the Emergency Classes specified in the McGuire Emergency Plan	4.1.1.1	Immediately after notification to state(s) **AND** local government (counties) **AND** **NOT** later than one hour after the time the Emergency Class was declared. Immediately **report** any change from one Emergency Class to another **OR** a termination of the Emergency Class (**Use** Attachment 2). **See** follow up requirements in Heading 4.1.6
	OR		
[50.72(c)(1)(ii)]	any change from one Emergency Class to another		
	OR		
[50.72(c)(1)(iii)]	a termination of the Emergency Class		
4.1.1.2 [20.1906]	Events involving receiving **AND** opening packages containing quantities of radioactive material in excess of a Type A quantity as defined in section 71.4 **AND** Appendix A to Part 71 of this chapter when;	4.1.1.2	**NOTE:** Reporting under 10CFR20.1906 should be made as follows, the licensee shall immediately notify the final delivery carrier **AND** by telephone **AND** telegram, mailgram, **OR** facsimile **AND** the NRC Operations Center at 9-301-816-5100.
[20.1906(d)(1)]	1) Removable radioactive surface contamination exceeds the limits of section 71.87(i) of 10CFR20;		
	OR		
[20.1906(d)(2)]	2) External radiation levels exceed the limits of section 71.47 of 10CFR20.		

<< Events Requiring NRC Notification >>

4.1.1	**Events Requiring Immediate Notifications: Reportable Events Corresponding 10CFR Section in Brackets [ ]**	**Reporting Time Requirements**	
4.1.1.3 [20.2201(a)(i)]	Any lost, stolen, **OR** missing licensed material in an aggregate quantity equal to **OR** greater than 1,000 times the quantity specified in Appendix C to Part 20 under such circumstance that it appears to the licensee that an exposure could result to persons in unrestricted areas.	4.1.1.3	Immediately after its occurrence becomes known to the licensee.
	OR		
[20.2201(a)(ii)]	3) Within 30 days after occurrence of any lost, stolen, **OR** missing licensed material becomes known to the licensee, all licensed material in a quantity greater than 10 times the quantity specified in Appendix C to Part 20 that is still missing at this time.		
4.1.1.4 [20.2202(a)]	Any event involving by-product, source, **OR** special nuclear material possessed by the licensee that may have caused **OR** threatens to cause any of the following conditions: An individual to receive:	4.1.1.4	Immediately after its occurrence becomes known to the licensee
[20.2202(a)(1)(i)]	1) A total effective dose equivalent of 25 rems (0.25 Sv) **OR** more;		
	OR		
[20.2202(a)(1)(ii)]	2) A lens dose equivalent of 75 rems (0.75 Sv) **OR** more.		
	OR		
[20.2202(a)(1)(iii)]	3) A shallow-dose equivalent to the skin **OR** extremities of 250 rads (2.5 Gy) **OR** more.		
	OR		
[20.2202(a)(2)]	4) The release of radioactive material, inside outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake five times the annual limit on intake (the provisions of this paragraph do **NOT** apply to locations where personnel are **NOT** normally stationed during routine operations, such as hot-cells **OR** process enclosures).		

Title:	**FR-S, RESPONSE TO NUCLEAR POWER GENERATION / ATWS**						
Number: OP-MC-EP-FRS			Revision: 14				Program: RO/SRO/LOCT
Time Required:	AO	AOCT	RO	SRO	LOCT		Prerequisites: None
	N/A	N/A	.75	.75	.75	Hrs.	

Overview:

This lesson will discuss the procedures in the Subcriticality (FR-S) series.

References:

1. WOG Emergency Response Guidelines
2. MNS Deviation Document
3. EP/1/A/5000/FR-S.1, Response to Nuclear Generation / ATWS
4. EP/1/A/5000/FR-S.2, Response to Loss of Core Shutdown

Operating Experience:
Salem 1 Reactor Trip Breakers Failed to Open

Recommended Evaluation Method:
Written Exam

Commitments Tracking:
None

Training Aids:

Listing of classroom audio-visual resources needed to stage and conduct the training

- Classroom projector
- Smartboards (optional)

Operator Fundamental Focus; Knowledge
***Reinforce** the knowledge required to determine if the reactor is tripped by asking the class participants which indications are monitored IAW FRP-S.1. The answer is "All rod bottom lights – lit, Reactor trip and bypass breakers – open and I/R %PWR – going down".*

STEP 2 Check Turbine Trip: (IMMEDIATE ACTION)

PURPOSE: To ensure that the turbine is tripped.

BASIS: The turbine is tripped to prevent an uncontrolled cooldown of the RCS due to steam flow that the turbine would require. For an ATWS event where a loss of normal feedwater has occurred, analyses have shown that a turbine trip is necessary (within 30 seconds) to maintain S/G inventory. For other ATWS events, manual tripping of the turbine may yield a higher system pressure than would otherwise occur. However, this action has been determined to be necessary due to the analytical results discussed earlier. Since there are many initiating ATWS events and some that require immediate mitigating actions, diagnosis of the initiating event would not be feasible and separate guidance for different ATWS events would complicate training and could delay timely performance of necessary operator actions.

If the turbine will not trip, a turbine runback (manual lowering of load) at maximum rate will also reduce steam flow in a delayed manner. If the turbine stop valves cannot be closed by either trip or runback, the MSIVs and MSIV bypass valves should be closed.

STEP 3 Monitor foldout page.

PURPOSE: Remind the operators to monitor the Foldout Page.

BASIS: The Foldout Page contains three items:

1. Transfer to Cold Leg Recirculation if FWST low level is reached. This operator action is required no matter what EP is in effect to ensure the transfer is accomplished without delay.
2. CA Suction Source Monitoring.
3. Criteria for isolating and unisolating the NV Pump Recirculation Isolation Valves (NV-150 and NV-151).

STEP 4 Check proper CA pump status:

PURPOSE: To ensure proper CA pump status.

BASIS: The MD CA pumps start automatically on an S/I signal and S/G low level to provide feed to the S/Gs for decay heat removal. If S/G levels drop below 17%, the TD CA pump will also automatically start to supplement the MD pumps.

STEP 5 Initiate emergency boration of NC System:

Direct manner of adding negative reactivity to the core. The intended boration path here is the most direct one available, not requiring S/I initiation, but using the normal NV pump(s). Charging flow is verified to be greater than emergency boration flow to ensure

Q84 References

Duke Energy McGuire Nuclear Station **Use Of Emergency And Abnormal Procedures And FLEX Support Guidelines**	Document No. **OMP 4-3**
	Revision No. 047
Information Use	Electronic Reference No. MP0070PK

7.8 ATWS

An ATWS (Anticipated Transient Without Scram) is defined in 10 CFR 50.62 as an anticipated operational occurrence followed by the failure of the reactor trip portion of the protective system. An anticipated operational occurrence is defined in 10 CFR 50, Appendix A, as those conditions of normal operation which are expected to occur one or more times during the life of the nuclear power unit and include but are **NOT** limited to loss of power to all NC pumps, tripping of the turbine generator, isolation of the main condenser and loss of all offsite power. Clearly, to have an ATWS there must be transient followed by a failure of the reactor trip breakers.

Instrument failures, by themselves, are **NOT** necessarily transients. For example, if one channel of Power Range Nuclear Instrument was out of service for preventive maintenance (bistable in tripped condition) and if another Power Range Nuclear Instrument channel failed, a reactor trip signal would be generated. **IF** the reactor failed to trip, this would be a failure of the reactor trip breakers and the automatic trip features of the reactor protection system and **NOT** an ATWS event. Obviously, the control operators would have to recognize and check that the channel failure was indeed a channel failure by checking the other two channels in this example. This would, however, force OPS to shutdown the affected unit to at least Hot Standby per Tech Specs.

7.9 Adverse Containment Setpoints

Many setpoints in the EPs are presented in a dual format with a second setpoint enclosed in parentheses. This second setpoint is used to account for the additional error in the setpoint due to the containment environment following a high-energy line break. The setpoint in parentheses will be used whenever containment pressure has exceeded 3 psig.

Duke Energy McGuire Nuclear Station **Annunciator Response For Panel 1FO-1**	Procedure No. **OP/1/A/6100/010 A**
	Revision No. **014**
Reference Use	Electronic Reference No. **MC00472V**

PERFORMANCE

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(ISSUED) - PDF Format

Nomenclature:	LO FLO P7 PERMIS RX TRIP	Window:	F3

Setpoint: 2/4 NC Loops flow less than 88% with Reactor Power greater than P-7 Setpoint (10% F.P.).

Origin:

1. 2/3 NC flow channels on 2/4 NC loops indicating flow is less than 88%
   (Loop A: MC1NCFT-5000, 5010 and 5020)

   (Loop B: MC1NCFT-5030, 5040 and 5050)

   (Loop C: MC1NCFT-5060, 5070 and 5080)

   (Loop D: MC1NCFT-5090, 5100 and 5110)

2. P-7 Setpoint (2/4 N41, 42, 43, 44 or 1/2 Turbine Inlet Pressure Channels indicating greater than 10% F.P.).

Probable Cause: Reactor Coolant Pump(s) Breakers open.

Automatic Action: Reactor trip.

Immediate Action:

1. Ensure Automatic Actions occur.

2. Go to EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).

Supplementary Action: None

References:

- McGuire UFSAR
- Tech Spec Amendment 191
- EC 105124

End Of Response

Q84 References

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.4 RCS Loops — MODES 1 and 2

LCO 3.4.4 Four RCS loops shall be OPERABLE and in operation.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of LCO not met.	A.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.4.1 Verify each RCS loop is in operation.	In accordance with the Surveillance Frequency Control Program

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EPE007 EA2.04 - Reactor Trip

Ability to determine or interpret the following as they apply to a reactor trip: (CFR 41.7 / 45.5 / 45.6)

If reactor should have tripped but has not done so, manually trip the reactor and carry out actions in ATWS EOP

....

Given the following on Unit 1:

- Unit is at 30% RTP
- NC pump 1C trips due to mis-operation during I&E testing
- Five minutes after the 1C NCP trip, a lockout occurs on 1A Busline due to a fault
- The Reactor Trip breakers remain closed

1) Which ONE (1) of the following describes the plant response?

2) For the conditions described above, which ONE (1) of the following is a subsequent action required and the basis for this action?

PROCEDURE LEGEND:

TECHNICAL SPECIFICATION 3.4.4 (RCS LOOPS MODES 1 & 2)

A. 1. An ATWS is in progress.
   2. Manually trip the turbine to conserve SG inventory.

B. 1. An ATWS is in progress.
   2. Manually trip the turbine to generate a redundant reactor trip signal.

C. 1. 1TA and 1TC auto-swap.
   2. Restart 1C NC pump within 6 hours to comply with TS 3.4.4.

D. 1. 1TA and 1TC auto-swap.
   2. Place the unit in MODE 3 within 6 hours to comply with TS 3.4.4.

General Discussion

For the conditions given, because the 1C NC pump has tripped prior to 1A Busline Lockout, a slow transfer of 1TA and 1TC will occur. The slow transfer will result in an underfrequency condition on 1TA and 1TC which will cause all four NC pumps to trip. This results in a reactor trip signal. Since the reactor trip breakers remain closed, an ATWS condition exists.

One of the actions required for the ATWS condition is to manually trip the main turbine to converse inventory in the SGs. The worse case ATWS scenario is a failure of the reactor to trip coincident with a loss of heat sink.

Had the 1B or 1D NC pump tripped prior to the 1A Busline Lockout, a fast transfer of the 1TA and 1TC busses would have occurred, no underfrequency condition would have occurred, and the remaining NC pumps would still be running. Therefore, an ATWS condition would not exist. However, since the unit would be in MODE 1 with less than 4 NC loops in service, a shutdown to MODE 3 within 6 hours would be required IAW TS 3.4.4.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is correct.

Part 2 is plausible because tripping the turbine would provide a redundant reactor trip signal.

Additionally, because manually initiating a protective feature to cause another protective feature to actuate is SOMETIMES true in the EOPs, licensed operators often conclude that the basis for manually initiating a protective feature (i.e. turbine trip, reactor, safety injection) is to cause another protective feature to occur is true when it is not. For example, in ECA-0.0 (Loss of All AC Power), one of the actions taken it to initiate Safety Injection. The basis for this is to generate a LOCA signal to the sequencer which may start the DG.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant concludes conditions are met for a fast transfer of 1TA and 1TC. If that were the case the auto-swap would occur and no ATWS condition would exist.

Part 2 is plausible because if the pump were restarted, the unit would be in compliance with TS 3.4.4. However, since reactor power is greater than 25% RTP, restarting the NC pump is not allowed.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant concludes conditions are met for a fast transfer of 1TA and 1TC. If that were the case the auto-swap would occur and no ATWS condition would exist.

Part 2 is plausible because if a fast transfer of 1TA and 1TC occurred, this would be the correct action.

Basis for meeting the KA

This K/A is matched because the applicant is being asked to evaluate (interpret) a set of plant conditions and determine whether or not an ATWS has occurred. He is then asked about actions contained in the ATWS EOP (Immediately tripping the main turbine) and the reason for that action.

Basis for Hi Cog

This question is Hi Cog because it requires more than one mental step. First, the applicant must evaluate a complex set of conditions and determine whether the reactor should have tripped. Next, the applicant must recall from memory the actions that are required by procedure for the conditions that exist, and the basis for those actions.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?

NO. While there is a systems knowledge aspect to the first part of the question, the applicant must also have knowledge of the administrative requirements of OMP 4-3 to understand if the conditions constitute and ATWS condition. The second part of the question cannot be answered with systems knowledge.

2) Can the question be answered solely by knowing immediate operator actions? NO. For the correct answer, the action is one of the immediate actions of FR-S.1. However, that actions is present in both A2 and B2. To select between A2 and B2, the applicant must have knowledge of the EOP basis which is NOT part of the immediate actions of FR-S.1. Therefore, the question CANNOT be answered solely by knowing immediate operator actions.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs? NO. Knowledge of the entry conditions for FR-S.1 alone will NOT allow the applicant to determine the correct response.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure? NO. The question does not relate solely to the purpose, sequence of event, or overall mitigative strategy of FR-S.1.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed

YES. The applicant must assess a complex set conditions given and determine whether an ATWS is in progress or whether to simply apply the requirements of TS 3.4.4. Technically speaking, C1 and D1 are correct. 1TA and 1TC do auto-swap. However, the auto-swap is a slow transfer as opposed to a fast transfer. Therefore, an underfrequency will occur on 1TA and 1TC resulting in a trip of all NCPs. Therefore, the reactor trip breakers should have opened and, in accordance with OMP 4-3 (Use of Emergency and Abnormal Procedures and FLEX Support Guidelines) an ATWS is in progress (i.e. a transient has occurred coincident with a failure of the reactor protective system).

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps. NO.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures. NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures. YES. This requires knowledge of OMP 4-3 to understand that the conditions which constitute an ATWS condition have been met.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2011 MNS NRC Exam Q84 (Bank 4434)

Development References

REFERENCES:
OMP 4-3 (Use of Emergency and Abnormal Procedures and FLEX Support Guidelines)
FRP S.1 (Response to Nuclear Power Generation/ATWS) Background Document

LEARNING OBJECTIVES:
NONE

Student References Provided

EPE007 EA2.04 - Reactor Trip
Ability to determine or interpret the following as they apply to a reactor trip: (CFR 41.7 / 45.5 / 45.6)
If reactor should have tripped but has not done so, manually trip the reactor and carry out actions in ATWS EOP
....

Remarks/Status

Rearranged answers from previous bank question so that the question does not appear exactly the same. HCF

401-9 Review Comments: SAT
EPE007 EA2.04

Facility Response: NONE

A. Purpose

This procedure provides actions to terminate leakage of reactor coolant into the secondary system following a steam generator tube rupture.

B. Symptoms or Entry Conditions

This procedure is entered from:

- EP/2/A/5000/E-0 (Reactor Trip or Safety Injection) Step 23,
  EP/2/A/5000/E-0 (Reactor Trip or Safety Injection) Step 39,
  EP/2/A/5000/E-1 (Loss of Reactor or Secondary Coolant) Step 5,
  EP/2/A/5000/E-2 (Faulted Steam Generator Isolation) Step 11,
  EP/2/A/5000/ECA-2.1 (Uncontrolled Depressurization of All Steam Generators) Step 9,
  EP/2/A/5000/ECA-2.1 (Uncontrolled Depressurization of All Steam Generators) Step 25,
  EP/2/A/5000/FR-H.3 (Response to Steam Generator High Level) Step 9, when secondary radiation is abnormal.

- EP/2/A/5000/E-0 (Reactor Trip or Safety Injection) Step 38,
  EP/2/A/5000/E-1 (Loss of Reactor or Secondary Coolant) Step 4,
  EP/2/A/5000/ES-1.2 (POST LOCA Cooldown and Depressurization) Step 9,
  EP/2/A/5000/ES-3.1 (Post-SGTR Cooldown Using Backfill) Step 6,
  EP/2/A/5000/ES-3.2 (Post-SGTR Cooldown Using Blowdown) Step 6,
  EP/2/A/5000/ES-3.3 (Post-SGTR Cooldown Using Steam Dump) Step 8,
  EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant - Subcooled Recovery Desired) Step 10,
  EP/2/A/5000/ECA-3.2 (SGTR With Loss of Reactor Coolant - Saturated Recovery Desired) Step 7, when a S/G N/R level goes up in an uncontrolled manner.

- EP/2/A/5000/E-1 (Loss of Reactor or Secondary Coolant),
  EP/2/A/5000/ES-1.2 (POST LOCA Cooldown and Depressurization), EP/2/A/5000/ES-3.1 (Post-SGTR Cooldown Using Backfill),
  EP/2/A/5000/ES-3.2 (Post-SGTR Cooldown Using Blowdown),
  EP/2/A/5000/ES-3.3 (Post-SGTR Cooldown Using Steam Dump), Foldout page, whenever any S/G level goes up in an uncontrolled manner or any S/G has abnormal radiation.

Q85 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
__ 1. **Monitor Foldout page.**	
2. **Identify ruptured S/G(s):**	**Perform the following:**
__ • Any S/G N/R level - GOING UP IN AN UNCONTROLLED MANNER	__ a. Continue to monitor S/G N/R levels and steamline EMFs.
OR	__ b. Dispatch operator and RP to check Unit 2 main steamlines in both exterior and interior doghouses for activity to aid in identifying ruptured S/G(s).
__ • Primary Chemistry or RP has determined ruptured S/G	
OR	c. Notify RP to perform the following:
• Any of the following EMFs - ABOVE NORMAL:	__ • Frisk all Unit 2 S/G cation columns to determine if activity level is significantly higher for any S/G.
__ • 2EMF-10 (S/G A)	__ • Notify Control Room of survey results.
__ • 2EMF-11 (S/G B)	
__ • 2EMF-12 (S/G C)	__ d. **WHEN** ruptured S/G(s) identified, **THEN** immediately **RETURN TO** Step 3.
__ • 2EMF-13 (S/G D).	__ e. **GO TO** Step 10.
__ 3. **Check at least one S/G - AVAILABLE FOR NC SYSTEM COOLDOWN.**	__ **Maintain at least one S/G available for NC System cooldown in subsequent steps.**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. Isolate flow from ruptured S/G(s) as follows:	
__ a. Check ruptured S/G(s) SM PORV - CLOSED.	a. **WHEN** ruptured S/G pressure is less than 1092 PSIG, **THEN** perform the following on affected SM PORV: __ 1) Check SM PORV - CLOSED. __ 2) **IF** SM PORV is still open, **THEN** CLOSE its manual loader. 3) **IF** SM PORV is still open, **THEN** perform the following: __ a) CLOSE SM PORV isolation valve. __ b) **IF** SM PORV isolation valve cannot be closed, **THEN** dispatch operator to CLOSE SM PORV isolation valve.
__ b. Check 2B and 2C S/Gs - INTACT.	b. Isolate TD CA pump steam supply from ruptured S/G as follows: __ 1) **IF** TD CA pump is the only source of feedwater, **THEN** maintain steam flow to it from at least one S/G. __ 2) Ensure operators dispatched in next step immediately notify Control Room Supervisor when valves are closed. (RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

4. (Continued)

3) Immediately dispatch two operators to concurrently verify (CV), unlock and CLOSE valves on ruptured S/G(s):

- For 2B S/G:
  - __ 2SA-78 (2B S/G SM Supply to Unit 2 TD CA Pump Turb Loop Seal Isol) (Unit 2 interior doghouse, 767+10, FF-59)
  - __ 2SA-2 (2B S/G SM Supply to Unit 2 TD CA Pump Turb Maint Isol) (Unit 2 interior doghouse, 767+12, FF-59).
- For 2C S/G:
  - __ 2SA-77 (2C S/G SM Supply to Unit 2 TD CA Pump Turb Loop Seal Isol) (Unit 2 interior doghouse, 767+8, FF-60)
  - __ 2SA-1 (2C S/G SM Supply to Unit 2 TD CA Pump Turb Maint Isol) (Unit 2 interior doghouse, 767+12, FF-59, at cont. wall).

__ 4) **IF AT ANY TIME** local closure of SA valves takes over 8 minutes, **THEN** isolate TD CA pump steam supply **PER** Enclosure 2 (Tripping TD CA Pump Stop Valve or Alternate Steam Isolation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. (Continued)	
c. Check blowdown isolation valves on ruptured S/G(s) - CLOSED:	
1) For 2A S/G:	1) Perform the following:
__ • 2BB-1B (2A S/G Blowdown Cont Outside Isol Control)	__ a) CLOSE valves.
__ • 2BB-5A (A S/G BB Cont Inside Isol).	__ b) CLOSE 2BB-123 (2A S/G Blowdown Flow Control).
2) For 2B S/G:	2) Perform the following:
__ • 2BB-2B (2B S/G Blowdown Cont Outside Isol Control)	__ a) CLOSE valves.
__ • 2BB-6A (B S/G BB Cont Inside Isol).	__ b) CLOSE 2BB-124 (2B S/G Blowdown Flow Control).
3) For 2C S/G:	3) Perform the following:
__ • 2BB-3B (2C S/G Blowdown Cont Outside Isol Control)	__ a) CLOSE valves.
__ • 2BB-7A (C S/G BB Cont Inside Isol).	__ b) CLOSE 2BB-125 (2C S/G Blowdown Flow Control).
4) For 2D S/G:	4) Perform the following:
__ • 2BB-4B (2D S/G Blowdown Cont Outside Isol Control)	__ a) CLOSE valves.
__ • 2BB-8A (D S/G BB Cont Inside Isol).	__ b) CLOSE 2BB-126 (2D S/G Blowdown Flow Control).

Q85 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

4. (Continued)

d. CLOSE steam drain on ruptured S/G(s):

__ • 2SM-83 (A SM Line Drain Isol)

__ • 2SM-89 (B SM Line Drain Isol)

__ • 2SM-95 (C SM Line Drain Isol)

__ • 2SM-101 (D SM Line Drain Isol).

e. CLOSE the following valves on ruptured S/G(s):

__ • MSIV

__ • MSIV bypass valve.

e. Perform the following:

__ 1) Place "STM PRESS CONTROLLER" in manual.

__ 2) Adjust "STM PRESS CONTROLLER" output to 0%.

__ 3) Place "STEAM DUMP SELECT" in steam pressure mode.

__ 4) Initiate Main Steam Isolation signal.

5) **IF** all S/G pressures are above 775 PSIG, **THEN** reset the following to allow automatic SM PORV operation:

__ • Main Steamline Isolation

__ • SM PORVs.

__ 6) **IF** ruptured S/G(s) MSIV and bypass valve are closed, **THEN GO TO** Step 5.

7) CLOSE the following valves on remaining S/Gs:

__ • MSIV

__ • MSIV bypass valve.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

4. (Continued)

__ 8) **IF** any intact S/G MSIV and associated bypass valve closed, **THEN GO TO** Step 10) in this RNO.

__ 9) **GO TO** EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant - Subcooled Recovery Desired).

__ 10) Select "OFF RESET" on steam dump interlock bypass switches.

__ 11) Dispatch operator to immediately CLOSE valves **PER** Enclosure 3 (Local Isolation SP Valves and Steam Drain Bypass Valves).

__ 12) CLOSE 2AS-12 (U2 SM to AS Hdr Control Inlet Isol).

13) **IF** 2AS-12 will not close, **THEN** dispatch operator to immediately perform the following:

__ a) CLOSE 2AS-11 (Unit 2 Main Steam To Aux Steam Hdr Control) (Unit 2 turbine bldg, 739+5, on column 2F-34) **PER** Step 2 of EP/2/A/5000/G-1 (Generic Enclosures), Enclosure 4 (Closing 2AS-11 Using Local Controller).

__ b) CLOSE 2AS-72 (Unit 2 Main Steam To Aux Steam Hdr Control Outlet Isol) (Unit 2 turbine bldg, 739+10, 2F-33, over SM equalization header).

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

4. (Continued)

14) **IF** MSR "RESET" light is dark, **THEN** perform the following:

__ a) Depress "SYSTEM MANUAL".

__ b) Depress "RESET".

__ 15) CLOSE 2SM-15 (U2 SM To MSR 2nd Stg Tube Bundles Isol).

16) **IF** 2SM-15 will not close, **THEN** perform the following:

__ a) Dispatch operator with fall protection to immediately CLOSE 2SM-15 (U2 SM To MSR 2nd Stg Tube Bundles Isol) (Unit 2 turbine bldg, 760+10, 2H-30, 2 ft south of column).

__ b) **IF AT ANY TIME** 2SM-15does not close (high D/P may prevent fully closing) as indicated by ruptured S/G pressure continuing to drop, **THEN** evaluate additional HM system isolation downstream of 2SM-15. (MCFD-2594-01.00 and 2594-01.01)

17) CLOSE from Control Room or dispatch operator to CLOSE the following valves:

__ • 2SM-14 (U2 Main Steam To CSAE Isol) (Unit 2 turbine bldg, 760+15, 2H-31, east side at column)

__ • 2TL-3 (SM To Steam Seal Isol) (Unit 2 turbine bldg, 760+6, 2D-31, west of DEH skid).

__ 18) **WHEN** cooldown is initiated in subsequent steps, **THEN** use intact S/G(s) SM PORV for steam dump.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

5. Control ruptured S/G(s) level as follows:

__ a. Check ruptured S/G(s) N/R level - GREATER THAN 11% (32% ACC).

a. Perform the following:

__ 1) **IF** any ruptured S/G is also faulted, **THEN** do not establish feed flow to the ruptured S/G unless needed for NC System cooldown.

2) **IF** any ruptured S/G is non-faulted **OR** is required for cooldown, **THEN** perform the following:

__ a) Establish and maintain feed flow to affected S/G(s).

__ b) **WHEN** affected S/G(s) N/R level greater than 11% (32% ACC), **THEN** complete Step 5.b.

__ 3) **GO TO** Step 6.

Q85 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
b. Isolate feed flow to ruptured S/G(s):	
• For 2A S/G:	
__ 1) CLOSE 2CA-66AC (U2 TD CA Pump Disch To 2A S/G Isol).	1) Perform the following: __ a) CLOSE 2CA-64AB (U2 TD CA Pump Disch To 2A S/G Control). __ b) Dispatch operator to CLOSE 2CA-66AC (U2 TD CA Pump Disch To 2A S/G Isol) (Unit 2 exterior doghouse, 750+8, EE-68, southeast corner of exterior doghouse). __ c) **IF** exterior doghouse not accessible, **OR** CA cannot be isolated, **THEN** dispatch operator to unlock and CLOSE 2CA-63 (Unit 2 TD CA Pump Disch To 2A S/G Control Inlet Isol) (Unit 2 CA pump rm, 716+15, BB-62, west end of VUCDT).
__ 2) CLOSE 2CA-62A (2A CA Pump Disch To 2A S/G Isol).	2) Perform the following: __ a) CLOSE 2CA-60A (2A CA Pump Disch To 2A S/G Control). __ b) Dispatch operator to CLOSE 2CA-62A (2A CA Pump Disch To 2A S/G Isol) (Unit 2 exterior doghouse, 750+10, EE-68, southeast corner, 6 ft from reactor bldg wall). __ c) **IF** exterior doghouse not accessible, **OR** CA cannot be isolated, **THEN** dispatch operator to unlock and CLOSE 2CA-59 (2A CA Pump Disch To 2A S/G Control Inlet Isol) (Unit 2 CA pump rm, 716+10, CC-62, next to reactor bldg wall).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
• For 2B S/G:	
__ 1) CLOSE 2CA-54AC (U2 TD CA Pump Disch To 2B S/G Isol).	1) Perform the following: __ a) CLOSE 2CA-52AB (U2 TD CA Pump Disch To 2B S/G Control). __ b) Dispatch operator to CLOSE 2CA-54AC (U2 TD CA Pump Disch To 2B S/G Isol) (Unit 2 interior doghouse, 750+8, DD-60, southwest corner against inner wall). __ c) **IF** interior doghouse not accessible, **OR** CA cannot be isolated, **THEN** dispatch operator to unlock and CLOSE 2CA-51 (Unit 2 TD CA Pump Disch To 2B S/G Control Inlet Isol) (Unit 2 CA pump rm, 716+10, CC-60, above aux shutdown panel).
__ 2) CLOSE 2CA-58A (2A CA Pump Disch To 2B S/G Isol).	2) Perform the following: __ a) CLOSE 2CA-56A (2A CA Pump Disch To 2B S/G Control). __ b) Dispatch operator to CLOSE 2CA-58A (2A CA Pump Disch To 2B S/G Isol) (Unit 2 interior doghouse, 750+10, DD-60, southeast corner against inner wall). __ c) **IF** interior doghouse not accessible, **OR** CA cannot be isolated, **THEN** dispatch operator to unlock and CLOSE 2CA-55 (2A CA Pump Disch To 2B S/G Control Inlet Isol) (Unit 2 CA pump rm, 716+09, CC-62, reactor bldg wall beside 2B CA pump).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
• For 2C S/G:	
__ 1) CLOSE 2CA-50B (U2 TD CA Pump Disch To 2C S/G Isol).	1) Perform the following: __ a) CLOSE 2CA-48AB (U2 TD CA Pump Disch To 2C S/G Control). __ b) Dispatch operator to CLOSE 2CA-50B (U2 TD CA Pump Disch To 2C S/G Isol) (Unit 2 interior doghouse, 750+7, EE-59, at column, against outer wall). __ c) **IF** interior doghouse not accessible, **OR** CA cannot be isolated, **THEN** dispatch operator to unlock and CLOSE 2CA-47 (Unit 2 TD CA Pump Disch To 2C S/G Control Inlet Isol) (Unit 2 CA pump rm, 716+10, CC-60, above aux shutdown panel).
__ 2) CLOSE 2CA-46B (2B CA Pump Disch To 2C S/G Isol).	2) Perform the following: __ a) CLOSE 2CA-44B (2B CA Pump Disch To 2C S/G Control). __ b) Dispatch operator to CLOSE 2CA-46B (2B CA Pump Disch To 2C S/G Isol) (Unit 2 interior doghouse, 750+8, EE-59, between CF isolation valves). __ c) **IF** interior doghouse not accessible, **OR** CA cannot be isolated, **THEN** dispatch operator to unlock and CLOSE 2CA-43 (2B CA Pump Disch To 2C S/G Control Inlet Isol) (Unit 2 CA pump rm, 716+09, CC-62, next to reactor bldg wall beside 2B CA pump).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. (Continued)	
• For 2D S/G:	
__ 1) CLOSE 2CA-38B (U2 TD CA Pump Disch To 2D S/G Isol).	1) Perform the following: __ a) CLOSE 2CA-36AB (U2 TD CA Pump Disch To 2D S/G Control). __ b) Dispatch operator to CLOSE 2CA-38B (U2 TD CA Pump Disch To 2D S/G Isol) (Unit 2 exterior doghouse, 750+8, EE-69, southwest corner 1 ft from outer wall). __ c) **IF** exterior doghouse not accessible, **OR** CA cannot be isolated, **THEN** dispatch operator to unlock and CLOSE 2CA-35 (Unit 2 TD CA Pump Disch To 2D S/G Control Inlet Isol) (Unit 2 CA pump rm, 716+9, BB-62, west end of VUCDT).
__ 2) CLOSE 2CA-42B (2B CA Pump Disch To 2D S/G Isol).	2) Perform the following: __ a) CLOSE 2CA-40B (2B CA Pump Disch To 2D S/G Control). __ b) Dispatch operator to CLOSE 2CA-42B (2B CA Pump Disch To 2D S/G Isol) (Unit 2 exterior doghouse, 750+9, EE-69, southwest corner 1 ft from outer wall). __ c) **IF** exterior doghouse not accessible, **OR** CA cannot be isolated, **THEN** dispatch operator to unlock and CLOSE 2CA-39 (2B CA Pump Disch To 2D S/G Control Inlet Isol) (Unit 2 CA pump rm, 716+09, CC-62, next to reactor bldg wall).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 6. **Check ruptured S/G(s) pressure - GREATER THAN 350 PSIG.**	**Perform the following:**
	a. **IF** ruptured S/G SM PORV is open, **AND** is in process of being locally isolated, **THEN** perform the following:
	__ 1) **WHEN** selecting target temperature in Step 9, **THEN** assume ruptured S/G pressure is at 350 PSIG, until ruptured S/G pressure recovers to greater than 350 PSIG.
	__ 2) **IF AT ANY TIME** it is determined that ruptured S/G SM PORV cannot be isolated, **OR** pressure cannot be recovered to greater than 350 PSIG after isolation, **THEN GO TO** EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant - Subcooled Recovery Desired).
	__ 3) **GO TO** Step 7.
	__ b. **GO TO** EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant - Subcooled Recovery Desired).
__ 7. **Check any NC pump - RUNNING.**	**Perform the following:**
	CAUTION **NC T-Cold indication in the ruptured loop may cause an invalid Integrity Status Tree condition.**
	__ Disregard NC T-Cold indication in the ruptured loop, until directed by this EP or until this EP is exited.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 8. **Check Pzr pressure - GREATER THAN 1955 PSIG.**	**IF "P-11 PRESSURIZER S/I BLOCK PERMISSIVE" status light (2SI-18) is lit, THEN block Low Pressure Steamline Isolation as follows:** __ a. Depress "BLOCK" on Low Pressure Steamline Isolation block switches. __ b. Maintain NC pressure less than 1955 PSIG.

Q85 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

9. Initiate NC System cooldown as follows:

__ a. Determine required core exit temperature based on lowest ruptured S/G pressure:

LOWEST RUPTURED S/G PRESSURE (PSIG)	REQUIRED CORE EXIT T/Cs (°F)	DESIRED CONTROL BAND (10 - 30°F BELOW REQUIRED) (°F)
GREATER THAN OR EQUAL TO 1050	515 (510 ACC)	485-505 (480-500 ACC)
1000 - 1049	510 (505 ACC)	480-500 (475-495 ACC)
950 - 999	500 (495 ACC)	470-490 (465-485 ACC)
900 - 949	495 (490 ACC)	465-485 (460-480 ACC)
850 - 899	490 (480 ACC)	460-480 (450-470 ACC)
800 - 849	480 (475 ACC)	450-470 (445-465 ACC)
750 - 799	470 (465 ACC)	440-460 (435-455 ACC)
700 - 749	465 (460 ACC)	435-455 (430-450 ACC)
650 - 699	455 (450 ACC)	425-445 (420-440 ACC)
600 - 649	445 (440 ACC)	415-435 (410-430 ACC)
550 - 599	435 (430 ACC)	405-425 (400-420 ACC)
500 - 549	425 (415 ACC)	395-415 (385-405 ACC)
450 - 499	410 (405 ACC)	380-400 (375-395 ACC)
400 - 449	395 (390 ACC)	365-385 (360-380 ACC)
350 - 399	380 (375 ACC)	350-370 (345-365 ACC)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
b. Check the following valves on ruptured S/G(s) - CLOSED:	b. Ensure the following valves CLOSED on at least one intact S/G:
__ • MSIV	__ • MSIV
__ • MSIV bypass valve.	__ • MSIV bypass valve.
__ c. Check ruptured S/G(s) SM PORV - CLOSED.	c. **IF** ruptured S/G pressure is less than 1092 PSIG, **THEN** perform the following:
	__ 1) Ensure SM PORV on ruptured S/G(s) is CLOSED or isolated.
	2) **IF** SM PORV is not closed or isolated, **THEN** perform the following:
	__ a) Ensure operator dispatched to CLOSE SM PORV isolation valve.
	b) Do not continue until affected S/G PORV is either:
	__ • Isolated
	OR
	__ • Determined to be unisolable.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

9. (Continued)

__ d. Check S/Gs 2B and 2C - INTACT.

d. **IF** 2B **OR** 2C S/G is ruptured, **THEN** perform the following:

1) Ensure steam to TDCA pump is isolated from ruptured S/G per one of the following:

__ • Local isolation of SA line (per Step 4.b)

OR

__ • Tripping TD CA pump stop valve (per Step 4.b).

2) Do not continue until affected TDCA pump steam supply is either:

__ • Isolated

OR

__ • Determined to be unisolable.

NOTE
- NC pump trip criteria based on subcooling does not apply after starting a controlled cooldown.
- After the Low Pressure Steamline Isolation signal is blocked, maintaining steam pressure negative rate less than 2 PSIG per second will prevent a Main Steam Isolation.

e. Check condenser available as follows:

__ • "C-9 COND AVAILABLE FOR STEAM DUMP" status light (2SI-18) - LIT

__ • MSIV on intact S/G(s) - OPEN.

__ e. **GO TO** RNO for Step 9.h.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

9. (Continued)

f. Place steam dumps in steam pressure mode as follows:

__ 1) Place "STM PRESS CONTROLLER" in manual.

__ 2) Adjust "STM PRESS CONTROLLER" output to equal "STEAM DUMP DEMAND" signal.

__ 3) Place "STEAM DUMP SELECT" in steam pressure mode.

__ g. **WHEN** "P-12 LO-LO TAVG" status light (2SI-18) lit, **THEN** place steam dumps in bypass interlock.

CAUTION **After initiating cooldown in next step, continue with subsequent steps without delay.**

__ h. Dump steam from intact S/G(s) to condenser at maximum rate while attempting to avoid a Main Steam Isolation.

h. Perform the following:

__ 1) Ensure at least one Pzr PORV isolation valve is OPEN.

2) **IF** VI is lost, **OR** a Phase B Isolation has occurred, **THEN** align N_2 to all Pzr PORVs as follows:

__ • OPEN 2NI-430A (Emerg N2 From CLA To 2NC-34A).

__ • OPEN 2NI-431B (Emerg N2 From CLA To 2NC-32B & 36B).

__ 3) **IF** Pzr pressure is greater than 1955 PSIG, **THEN** depressurize to 1900 PSIG using Pzr PORV.

__ 4) Depress "BLOCK" on Low Pressure Steamline Isolation block switches.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

9. (Continued)

__ 5) Maintain NC pressure less than 1955 PSIG.

__ 6) Ensure Main Steam Isolation reset.

__ 7) Ensure SM PORVs reset.

8) **IF** any intact S/G SM PORV isolation valve is closed, **AND** associated SM PORV is operable, **THEN** perform the following:

__ a) OPEN SM PORV isolation valve(s).

__ b) **IF** isolation valve will not open, **THEN** dispatch operator to OPEN isolation valve.

9) Dump steam using all intact S/G(s) SM PORVs at maximum rate as follows:

__ a) CLOSE SM PORV manual loader on ruptured S/G(s).

__ b) Place intact S/G SM PORV manual loaders at 50%.

__ c) Select "MANUAL" on "SM PORV MODE SELECT".

__ d) Adjust manual loaders on intact S/G SM PORVs as required to control intact S/G depressurization rate at approximately 2 PSIG per second.

(RNO continued on next page)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	

10) **IF** any intact S/G SM PORV closed, **THEN** dump steam as follows, at maximum rate:

   a) Dispatch operators to perform the following:

      __ • Immediately fully OPEN intact S/G(s) SM PORVs (at valves).

      __ • Establish communication with Control Room.

   __ b) Monitor pressures in all S/G(s) to ensure the correct SM PORVs are locally operated.

   c) **IF** any intact S/G SM PORV is unavailable, **THEN** evaluate using the following to dump steam:

      __ • REOPEN MSIVs and dump steam to condenser **PER** Enclosure 4 (Condenser Dump Operation).

      __ • Start TD CA pump.

      __ • Use steam drains **PER** EP/2/A/5000/G-1 (Generic Enclosures), Enclosure 19 (S/G Depressurization Using Steam Drains).

11) **IF** no intact S/G available, **THEN** contact station management to determine which of the following to perform:

   __ • Use faulted S/G for cooldown

   OR

   __ • **GO TO** EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant - Subcooled Recovery Desired).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9. (Continued)	
__ i. Check Low Pressure Steamline Isolation - BLOCKED.	i. Perform the following: 1) Depressurize Pzr to less than 1955 PSIG using one of the following: __ • Maximum available Pzr spray OR __ • **IF** normal Pzr spray is not available, **THEN** use Pzr PORV. __ 2) Do not continue until Pzr pressure is less than 1955 PSIG. __ 3) Depress "BLOCK" on Low Pressure Steamline Isolation block switches. __ 4) CLOSE Pzr spray valve(s) and Pzr PORVs.
__ j. Check core exit T/Cs - LESS THAN REQUIRED TEMPERATURE.	j. Perform the following: __ 1) **WHEN** core exit T/Cs are less than required temperature, **THEN** stabilize core exit T/Cs in desired control band, 10°F to 30°F less than required temperature. __ 2) **GO TO** Step 10.
__ k. Stabilize core exit T/Cs in desired control band, 10°F to 30°F less than required temperature.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
10. **Control intact S/G levels:**	
__ a. Check N/R level in any intact S/G - GREATER THAN 11% (32% ACC).	a. Perform the following: __ 1) Maintain total feed flow greater than 450 GPM until at least one intact S/G N/R level greater than 11% (32% ACC). 2) **IF** total feed flow greater than 450 GPM cannot be established, **THEN** contact station management for guidance to establish feed flow from alternate source: __ • CF __ • CM __ • Alternate low pressure water source.
__ b. Throttle feed flow to maintain all intact S/G N/R levels between 22% (32% ACC) and 50%.	b. **IF** N/R level in any intact S/G continues to go up in an uncontrolled manner, **THEN** perform the following: __ 1) Stop any operator controlled cooldown. __ 2) **RETURN TO** Step 1.

Q85 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. Check Pzr PORVs and isolation valves:	
__ a. Power to all Pzr PORV isolation valves - AVAILABLE.	__ a. Evaluate cause of power loss and initiate actions to restore power to affected isolation valve(s).
__ b. All Pzr PORVs - CLOSED.	b. **IF** Pzr pressure less than 2315 PSIG, **THEN** perform the following: __ 1) CLOSE Pzr PORV(s). __ 2) **IF** any Pzr PORV cannot be closed, **THEN** CLOSE its isolation valve. 3) **IF** PORV isolation valve cannot be closed, **THEN** perform the following: a) Align N_2 to all Pzr PORVs as follows: __ • OPEN 2NI-430A (Emerg N2 From CLA To 2NC-34A). __ • OPEN 2NI-431B (Emerg N2 From CLA To 2NC-32B & 36B). __ b) CLOSE Pzr PORV. __ 4) **IF** any Pzr PORV cannot be closed or isolated, **THEN** **GO TO** EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant - Subcooled Recovery Desired).

(RNO continued on next page)

Q85 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. (Continued)	
	5) **IF** any Pzr PORV cannot be closed, **THEN** CLOSE the following valve(s): __ • **IF** 2NC-32B (U2 Pzr PORV) failed, **THEN** CLOSE 2NC-271 (U2 PZR PORV Drn Isol For 2NC-32B). __ • **IF** 2NC-34A (U2 Pzr PORV) failed, **THEN** CLOSE 2NC-270 (U2 PZR PORV Drn Isol For 2NC-34A). __ • **IF** 2NC-36B (U2 Pzr PORV) failed, **THEN** CLOSE 2NC-269 (U2 PZR PORV Drn Isol For 2NC-36B).
__ c. At least one Pzr PORV isolation valve - OPEN.	__ c. OPEN one Pzr PORV isolation valve unless it was closed to isolate an open PORV.
12. **Reset the following:**	
__ a. S/I.	__ a. Reset S/I **PER** EP/2/A/5000/G-1 (Generic Enclosures), Enclosure 23 (Local Reset of S/I Signal) while continuing in this EP.
__ b. Sequencers.	b. Dispatch operator to OPEN affected sequencer control power breaker: __ • A Train - 2EVDA Breaker 6 __ • B Train - 2EVDD Breaker 8.
__ c. Phase A Isolation.	
__ d. Phase B Isolation.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
13. **Establish VI to containment as follows:**	
a. OPEN the following valves:	
__ 1) 2VI-129B (A Ess Hdr Cont Outside Isol).	__ 1) OPEN 2NI-430A (Emerg N2 From CLA To 2NC-34A).
__ 2) 2VI-160B (B Ess Hdr Cont Outside Isol).	__ 2) OPEN 2NI-431B (Emerg N2 From CLA To 2NC-32B & 36B).
__ 3) 2VI-150B (Lwr Cont Non-Ess Cont Outside Isol).	
__ b. Check VI header pressure - GREATER THAN 85 PSIG.	b. Perform the following: 1) Align N_2 to all Pzr PORVs as follows: __ • OPEN 2NI-430A (Emerg N2 From CLA To 2NC-34A). __ • OPEN 2NI-431B (Emerg N2 From CLA To 2NC-32B & 36B). __ 2) **IF** CA control valves cannot be throttled in subsequent steps, **THEN** control flow **PER** EP/2/A/5000/G-1 (Generic Enclosures), Enclosure 16 (CA Flow Control With Loss of VI). __ 3) Restore VI **PER** AP/2/A/5500/22 (Loss Of VI).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
14. Check if NC System cooldown should be stopped as follows:	
__ a. Check cooldown - INITIATED PER STEP 9.	a. **IF** cooldown has not yet been initiated, **THEN** perform the following: __ 1) **IF** operator has been dispatched to initiate cooldown by locally opening intact S/G SM PORV(s), **THEN GO TO** Step 14.b. __ 2) Do not continue until ruptured S/G identified. __ 3) **RETURN TO** Step 3.
__ b. Check core exit T/Cs - LESS THAN REQUIRED TEMPERATURE.	b. Perform the following: **NOTE** The following step only applies during performance of this RNO. It may be performed more than once if ruptured S/G pressure continues to rise. __ 1) **IF** ruptured S/G pressure goes up by over 50 PSIG since required temperature was selected, **AND** ruptured S/G pressure is greater than 400 PSIG, **THEN** select a new required temperature from table in Step 9.a. __ 2) Do not continue until core exit T/Cs are less than required temperature.
__ c. Stabilize core exit T/Cs in desired control band, 10°F to 30°F less than required temperature.	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 15. **Check ruptured S/G(s) pressure - STABLE OR GOING UP.**	**Perform the following:** __ a. Ensure ruptured S/G(s) isolated **PER** Steps 3 through 5. __ b. **IF** ruptured S/G(s) pressure is less than intact S/G(s) used for cooldown, **THEN GO TO** EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant - Subcooled Recovery Desired). c. **IF AT ANY TIME** while in this procedure, delta P between ruptured S/G(s) and intact S/G(s) used for cooldown is less than or equal to 250 PSIG, **THEN** perform the following concurrently: __ • Maintain cooldown rate in NC T-Colds less than 100°F in an hour. __ • Dump steam from intact S/Gs to maintain intact S/G pressures at least 250 PSIG below ruptured S/G(s) pressure. __ d. **IF** intact S/G(s) used for cooldown cannot be maintained at least 250 PSIG below the pressure of the ruptured S/G(s), **THEN GO TO** EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant - Subcooled Recovery Desired).
__ 16. **Check NC subcooling based on core exit T/Cs - GREATER THAN 20°F.**	__ **IF NC subcooling cannot be promptly restored to greater than 20°F, THEN GO TO EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant - Subcooled Recovery Desired).**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. **Depressurize NC System using Pzr spray as follows:**	
__ a. Check normal Pzr spray flow - AVAILABLE.	__ a. **GO TO** Step 18.
__ b. Initiate NC depressurization using maximum available spray.	
__ c. **IF AT ANY TIME** during this step, spray valves are not effective in reducing NC pressure, **OR** ruptured S/G(s) NR level goes above 83% (73% ACC), **THEN GO TO** Step 18.	
d. Do not continue until any of the following conditions satisfied:	
• Both of the following:	
__ • NC pressure - LESS THAN RUPTURED S/G(s) PRESSURE	
__ • Pzr level - GREATER THAN 11% (29% ACC)	
OR	
• Both of the following:	
__ • NC pressure - LESS THAN 1600 PSIG	
__ • Pzr level - GREATER THAN 31% (49% ACC)	
OR	
__ • Pzr level - GREATER THAN 76% (58% ACC)	
OR	
__ • NC subcooling based on core exit T/Cs - LESS THAN 0°F.	

Title:	E-3, STEAM GENERATOR TUBE RUPTURE						
Number:	OP-MC-EP-E3		Revision: 14				Program: RO/SRO/LOCT
Time Required:	AO	AOCT	RO	SRO	LOCT		Prerequisites: None
	N/A	N/A	4.0	4.0	3.0	Hrs.	

Overview:

This lesson will discuss the Emergency Procedures in the E-3, Steam Generator Tube Rupture series.

References:

1. Background Information for Westinghouse Owners Group Emergency Response Guideline
2. McGuire Emergency Procedure Deviation Document
3. MNS Operating Procedures
   - E-3, Steam Generator Tube Rupture Unit 1
   - ES-3.1, Post SGTR Cooldown Using Backfill.
   - ES-3.2, Post SGTR Cooldown Using Blowdown,
   - ES-3.3, Post SGTR Cooldown Using Steam Dump,
   - ECA-3.1, SGTR with Loss of Reactor Coolant - Subcooled Recovery Desired
   - ECA-3.2, SGTR with Loss of Reactor Coolant - Saturated Recovery Desired
4. DW-96-037 ERG Direct Work Request Form

Operating Experience:
SOER 93-1 Diagnosis and Mitigation of Reactor Coolant System leakage including Steam Generator Tube Ruptures.

Recommended Evaluation Method:
Written Exam

Commitments Tracking:
None

Training Aids:

Listing of classroom audio-visual resources needed to stage and conduct the training

- Classroom projector
- Smartboards (optional)

PURPOSE: To direct the operator to ECA-3.1 if a ruptured S/G cannot be isolated because of a steam leak, and to ensure the operators stay in E-3 unless it is absolutely required to transfer to ECA-3.1.

BASIS: After the primary system has been cooled by depressurizing the intact S/G's, even a small steam leak will depressurize the ruptured S/G since no energy will be transferred from the NC into that S/G. A sufficient pressure differential must be maintained between the ruptured and intact S/G's used for cooldown in order to ensure NC subcooling after primary-to-secondary leakage is terminated.

If the ruptured S/G pressure is slowly dropping, the differential can be maintained by lowering the intact S/G's pressure. If the pressure differential between the ruptured S/G and the intact S/G's cannot be maintained greater than 250 PSI, then an exit transition is provided to ECA-3.1, SGTR with Loss of Reactor Coolant - Subcooled Recovery Desired.

Note: This pressure differential criterion does not ensure NC subcooling in the subsequent steps if NC pumps are not running.

STEP 16 Check NC subcooling based on core exit T/Cs - GREATER THAN 20°F

PURPOSE: To determine if a loss of reactor coolant other than the diagnosed SGTR event is occurring.

BASIS: The NC cooldown completed in Step 16 is designed to establish a 20°F subcooling margin in the primary system at the ruptured S/G pressure. For SGTR events, including multiple tube failures, the primary pressure will stabilize at a value greater than the ruptured S/G pressure with S/I on. Consequently, at this stage of the recovery, the subcooling margin is expected to be greater than 20°F. If not, a loss of reactor coolant is suspected.

In that case, an exit transition is directed to ECA-3.1.

For multiple tube failures, NC pressure may temporarily drop below the ruptured S/G pressure during cooldown. However, pressure and subcooling should quickly rise when the cooldown is complete. The transition to ECA-3.1 is not necessary if subcooling rises sufficiently after the cooldown is complete.

STEP 17 Depressurize NC System using Pzr spray:

PURPOSE: To lower NC pressure to stop primary-to-secondary leakage and establish an indicated Pzr level.

Operator Fundamental Focus; Monitoring, Control, Teamwork ***Emphasize*** *to the class that this step requires a lot of coordination as there are actually four sets of criteria to monitor which would require depressurization to stop.* ***Reinforce*** *the need to monitor the affected parameters within the Control Room Team. This step is often discussed during the time period of the previous cooldown to allow control of the evolution to be expeditious.*

BASIS: After the cooldown is completed, S/I flow will pressurize the NC to an

equilibrium condition where break flow equals S/I flow. This equilibrium pressure will be somewhere between the ruptured S/G pressure and the shutoff head of the NI pumps and rises with S/I capacity.

In some cases, Pzr level may approach the upper tap (top of the indicating range) before NC pressure is reduced to the ruptured S/G pressure. This may be a symptom of a smaller tube failure, voiding in the upper head during natural circulation conditions, or injection of the CLAs. Depressurization of the NC is terminated on high Pzr level to prevent filling the Pzr and loss of Pzr pressure control. Following S/I termination, Pzr level drops which further reduces NC pressure to equilibrium with the ruptured S/G.

Revision 26 of EP-3, revised criteria to terminate the depressurization when NCS pressure is less than 1600 PSIG and PZR level is greater than 31% (49% ACC). Past transients show that normal PZR spray is very effective in reducing PZR pressure to less than 1600 PSIG, but slows down due to the saturation temperature of the PZR approaching the normal spray line temperature. PZR level requirement of 31% ensures that PZR level will be maintained above the SI reinitiation criteria when SI is terminated.

For multiple tube failures or reduced S/I capacity for a smaller tube failure, it may be necessary to lower NC pressure below that of the ruptured S/G pressure in order to restore Pzr level. In that case, reverse flow (i.e., secondary-to-primary leakage) will supplement S/I flow to restore Pzr level. If pressure continued to be reduced to saturation, voiding in the primary system may result in an unreliable Pzr level indication and delay S/I termination. To avoid this, depressurization of the NC is terminated if minimum NC subcooling is reached.

The crew may reach a point in the depressurization where NC pressures **stabilizes** or **starts increasing**. If this occurs prior to meeting criteria to stop depressurization, then sprays can be deemed ineffective and the continuous action used to transition to next step and use a Pressurizer PORV. If the ruptured SG level approaches 83%, the operator is also directed to the Pressurizer PORVs to complete the depressurization. The P-14 setpoint (83%) is used as an indication of S/G overfill. It allows time for completion of depressurization and S/I termination in order to prevent overfill.

The preferred order of NC depressurization follows:

1. Normal Pzr spray is most preferred. This method does not result in a loss of reactor coolant.
2. Pzr PORV is preferred when normal Pzr spray is unavailable. This method will result in an additional loss of reactor coolant, which may rupture the PRT and lead to abnormal containment conditions.
3. Auxiliary spray is least preferred. This method may cause excessive thermal stresses in the spray nozzle and may not be sufficient to rapidly decrease NC pressure. This method is used only if normal spray and all Pzr PORVs are unavailable.

Once the depressurizing is to be stopped, a step is provided for the case of spray valves not closing. This RNO directs the operator to secure the A and B NCPs and if pressure continues to go down to secure a third NCP. This is based on industry experience of failure of spray valves to close. IF Pzr level is low securing the second

Given the following conditions on Unit 2:

- Operating crew is in EP/2/A/5000/E-3 (Steam Generator Tube Rupture)
- Initial cooldown of the NC system to the target CET temperature has just been completed

In accordance with the E-3 basis document, the purpose of the initial cooldown of the NC system is to establish a MINIMUM of _____(1)_____ of subcooling, including allowances for subcooling uncertainties.

If the above amount of subcooling cannot be maintained after the cooldown is stopped, E-3 requires the operators to GO TO _____(2)_____.

Procedure Legend:

- EP/2/A/5000/ECA-3.1 (SGTR With Loss of Reactor Coolant Subcooled Recovery Desired)
- EP/2/A/5000/ECA-3.2 (SGTR With Loss of Reactor Coolant Saturated Recovery Desired)

Which ONE (1) of the following completes the statements above?

A. 1. 0 °F
 2. ECA-3.1

B. 1. 0 °F
 2. ECA-3.2

C. 1. 20 °F
 2. ECA-3.1

D. 1. 20 °F
 2. ECA-3.2

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EXAM BANK QUESTION: 6380 CNS

C

General Discussion

Per the E-3 bases, the initial cooldown of the NC system is to establish a minimum of 20 degrees F of subcooling prior to depressurizing the NC system to stop the primary to secondary leakage.

If the minimum subcooling can not be maintained, then E-3 will direct a procedure transition to ECA-3.1 (SGTR With Loss of Reactor Coolant Subcooled Recovery Desired).

Answer A Discussion

INCORRECT:

Part 1 is plausible because NC subcooling less than 0 degrees F is a point at which the depressurization performed in E-3, to stop the primary to secondary leakage, is secured. However the initial cooldown is performed to ensure that a minimum of 20 degrees of subcooling exists prior to beginning the depressurization.

Part 2 is CORRECT.

Answer B Discussion

INCORRECT:

Part 1 is plausible because NC subcooling less than 0 degrees F is a point at which the depressurization performed in E-3, to stop the primary to secondary leakage, is secured. However the initial cooldown is performed to ensure that a minimum of 20 degrees of subcooling exists prior to beginning the depressurization.

Part 2 is plausible because if adequate subcooling can not be maintained, procedures in the EP network typically require transition to a procedure that deals with "saturated" recovery.

Answer C Discussion

CORRECT - See discussion above.

Answer D Discussion

INCORRECT:

Part 1 is CORRECT.

Part 2 is plausible because if adequate subcooling can not be maintained, procedures in the EP network typically require transition to a procedure that deals with "saturated" recovery.

Basis for meeting the KA

The KA is matched due to the applicants being required to show the ability to apply the Steam Generator Tube Rupture limit on required subcooling, and if that limit can not be maintained, to determine the proper procedure transition.

Basis for Hi Cog

Basis for SRO only

This question meets the screening requirements for SRO only linked to 10 CFR 55.43(b)(5) (Assessment and selection of procedures) as follows:

Question can not be answered solely by knowing "systems knowledge".
Question can not be answered solely by knowing the immediate operator actions.
Question can not be answered solely by knowing entry conditions or plant parameters that required direct entry into major EOPs.
Question can not be answered solely by knowing the purpose, overall sequence of events, or overally mitigative strategy of the procedure.
Question DOES require knowledge of diagnostic steps and a decision point in E-3 that involves a transition to an emergency contingency procedure (ECA-3.1) and is therefore an SRO only question.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	ILT16 CNS NRC Examination

Development References
EP/1/A/5000/E-3 (Rev 43) EBG/1/5000/E-3 (Rev 23)

Student References Provided

Q86 References

A. Purpose

This procedure provides actions to respond to a loss of secondary heat sink in all steam generators.

B. Symptoms or Entry Conditions

This procedure is entered from:

- EP/2/A/5000/E-0 (Reactor Trip or Safety Injection), Step 18, when minimum CA flow is not verified **AND** N/R level in all S/Gs is less than 11% (32% ACC).
- EP/2/A/5000/F-0 (Critical Safety Function Status Trees), (Heat Sink), on a red condition.

Q86 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. Operator Actions

__ 1. **IF total feed flow is less than 450 GPM due to operator action, THEN RETURN TO procedure and step in effect.**

CAUTION **If a non-faulted S/G is available, then feed flow should only be established to non-faulted S/G(s) in subsequent steps.**

2. **Check if secondary heat sink is required:**

__ A. NC pressure - GREATER THAN ANY NON-FAULTED S/G PRESSURE.

__ A. **RETURN TO** procedure and step in effect.

__ B. Any NC T-Hot - GREATER THAN 350°F (347°F ACC).

B. Perform the following while continuing in this procedure:

1) Try to place ND in RHR mode as follows:

__ a) Ensure NC pressure is less than 385 PSIG.

__ b) **IF** S/I has occurred, **THEN** place ND in RHR mode **PER** EP/2/A/5000/G-2 (Placing ND in RHR Mode).

__ c) **IF** S/I has not occurred, **THEN** place ND in service **PER** Enclosure 2 (Placing ND in RHR mode).

__ 2) **WHEN** adequate ND cooling is established, **THEN RETURN TO** procedure and step in effect.

__ 3. **Monitor Foldout Page.**

Q86 References

MNS EP/2/A/5000/FR-H.1 **UNIT 2**	RESPONSE TO LOSS OF SECONDARY HEAT SINK	PAGE NO. 3 of 138 Rev. 24

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4. **Check at least one of the following NV pumps - AVAILABLE:**	__ **GO TO Step 22.**
__ • 2A NV pump OR __ • 2B NV pump.	
5. **Check if NC System feed and bleed should be initiated:**	
__ A. Check W/R level in at least 3 S/Gs - LESS THAN 24% (36% ACC).	A. Perform the following: __ 1) Monitor feed and bleed initiation criteria. __ 2) **WHEN** criteria satisfied, **THEN GO TO** Step 22. __ 3) **GO TO** Step 6.
__ B. **GO TO** Step 22.	
__ 6. **Ensure S/G BB and NM valves CLOSED PER Enclosure 3 (S/G BB and Sampling Valve Checklist).**	

Q86 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. Attempt to establish CA flow to at least one S/G as follows:	
__ A. Check power to both MD CA pumps - AVAILABLE.	A. Perform the following: __ • **IF** 2ETA **OR** 2ETB deenergized, **THEN** restore power to the affected essential bus **PER** AP/2/A/5500/07 (Loss of Electrical Power). __ • **IF** the essential bus is energized, **THEN** dispatch operator to determine cause of breaker failure.
__ B. Ensure control room CA valves aligned **PER** Enclosure 4 (CA Valve Alignment).	
__ C. Start all available CA pumps.	
__ D. Check TD CA pump - RUNNING.	D. Perform the following as necessary: 1) **IF** 2SA-48ABC (SM From S/G C To TD CA Pump Isol) is closed, **THEN** dispatch operator to fail air as follows: __ a) CLOSE 2VI-2046 (Unit 2 VI Pilot Air to 2SA-48ABC Isol) (Unit 2 Interior Doghouse, 767+5, west of column EE-60). __ b) Bleed air at associated air regulator.

(RNO continued on next page)

Q86 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	2) **IF** 2SA-49AB (SM From S/G B to TD CA Pump Isol) is closed, **THEN** dispatch operator to fail air as follows: __ a) CLOSE 2VI-2047 (Unit 2 VI Pilot Air to 2SA-49AB Isol) (Unit 2 Interior Doghouse, 767+7, east of column EE-59). __ b) Bleed air at associated air regulator. __ 3) **IF** "TD CA PUMP STOP VLV NOT OPEN" alarm (2AD-5, F-3) is lit, **THEN** dispatch operator to reset 2SA-3 (Unit 2 TD CA Pump Turb Stop Valve) **PER** EP/2/A/5000/G-1 (Generic Enclosures), Enclosure 24 (Resetting TD CA Stop Valve). 4) **IF** reason for loss of steam supply to TD CA pump not determined, **THEN** dispatch operator to ensure the following valves are OPEN: __ • 2SA-1 (2C S/G SM Supply to Unit 2 TD CA Pump Turb Maint Isol) (Unit 2 interior doghouse, 767+12, FF-59, at cont. wall) __ • 2SA-2 (2B S/G SM Supply to Unit 2 TD CA Pump Turb Maint Isol) (Unit 2 interior doghouse, 767+12, FF-59).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. (Continued)	
__ E. Check total flow to S/G(s) - GREATER THAN 450 GPM.	E. Perform the following: __ 1) **IF** only one MD CA pump is on, **AND** its discharge path cannot be reopened to its associated S/Gs, **THEN** evaluate aligning flow to another S/G through MD CA train A/B cross-tie **PER** Enclosure 5 (MD CA Pump Train A/B Cross-tie Alignment). __ 2) **IF** any CA pump is running, **AND** Step 37 has been implemented, **THEN** **GO** **TO** Step 7.H. 3) **IF** any feed flow to at least one S/G is indicated, **THEN** perform the following: __ a) Maintain flow to restore N/R level to greater than 11% (32% ACC). __ b) **WHEN** N/R level is greater than 11% (32% ACC), **THEN** **RETURN** **TO** procedure and step in affect. __ c) **GO** **TO** Step 8. 4) **IF** no feed flow indicated, **THEN** perform the following: __ a) **IF** no CA pump can be started, **THEN** dispatch operator and maintenance to CA pumps to try to restore one CA pump to service. __ b) Dispatch operator to ensure CA valves aligned **PER** Enclosure 6 (Local CA Valve Alignment). __ c) **IF** **AT** **ANY** **TIME** CA pump is restored, **THEN** **RETURN** **TO** Step 7.E. __ d) **GO** **TO** Step 8.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5. **CLOSE the following CA control valves:** __ • 2CA-60A (2A CA Pump Disch To 2A S/G Control) __ • 2CA-56A (2A CA Pump Disch To 2B S/G Control).	**Perform the following:** A. Dispatch operator to unlock and THROTTLE the following valves to 2 turns OPEN: __ • 2CA-59 (2A CA Pump Disch To 2A S/G Control Inlet Isol) (Unit 2 CA pump rm, 716+10, CC-62, next to reactor bldg wall) __ • 2CA-55 (2A CA Pump Disch To 2B S/G Control Inlet Isol) (Unit 2 CA pump rm, 716+09, CC-62, reactor bldg wall beside 2B CA pump). __ B. Do not continue until valves above are throttled.
6. **Limit MD CA pump flow in next steps to the following limits to prevent pump runnout:** __ • Total CA flow to all S/Gs less than 600 GPM __ • MD CA pump suction flow less than 600 GPM.	

Title:	**FR-S, RESPONSE TO NUCLEAR POWER GENERATION / ATWS**						
Number: OP-MC-EP-FRS			Revision: 14			Program: RO/SRO/LOCT	
Time Required:	AO	AOCT	RO	SRO	LOCT		Prerequisites: None
	N/A	N/A	.75	.75	.75	Hrs.	

Overview:

This lesson will discuss the procedures in the Subcriticality (FR-S) series.

References:

1. WOG Emergency Response Guidelines
2. MNS Deviation Document
3. EP/1/A/5000/FR-S.1, Response to Nuclear Generation / ATWS
4. EP/1/A/5000/FR-S.2, Response to Loss of Core Shutdown

Operating Experience:
Salem 1 Reactor Trip Breakers Failed to Open

Recommended Evaluation Method:
Written Exam

Commitments Tracking:
None

Training Aids:

Listing of classroom audio-visual resources needed to stage and conduct the training

- Classroom projector
- Smartboards (optional)

Core Cooling, since it is the procedure which provides actions to reduce core temperature.

A transition to SAMG is built into FR-S.1 prior to checking for subcriticality since it loops the operator back to continue emergency boration and check for sources of positive reactivity and can not be exited until the reactor is subcritical. If these actions are not successful, it is possible for the core to overheat requiring the need to transition to the SAMGs. Since S.1 is a higher priority than C.1 the operator may never reach the C.1 transition on high core exit temperatures.

Once the transition to the SAMGs has been made, the Emergency Procedures are discontinued. The operators implement SACRG-1 (Severe Accident Control Room Guideline-1) and the TSC will implement the other components of the SAMG program.

3.3.5 Ensure Subcriticality

This final action checks on the effectiveness of previous steps in mitigating the transient prior to departing the procedure. Departure is not allowed until subcriticality is verified.

3.4 Detailed Description of Procedural Steps

<u>Caution</u>: NC pumps should not be tripped with reactor power greater than 5%.

<u>PURPOSE:</u> To inform the operator that the NC pumps should not be tripped even if all normal running conditions are not satisfied.

<u>BASIS:</u> During an ATWS, NC pump operation could be beneficial by temporarily cooling the core under voided NC system conditions. If reactor power is greater than 5%, the NC pumps should not be tripped even if all normal running conditions are not satisfied. Manually tripping the NC pumps during some ATWS events could result in reduced heat removal and a challenge to fuel integrity. An ATWS is not a design basis event; therefore the licensing requirement to trip the NC pumps within a timely manner to remain within the small-break LOCA design basis is not applicable.

This caution is applicable during the performance of the Immediate Action Steps and should be known by the operator without the availability of written guidance.

STEP 1 Check Reactor Trip: (IMMEDIATE ACTION)

<u>PURPOSE:</u> To ensure that the reactor has tripped.

<u>BASIS:</u> Reactor trip must be verified to ensure that the only heat being added to the NC system is from decay heat and NC Pump heat. The safeguards systems that protect the plant during accidents are designed assuming that only decay heat and pump heat are being added. If the reactor cannot be tripped, then the control rods should be manually, or allowed to automatically, insert into the core in order to lower reactor power.

Operator Fundamental Focus; Knowledge
***Reinforce** the knowledge required to determine if the reactor is tripped by asking the class participants which indications are monitored IAW FRP-S.1. The answer is "All rod bottom lights – lit, Reactor trip and bypass breakers – open and I/R %PWR – going down".*

STEP 2 Check Turbine Trip: (IMMEDIATE ACTION)

PURPOSE: To ensure that the turbine is tripped.

BASIS: The turbine is tripped to prevent an uncontrolled cooldown of the RCS due to steam flow that the turbine would require. For an ATWS event where a loss of normal feedwater has occurred, analyses have shown that a turbine trip is necessary (within 30 seconds) to maintain S/G inventory. For other ATWS events, manual tripping of the turbine may yield a higher system pressure than would otherwise occur. However, this action has been determined to be necessary due to the analytical results discussed earlier. Since there are many initiating ATWS events and some that require immediate mitigating actions, diagnosis of the initiating event would not be feasible and separate guidance for different ATWS events would complicate training and could delay timely performance of necessary operator actions.

If the turbine will not trip, a turbine runback (manual lowering of load) at maximum rate will also reduce steam flow in a delayed manner. If the turbine stop valves cannot be closed by either trip or runback, the MSIVs and MSIV bypass valves should be closed.

STEP 3 Monitor foldout page.

PURPOSE: Remind the operators to monitor the Foldout Page.

BASIS: The Foldout Page contains three items:

1. Transfer to Cold Leg Recirculation if FWST low level is reached. This operator action is required no matter what EP is in effect to ensure the transfer is accomplished without delay.
2. CA Suction Source Monitoring.
3. Criteria for isolating and unisolating the NV Pump Recirculation Isolation Valves (NV-150 and NV-151).

STEP 4 Check proper CA pump status:

PURPOSE: To ensure proper CA pump status.

BASIS: The MD CA pumps start automatically on an S/I signal and S/G low level to provide feed to the S/Gs for decay heat removal. If S/G levels drop below 17%, the TD CA pump will also automatically start to supplement the MD pumps.

STEP 5 Initiate emergency boration of NC System:

Direct manner of adding negative reactivity to the core. The intended boration path here is the most direct one available, not requiring S/I initiation, but using the normal NV pump(s). Charging flow is verified to be greater than emergency boration flow to ensure

emergency boration flow is going into the NC System. Several means of rapid boration are listed in the procedure in order of preference.

The check on Pzr pressure is intended to alert the operator to a condition which would reduce charging or S/I pump injection into the NC system, and therefore, boration. The Pzr PORV lift setpoint is chosen as that pressure at which flow into the NC system is insufficient. The contingency action is a rapid depressurization to a pressure which would allow a rise in injection flow. When primary pressure drops to 200 PSI below the PORV lift setpoint, the PORVs should be closed.

Because the depressurization uses pressurizer PORVs which discharge to the PRT, it is possible for the rupture disc to burst. Isolation of the Containment Air Addition and Release valves (VQ) is an expedient action to verify a barrier to radiation release.

STEP 6 Close the following VQ valves:

PURPOSE: To ensure non-essential containment ventilation penetrations (VQ) are Isolated.

BASIS: The non-essential containment ventilation penetrations are isolated to prevent potential release of radioactive materials from containment. The only containment ventilation penetration which may be open in modes 1-4 are the VQ valves.

STEP 7 IF AT ANY TIME while in this procedure an S/I signal exists or occurs, THEN: Have another licensed operator check S/I equipment PER Enclosure 3 and continue in the procedure (CONTINUOUS ACTION)

PURPOSE: To alert the operator that proper actuation of all S/I actuated equipment must be verified.

BASIS: It is possible to make a transition to this procedure without having performed the verification of automatic S/I actions in E-0. This step specifically instructs the operator to have another Licensed Operator perform the necessary verification in accordance with Enclosure 3.

STEP 8 Check if Reactor and Turbine trips have occurred:

PURPOSE: To determine if earlier control room actions were successful in producing a reactor and turbine trip and, if not, to initiate local actions.

BASIS: A reactor trip is the fastest mechanism for adding negative reactivity to the core. Turbine trip removes a large source of positive reactivity addition (heat removal by steaming), and will conserve S/G inventory for the limiting ATWS event. If any of these actions have not been successfully achieved when attempted from the control room, an operator should be dispatched to perform the actions locally. Local actions were delayed until now because they will be more time consuming to initiate and complete, but may still be effective.

STEPS 9 &10 Check reactor subcritical:

PURPOSE: Allows a quick kickout of this EP once the mitigating action to shutdown reactor is completed. (Power is less than 5%).

BASIS: At this point, other EPs may have higher priority and should be implemented without delay. Boration will be continued until shutdown margin is confirmed. Step 10 provides the transition if criteria of Step 9 are met.

STEP 11 Control S/G levels:

PURPOSE: To ensure that sufficient CA flow is present to remove heat generated from power operation during an ATWS event or a return to criticality, and to alert the operator to monitor CA storage tank level.

BASIS: ATWS analyses have shown that CA flow of 700 gpm is acceptable to adequately remove the heat generated from power operation prior to reactor shutdown. If CA flow is not greater than 700 gpm when needed (when S/G levels are below 11%), it is important to increase CA flow in order to maintain a secondary heat sink. For the loss of normal feedwater ATWS, the S/G tubes are uncovered in about two minutes.

For other transients, such as a return to criticality, this feed flow would be excessive. Narrow range S/G level can be maintained with lower CA flow rates. As long as level can be maintained then the higher rate is not necessary.

STEP 12 Check all dilution paths – ISOLATED.

PURPOSE: To insure that any possible dilution path is isolated.

BASIS: A possible cause of power generation would be an inadvertent dilution of the NC system. Removal of this source of positive reactivity will make the boration performed earlier more effective.

STEP 13 Check steamlines intact:

PURPOSE: To identify any faulted steam generators and to see if an uncontrolled cooldown is in progress.

BASIS: To limit any uncontrolled cooldown caused by a faulted steam generator or secondary side break. If a faulted S/G is found, then all MSIVs and MSIV bypass valves are closed. If any S/G is still depressurized or pressure is still going down in an uncontrolled manner, then the faulted S/G(s) is isolated per Enclosure 2.

If all Steam Generators are faulted, Enclosure 2 directs throttling feed flow to maintain at least 25 gpm to each steam generator. 25 gpm is the minimum verifiable feed flow and is necessary to prevent dryout, thereby minimizing thermal shock if feed flow is increased.

STEP 14 Check NC T-Colds – STABLE OR GOING UP.

PURPOSE: To see if a controlled cooldown is in progress.

BASIS: If a controlled cooldown is indicated by NC T-Colds going down, the operator is instructed to stop the cooldown by throttling CA flow or closing steam dumps or S/G PORVs. CA flow must be maintained at or above 450 gpm total flow, and at least one S/G N/R level must be maintained greater than 11% (32% ACC) to preserve the heat sink. These actions minimize the amount of positive reactivity being added to the core.

A. Purpose

This procedure provides actions to respond to a loss of all AC power.

B. Symptoms or Entry Conditions

This procedure is entered from:

- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Step 4, on the indication that all AC emergency busses are de-energized.
- Directly from symptoms that both emergency AC busses are deenergized.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

CAUTION **Lowering S/G pressures to less than 190 PSIG may cause injection of CLA N_2 into the NC System.**

NOTE

- The S/Gs should be depressurized at a rate sufficient to maintain a cooldown rate in the NC System cold legs near 100°F/hr. This will minimize NC System inventory loss while cooling the NC pump seals in a controlled manner.
- Pzr level may be lost and reactor vessel head voiding may occur due to depressurization of S/Gs. Depressurization should not be stopped to prevent these occurrences.
- If vital battery load stripping strategy has been implemented, review the following notes:
  - Main Steam Isolation initiate and reset lights do not work
  - NC T-Cold indications are lost
  - Enclosure 24 (S/G Depressurization Limits) provides alternate indications to replace NC T-Colds for controlling cooldown rate in next step.

31. **Depressurize intact S/Gs to 290 PSIG as follows:**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ A. Check S/G N/R level in any intact S/G - GREATER THAN 11% (32% ACC).	A. Perform the following: __ 1) Maintain maximum CA flow until N/R level greater than 11% (32% ACC) in at least one S/G. __ 2) **IF** CA pump flow cannot be established, **THEN** perform Enclosure 8 (Feeding S/Gs with Low Pressure Source). __ 3) **WHEN** N/R level greater than 11% (32% ACC) in at least one S/G, **THEN** perform Steps 31.B through 31.K. __ 4) Observe Note prior to Step 32 and **GO TO** Step 32.

Q87 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
31. (Continued)	
__ B. Ensure operator monitors Enclosure 24 (S/G Depressurization Limits) throughout the S/G depressurization.	
__ C. **WHEN** "P-11 PRESSURIZER S/I BLOCK PERMISSIVE" status light (1SI-18) lit, **THEN** depress "BLOCK" on Low Pressure Steamline Isolation block switches.	
__ D. Reset Main Steam Isolation.	
__ E. Reset SM PORVs.	
__ F. Dump steam using intact S/G(s) SM PORVs while maintaining a cooldown rate based on NC T-Colds - LESS THAN 100°F IN AN HOUR.	F. **IF** Control Room operation of any SM PORV does not work, **THEN** perform the following: __ 1) **IF** at least one SM PORV opens, **THEN** dispatch operator to locally operate the failed SM PORV(s). 2) **IF** all SM PORVs remain closed, **THEN** perform the following: __ a) CLOSE SM PORV manual loaders. __ b) **IF** loss of control due to loss of DCA, 1EVDA or 1EVDD, **OR** inability to reset Main Steam Isolation, **THEN** dispatch operator to perform FG/1/A/FLEX/FSG-07 (Loss Of Vital Instrumentation Or Control Power), Enclosure 7 (Bypassing Unit 1 SM PORV Solenoid Valves). __ c) **IF AT ANY TIME** step above does not restore Control Room control, **THEN** dispatch operator to locally operate affected SM PORV(s). __ d) **WHEN** SM PORV operation is established, **THEN RETURN TO** Step 31.F.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
31. (Continued)	
__ G. Check NC T-Colds - AVAILABLE.	__ G. **IF** NC T-Colds are unavailable, **THEN GO TO** Step 31.I.
__ H. Check NC T-Colds - GREATER THAN 280°F.	H. Perform the following: __ 1) THROTTLE SM PORVs to stop S/G depressurization. __ 2) Observe Note prior to Step 32 and **GO TO** Step 32.
__ I. Maintain at least one intact S/G N/R level - GREATER THAN 11% (32% ACC).	I. Perform the following: __ 1) Stop S/G depressurization. __ 2) Restore at least one intact S/G N/R level to greater than 11% (32% ACC). __ 3) **WHEN** at least one intact S/G N/R level greater than 11% (32% ACC), **THEN** continue S/G depressurization.
__ J. Check S/G pressures - LESS THAN OR EQUAL TO 290 PSIG.	J. Perform the following: __ 1) **WHEN** S/G pressures are less than or equal to 290 PSIG, **THEN** perform Step 31.K. __ 2) Observe Note prior to Step 32 and **GO TO** Step 32.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

31. (Continued)

__ K. THROTTLE SM PORVs to maintain S/G pressures at 290 PSIG.

K. Perform the following:

__ 1) **IF** Control Room control of SM PORVs has failed, **THEN** perform RNO for Step 31.F and maintain S/G pressures at 290 PSIG.

2) **IF** all the following conditions are met, **THEN** perform FG/1/A/FLEX/FSG-09 (Low Decay Heat Temperature Control):

__ • S/G pressures go below 290 PSIG and continue to go down

__ • SM PORVs closed

__ • CA flow throttled to zero.

NOTE If vital battery load stripping strategy has been implemented, only N31 S/R SUR, N35 I/R SUR, and W/R Neutron Flux will be available.

32. Monitor reactor subcritical as follows:

__ • I/R start up rate - ZERO OR NEGATIVE

__ • S/R start up rate - ZERO OR NEGATIVE

__ • W/R Neutron Flux - STABLE OR GOING DOWN.

Perform the following:

__ A. THROTTLE SM PORVs to stop S/G depressurization and allow NC System to heatup to obtain a negative start up rate.

B. **IF** loss of all Unit 1 4160V busses is anticipated to last over 4 hours (ELAP event), **THEN** perform either of the following:

__ • Allow time for xenon to build in prior to continuing S/G depressurization.

OR

__ • Perform FG/1/A/FLEX/FSG-08 (Alternate NC System Boration).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
33. **Check S/I signal status as follows:**	
__ A. Check S/I - HAS BEEN ACTUATED.	A. Perform the following: __ 1) **IF AT ANY TIME** S/I actuates, **THEN** perform Steps 33.B, 34 and 35. __ 2) **GO TO** Step 36.
__ B. Reset S/I.	__ B. Reset S/I **PER** EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 23 (Local Reset of S/I Signal).
34. **Check Containment Phase A Isolation as follows:**	
__ A. Phase A - ACTUATED.	__ A. Initiate Phase A.
__ B. Ensure Phase A valves CLOSED **PER** Enclosure 25 (Phase A Containment Isolation).	
__ 35. **Check containment pressure - HAS REMAINED LESS THAN 3 PSIG.**	**Perform the following:** __ A. Initiate Phase B using "PHASE B & VX & CONT VENT ISOL TRAIN A(B)" pushbuttons. __ B. Ensure Phase B valves CLOSED **PER** Enclosure 26 (Phase B Containment Isolation).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
36. **Check H2 Igniters as follows:**	
__ A. Check FG/0/A/FLEX/FSG-05 (Initial Assessment and FLEX Equipment Staging) - INITIATED.	__ A. Observe Note prior to Step 36.D and **<u>GO</u> <u>TO</u>** Step 36.D.
__ B. Check if H2 Igniters - ENERGIZED BY FLEX POWER PER FG/0/A/FLEX/FSG-05 (INITIAL ASSESSMENT AND FLEX EQUIPMENT STAGING).	__ B. Observe Note prior to Step 36.D and **<u>GO</u> <u>TO</u>** Step 36.D.
__ C. **<u>GO</u> <u>TO</u>** Step 37.	

<u>NOTE</u> "A" Train H_2 Igniters may have been locally energized by SSF power in Step 30. The following step will not stop H_2 Igniters powered by SSF.

D. Depress "OFF" in the Control Room for the following H_2 igniters: __ • 1A H_2 Igniter __ • 1B H_2 Igniter.	
__ 37. **Check Core Exit T/Cs - LESS THAN 1200°F.**	__ **<u>IF</u> Core Exit T/Cs greater than 1200°F <u>AND</u> going up, <u>THEN</u> <u>GO</u> <u>TO</u> EG/1/A/SAMG/SAG-1 (Control Room Severe Accident Guideline Initial Response).**

Title:	ECA-0.0, LOSS OF ALL AC POWER						
Number: OP-MC-EP-ECA-0			Revision: 28			Program: RO/SRO/LOCT	
Time Required:	AO	AOCT	RO	SRO	LOCT		Prerequisites: None
	N/A	N/A	1.5	1.5	1.0	Hrs.	

Overview:

This lesson will discuss the Emergency Procedures in the ECA-0, Loss of All AC Power series.

References:

1. Background Information for Westinghouse Owners Group Emergency Response Guideline, ECA-0.0, Loss of All AC Power, HP Rev.2, 4/30/05
2. McGuire Deviation Document.
3. Westinghouse Ice Condenser Supplement
4. MNS Operating Procedures
   - ECA 0.0, Loss of All AC Power
   - ECA 0.1, Loss of All AC Power Recovery without S/I Required
   - ECA 0.2, Loss of All AC Power Recovery with S/I Required

Operating Experience:
SER 4-06 Dual-Unit Loss of Off-Site Power

Recommended Evaluation Method:
Written Exam

Commitments Tracking:
None

Training Aids:

Listing of classroom audio-visual resources needed to stage and conduct the training

- Classroom projector
- Smartboards (optional)

OUTLINE

1.0 INTRODUCTION

1.1 Purpose

1.1.1 Introduce the Objectives

1.1.2 Describe the Evaluation method

1.1.3 A total loss of AC power at a nuclear power station can result only through a coincident loss of grid power from the high voltage distribution lines serving the station and some combination of events preventing the station emergency diesel generators from energizing the emergency AC busses. The immediate consequences of the loss of AC power, if not accompanied by some other complicating event such as a loss of reactor coolant, loss of secondary coolant, or S/G tube rupture, are not severe. However, should AC power either from the grid or the emergency diesels not be restored quickly, the consequences to plant and public safety can potentially be extreme.

1.2 Emergency Procedures in This Series

- ECA-0.0, Loss of All AC Power
- ECA-0.1, Loss of All AC Power Recovery Without S/I Required
- ECA-0.2, Loss of All AC Power Recovery with S/I Required

2.0 PROCEDURE SERIES BACKGROUND

The loss of all AC power procedures are unique within the EPs. Except for these procedures, all other EPs are written on the premise that at least one AC emergency bus is energized and associated equipment can be powered from the energized AC emergency bus. Consequently, the guidance provided in other EPs is not applicable following the loss of all AC power.

Thus, ECA-0.0, Loss of All AC Power, has priority over all other EPs.

ECA-0.0 provides guidance from when a loss of all AC power condition is diagnosed until AC power is restored and the operator selects one of the two plant recovery procedures.

The following criteria is used to determine which recovery procedure to implement after AC power is recovered:

1. The existence of NC system subcooling
2. The existence of pressurizer level
3. The confirmation S/I equipment is not operating

If plant conditions have not deteriorated significantly prior to AC power restoration (all three criteria are satisfied), the operator is instructed to implement procedure ECA-0.1 and attempt to stabilize the plant utilizing normal operational systems.

If plant conditions have deteriorated significantly (any criterion is not satisfied), the operator may have insufficient or conflicting indications as to plant status and a concurrent event may be contributing to the deterioration of NC system conditions. Under these conditions, the operator is instructed to implement procedure ECA-0.2 and initiate plant recovery utilizing S/I operational systems.

If power is not anticipated to be restored within 4 hours the operator is directed to FSGs to deal with deteriorating plant conditions and provide flex power to essential equipment.

Instructor Note:
While covering this procedure series, discuss different plant conditions walking through procedure flowpaths to determine any required action and its basis. It is not intended that the instructor cover all potential scenarios. The walkthrough should include discussion of branching steps and what conditions would require alternate procedure routing.
Objective 4 is addressing the body of the procedures not enclosures.

3.0 ECA-0.0, LOSS OF ALL AC POWER NORMAL OPERATION

Objective # 1

3.1 Purpose

This procedure provides actions to respond to a loss of all AC power.

The objective of the recovery/restoration technique incorporated into ECA-0.0, Loss of All AC Power, is to mitigate deterioration of NC system conditions while AC emergency power is not available.

ECA-0.0 is structured to address the loss of all AC power as an initiating event while including actions addressing possible coincident occurrences such as loss of reactor coolant, loss of secondary coolant, or S/G tube rupture.

Since the guidance contained in ECA-0.0 has priority over all other EPs, the steps also include actions that implicitly monitor and maintain the CSFs.

3.2 Symptoms/Conditions

Objective # 2

3.2.1 ECA-0.0 is entered from the following.

1. E-0, Reactor Trip or Safety Injection, Step 4, on the indication that all AC emergency busses are deenergized.
2. Directly from symptoms that both emergency AC busses are deenergized.

3.3 Major Actions

Objective # 3

The recovery/restoration technique of ECA-0.0 includes the following five major action categories.

1. Perform immediate actions
2. Restore AC power
3. Maintain plant conditions for optimal recovery
4. Evaluate energized AC emergency bus
5. Select recovery procedure after AC power restoration

Operator Fundamental Focus; Knowledge and Teamwork

Reinforce *the need to understand the five major actions ECA-00 is trying to accomplish.*

Explain *that each crew member having this level of understanding is critical for crew to efficiently execute the procedure and for the crew members to back one another up to ensure the correct procedures are used and priorities are established. They are:*

1. *Perform immediate actions*
2. *Restore AC power*
3. *Maintain plant conditions for optimal recovery*
4. *Evaluate energized AC emergency bus*
5. *Select recovery procedure after AC power restoration*

The following subsections provide a more detailed discussion of each major action category.

3.3.1 **Perform Immediate Actions**

Certain immediate actions are performed regardless of the duration of the AC power outage. These actions are appropriate for all loss of AC power scenarios. The following are the two immediate actions.

1. Check Reactor Trip
2. Check Turbine Trip

Operator Fundamental Focus; Knowledge

Reinforce *importance of solid understanding of select actions (immediate actions) such that they can be performed expeditiously from memory.*

Explain *they are to Verify the Reactor and Turbine Tripped.*

3.3.2 **Restore AC Power**

Optimal recovery cannot be initiated until AC power is restored to at least one emergency AC bus. Consequently, the major objective of procedure ECA-0.0, following the immediate actions, is to restore AC emergency power as soon as possible.

ECA-0.0 instructs the operator to restore AC emergency power from the control room. If AC power cannot be restored from the control room, the operator is instructed to dispatch personnel to locally restore AC power.

3.3.3 **Maintain Plant Conditions for Optimal Recovery**

This major action category consists of actions to mitigate deterioration of NC system conditions and establish plant conditions amenable to optimal recovery <u>following AC power restoration.</u> The operator is limited in actions available to mitigate deteriorating NC system conditions. By minimizing NC system inventory loss and maintaining a secondary heat sink, the operator can extend the time to core uncovery.

NC system inventory loss is minimized by depressurizing the secondary system, thereby resulting in the following.

1. Reducing NC system temperature to minimize NC pump seal degradation.
2. Reducing NC system pressure to reduce NC pump seal leakage and to permit injection of S/I accumulator water to partially replace the NC system inventory lost through the NC pump seals.

Secondary heat sink is maintained by controlling the turbine driven CA pump and the rate of S/G steam release to maintain narrow range (N/R) level in at least one intact S/G.

Plant conditions amenable to optimal recovery are established through operator actions that anticipate the restoration of AC power and establish required systems and equipment alignments prior to AC power restoration.

Defeating automatic loading of the energized AC emergency bus provides bus overload protection by permitting the operator to evaluate the status of the restored bus and to manually load equipment onto the bus consistent with bus status and plant conditions.

Actions to isolate NC pump seal cooling and to check the status of auxiliary boration systems permit the NC system inventory makeup systems to be quickly started and minimize the potential for equipment damage following AC power restoration

3.3.4 **Evaluate Energized AC Emergency Bus**

Following restoration of AC power, the operator is instructed to:

1. Stabilize S/G pressures, if a secondary depressurization is in progress, and
2. Evaluate the status of the energized AC emergency bus.

These actions confirm certain select equipment has automatically loaded on the AC emergency bus and provides the operator with information that will aid him in loading subsequent equipment on the energized AC emergency bus.

Objective # 2

3.3.5 **Select Recovery Procedure after AC Power Restoration**

The last action category in procedure ECA-0.0 is the selection of the recovery procedure based on existing NC system conditions. The criteria for recovery procedure selection include:

1. Existence of NC system subcooling,
2. Existence of pressurizer level, and
3 Confirmation S/I equipment has not automatically actuated upon AC power restoration.

If NC conditions have not deteriorated significantly (i.e., all criteria are satisfied), the operator is directed to procedure ECA-0.1 to recover the plant using normal operational systems.

If NC system conditions have deteriorated significantly (i.e., any criterion is not satisfied), the operator is directed to procedure ECA-0.2 to recover the plant using safeguards systems.

PURPOSE: This step allows skipping steps associated with cooling down the plant if the SSF is operating properly and plant conditions are stable.

BASIS: Since MNS has an independent NC pump seal injection supply system, an immediate cooldown may not be required.

STEP 30 Check if A train H2 Igniters should be energized from the SSF as follows:

PURPOSE: To energize the H2 Igniters from the SSF D/G.

BASIS: To help mitigate a H2 concentration concern in containment should a LOCA occur during the event.

CAUTION Lowering S/G pressures to less than 190 PSIG will cause injection of CLA N_2 into the NC System.

PURPOSE: To alert the operator that S/G pressures must be maintained above the specified limit (190 PSIG.)

BASIS: S/Gs should be depressurized to maximize delivery (into the NC) of the water contained in the S/I accumulators while minimizing delivery of nitrogen. Maintaining S/G pressures above a value that prevents introduction of a significant volume of nitrogen into the NC ensures accumulator nitrogen will not impede natural circulation.

NOTE The S/Gs should be depressurized at a rate sufficient to maintain a cooldown rate in the NC System cold legs near 100^{o} F/hr. This will minimize NC System inventory loss while cooling the NC pump seals in a controlled manner.

NOTE Pzr level may be lost and reactor vessel head voiding may occur due to depressurization of S/Gs. Depressurization should not be stopped to prevent these occurrences.

NOTE If vital battery load stripping strategy has been implemented, review the following notes:

- **Main Steam Isolation initiate and reset lights do not work**
- **NC T-Cold indications are lost**
- **Enclosure 24 (S/G Depressurization Limits) provides alternate indications to replace NC T-Colds for controlling cooldown rate in next step.**

PURPOSE: To inform the operator of the following.

1. The desired rate of S/G depressurization.
2. The control room does not have control of 2SV-7 (2C SM PORV) due to swap to SSF.
3. Reactor vessel upper head voiding is possible during S/G depressurization.

BASIS:

1. The intact S/Gs should be depressurized as quickly as possible, to minimize NC inventory loss, but within the constraint of controllability. Controllability is required to ensure S/G pressures do not undershoot the specified limit.

2. The design of the SSF system provides for control of various valves from the SSF. When control is swapped to the SSF, the control room no longer has control of these valves. Some of these valves fail to their required position and remote control is not available.

3. Loss of pressurizer level and reactor vessel upper head voiding may result from the rapid depressurization of the intact S/Gs. Such a condition is anticipated and should not interfere with operator actions to depressurize the S/Gs to reduce NC pressure and temperature and to minimize NC inventory loss out of the NC seals.

STEP 31 Depressurize intact S/Gs to 290 PSIG as follows:

PURPOSE: To depressurize the intact S/Gs.

It is important to maintain at least one intact S/G N/R level above the top of the U-tubes during depressurization.

BASIS: During the rapid depressurization performed in this step, S/G level could drop out of the N/R, resulting in a loss of adequate heat sink. If this situation occurs, the depressurization should be stopped and CA flow reestablished until S/G N/R level is raised to greater than 11% (32% ACC).

This step depressurizes the intact S/Gs, thereby reducing NC temperature and pressure to reduce NC pump seal leakage and minimize NC inventory loss.

Once intact S/G pressure is reduced to 290 PSIG, the S/G PORVs and CA flow should be controlled to maintain S/G pressure at that level until AC power is restored.

RNO points to FSG-9 (Low Decay Heat Temperature Control) if uncontrolled cooldown below 290 PSIG occurs.

NOTE The If vital battery load stripping strategy has been implemented, only N31 S/R SUR, N35 I/R SUR, and W/R Neutron Flux will be available.

STEP 32 Monitor reactor subcritical as follows:

PURPOSE: To ensure the reactor does not return to a critical condition during S/G depressurization.

BASIS: This step checks for a zero or negative startup rate on the intermediate and source range channels. If a positive startup rate is detected, the RNO action requires secondary depressurization be terminated and NC temperature be allowed to go up to shut down the reactor. This step addresses the core criticality concern associated with S/G depressurization and NC cooldown.

If in an ELAP event anticipated to last over 4 hours then the user is directed to perform FSG-08 Alternate NC System Boration.

STEP 33 Check S/I signal status as follows:

PURPOSE: To check if an S/I signal exists.

BASIS: The secondary depressurization initiated in Step 31 will result in S/I actuation, if not already actuated, on low Pzr pressure. The operator should check S/I actuation status and reset S/I as soon as the reset delay time has expired. This reset action is consistent with the philosophy of defeating automatic loading of the emergency bus upon AC power

3.8 ELECTRICAL POWER SYSTEMS

3.8.6 Battery Cell Parameters

LCO 3.8.6 Battery cell parameters for the channels of DC batteries shall be within the limits of Table 3.8.6-1.

APPLICABILITY: When associated channels of DC sources are required to be OPERABLE.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each battery.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more batteries with one or more battery cell parameters not within Category A or B limits.	A.1 Verify pilot cells electrolyte level and float voltage meet Table 3.8.6-1 Category C limits.	1 hour
	AND	
	A.2 Verify battery cell parameters meet Table 3.8.6-1 Category C limits.	24 hours AND Once per 7 days thereafter
	AND	
	A.3 Restore battery cell parameters to Category A and B limits of Table 3.8.6-1.	31 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met. <u>OR</u> One or more batteries with average electrolyte temperature of the representative cells < 60°F. <u>OR</u> One or more batteries with one or more battery cell parameters not within Category C values.	B.1 Declare associated battery inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.8.6.1 Verify battery cell parameters meet Table 3.8.6-1 Category A limits.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.6.2	Verify battery cell parameters meet Table 3.8.6-1 Category B limits.	In accordance with the Surveillance Frequency Control Program AND Once within 7 days after a battery discharge < 110 V AND Once within 7 days after a battery overcharge > 150 V
SR 3.8.6.3	Verify average electrolyte temperature of representative cells is ≥ 60°F.	In accordance with the Surveillance Frequency Control Program

Table 3.8.6-1 (page 1 of 1)
Battery Cell Parameters Requirements

PARAMETER	CATEGORY A: LIMITS FOR EACH DESIGNATED PILOT CELL	CATEGORY B: LIMITS FOR EACH CONNECTED CELL	CATEGORY C: ALLOWABLE LIMITS FOR EACH CONNECTED CELL
Electrolyte Level	> Minimum level indication mark, and ≤ ¼ inch above maximum level indication mark[(a)]	> Minimum level indication mark, and ≤ ¼ inch above maximum level indication mark[(a)]	Above top of plates, and not overflowing
Float Voltage	≥ 2.13 V	≥ 2.13 V	> 2.07 V
Specific Gravity[(b)(c)]	≥ 1.200	≥ 1.195 AND Average of all connected cells > 1.205	Not more than 0.020 below average of all connected cells or ≥ 1.195 AND Average of all connected cells ≥ 1.195

(a) It is acceptable for the electrolyte level to temporarily increase above the specified maximum during equalizing charges provided it is not overflowing.

(b) Corrected for electrolyte temperature and level. Level correction is not required, however, when battery charging is < 2 amps when on float charge.

(c) A battery charging current of < 2 amps when on float charge is acceptable for meeting specific gravity limits following a battery recharge, for a maximum of 7 days. When charging current is used to satisfy specific gravity requirements, specific gravity of each connected cell shall be measured prior to expiration of the 7 day allowance.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery Cell Parameters

BASES

BACKGROUND

This LCO delineates the limits on electrolyte temperature, level, float voltage, and specific gravity for the DC power source batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources—Operating," and LCO 3.8.5, "DC Sources—Shutdown."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators, emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining at least one train of DC sources OPERABLE during accident conditions, in the event of:

a. An assumed loss of all offsite AC power or all onsite AC power; and

b. A worst case single failure.

Battery cell parameters satisfy the Criterion 3 of 10 CFR 50.36 (Ref. 3).

LCO

Battery cell parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. Electrolyte limits are conservatively established, allowing continued DC electrical system function even with Category A and B limits not met.

APPLICABILITY

The battery cell parameters are required solely for the support of the associated DC electrical power subsystems. Therefore, battery electrolyte is only required when the DC power source is required to be OPERABLE. Refer to the Applicability discussion in Bases for LCO 3.8.4 and LCO 3.8.5.

ACTIONS

A.1, A.2, and A.3

With one or more cells in one or more batteries not within limits (i.e., Category A limits not met, Category B limits not met, or Category A and B limits not met) but within the Category C limits specified in Table 3.8.6-1 in the accompanying LCO, the battery is degraded but there is still sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of Category A or B limits not met and operation is permitted for a limited period.

The pilot cell electrolyte level and float voltage are required to be verified to meet the Category C limits within 1 hour (Required Action A.1). This check will provide a quick indication of the status of the remainder of the battery cells. One hour provides time to inspect the electrolyte level and to confirm the float voltage of the pilot cells. One hour is considered a reasonable amount of time to perform the required verification.

Verification that the Category C limits are met (Required Action A.2) provides assurance that during the time needed to restore the parameters to the Category A and B limits, the battery is still capable of performing its intended function. A period of 24 hours is allowed to complete the initial verification because specific gravity measurements must be obtained for each connected cell. Taking into consideration both the time required to perform the required verification and the assurance that the battery cell parameters are not severely degraded, this time is considered reasonable. The verification is repeated at 7 day intervals until the parameters are restored to Category A or B limits. This periodic verification is consistent with the normal Frequency of pilot cell Surveillances.

Continued operation is only permitted for 31 days before battery cell parameters must be restored to within Category A and B limits. With the consideration that, while battery capacity is degraded, sufficient capacity exists to perform the intended function and to allow time to fully restore the battery cell parameters to normal limits, this time is acceptable prior to declaring the battery inoperable.

B.1

With one or more batteries with one or more battery cell parameters outside the Category C limit for any connected cell, sufficient capacity to supply the maximum expected load requirement is not assured and the corresponding DC electrical power subsystem must be declared inoperable. Additionally, other potentially extreme conditions, such as not

ACTIONS (continued)

completing the Required Actions of Condition A within the required Completion Time or average electrolyte temperature of representative cells falling below 60°F, are also cause for immediately declaring the associated DC electrical power subsystem inoperable.

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

This SR verifies that Category A battery cell parameters are consistent with IEEE-450 (Ref. 4), which recommends regular battery inspections including voltage, specific gravity, and electrolyte temperature of pilot cells. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.8.6.2

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. In addition, within 7 days of a battery discharge < 110 V or a battery overcharge > 150 V, the battery must be demonstrated to meet Category B limits. Transients, such as motor starting transients, which may momentarily cause battery voltage to drop to ≤ 110 V, do not constitute a battery discharge provided the battery terminal voltage and float current return to pre-transient values. This inspection is also consistent with IEEE-450 (Ref. 4), which recommends special inspections following a severe discharge or overcharge, to ensure that no significant degradation of the battery occurs as a consequence of such discharge or overcharge.

SR 3.8.6.3

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

Lower than normal temperatures act to inhibit or reduce battery capacity. This SR ensures that the operating temperatures remain within an acceptable operating range. This limit is based on manufacturer recommendations.

The term "representative cells" replaces the fixed number of "six connected cells", consistent with the recommendations of IEEE-450 (Ref. 4) to provide a general guidance to the number of cells adequate to

SURVEILLANCE REQUIREMENTS (continued)

monitor the temperature of the battery cells as an indicator of satisfactory performance. For some cases, the number of cells may be less than six, in other conditions, the number may be more.

Table 3.8.6-1

This table delineates the limits on electrolyte level, float voltage, and specific gravity for three different categories. The meaning of each category is discussed below.

Category A defines the normal parameter limit for each designated pilot cell in each battery. The cells selected as pilot cells are those whose temperature, voltage, and electrolyte specific gravity approximate the state of charge of the entire battery.

The Category A limits specified for electrolyte level are based on manufacturer recommendations and are consistent with the guidance in IEEE-450 (Ref. 4), with the extra 1/4 inch allowance above the high water level indication for operating margin to account for temperatures and charge effects. In addition to this allowance, footnote a to Table 3.8.6-1 permits the electrolyte level to be above the specified maximum level during equalizing charge, provided it is not overflowing. These limits ensure that the plates suffer no physical damage, and that adequate electron transfer capability is maintained in the event of transient conditions. IEEE-450 (Ref. 4) recommends that electrolyte level readings should be made only after the battery has been at float charge for at least 72 hours.

The Category A limit specified for float voltage is ≥ 2.13 V per cell. This value is based on the recommendations of IEEE-450 (Ref. 4), which states that prolonged operation of cells < 2.13 V can reduce the life expectancy of cells.

The Category A limit specified for specific gravity for each pilot cell is ≥ 1.200 (0.015 below the manufacturer fully charged nominal specific gravity or a battery charging current that had stabilized at a low value). This value is characteristic of a charged cell with adequate capacity. According to IEEE-450 (Ref. 4), the specific gravity readings are based on a temperature of 77°F (25°C).

SURVEILLANCE REQUIREMENTS (continued)

The specific gravity readings are corrected for actual electrolyte temperature and level. For each 3°F (1.67°C) above 77°F (25°C), 1 point (0.001) is added to the reading; 1 point is subtracted for each 3°F below 77°F. The specific gravity of the electrolyte in a cell increases with a loss of water due to electrolysis or evaporation.

Category B defines the normal parameter limits for each connected cell. The term "connected cell" excludes any battery cell that may be jumpered out.

The Category B limits specified for electrolyte level and float voltage are the same as those specified for Category A and have been discussed above. The Category B limit specified for specific gravity for each connected cell is ≥ 1.195 (0.020 below the manufacturer fully charged, nominal specific gravity) with the average of all connected cells > 1.205 (0.010 below the manufacturer fully charged, nominal specific gravity). These values are based on manufacturer's recommendations. The minimum specific gravity value required for each cell ensures that the effects of a highly charged or newly installed cell will not mask overall degradation of the battery.

Category C defines the limits for each connected cell. These values, although reduced, provide assurance that sufficient capacity exists to perform the intended function and maintain a margin of safety. When any battery parameter is outside the Category C limits, the assurance of sufficient capacity described above no longer exists, and the battery must be declared inoperable.

The Category C limits specified for electrolyte level (above the top of the plates and not overflowing) ensure that the plates suffer no physical damage and maintain adequate electron transfer capability. The Category C limits for float voltage is based on IEEE-450 (Ref. 4), which states that a cell voltage of 2.07 V or below, under float conditions and not caused by elevated temperature of the cell, indicates internal cell problems and may require cell replacement.

The Category C limit of average specific gravity ≥ 1.195 is based on manufacturer recommendations (0.020 below the manufacturer recommended fully charged, nominal specific gravity). In addition to that limit, it is required that the specific gravity for each connected cell must be no less than 0.020 below the average of all connected cells. This limit ensures that the effect of a highly charged or new cell does not mask overall degradation of the battery.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems—Operating

BASES

BACKGROUND

The onsite Class 1E AC, DC, and AC vital bus electrical power distribution systems are divided by train into two redundant and independent AC, four independent channels (two per train) of DC, and four AC vital buses electrical power distribution subsystems.

The AC electrical power subsystem for each train consists of a primary Engineered Safety Feature (ESF) 4.16 kV bus and secondary 600 V buses, distribution panels, motor control centers and load centers. Each 4.16 kV ESF bus has at least one separate and independent offsite source of power from a 6.9 kV non safety related bus, as well as a dedicated onsite diesel generator (DG) source. Each 6.9 kV bus is normally connected to an offsite source. After a loss of the normal offsite power source to a 6.9 kV bus, an automatic transfer scheme automatically transfers the bus to the alternate offsite source if it is available. A fast transfer occurs if normal and alternate sources are synchronous, otherwise this transfer is done as a slow transfer (time delayed). If the normal and alternate offsite sources are unavailable, the onsite emergency DG supplies power to the 4.16 kV ESF bus. Control power for the 4.16 kV breakers is supplied from the Class 1E batteries. Additional description of this system may be found in the Bases for LCO 3.8.1, "AC Sources—Operating," and the Bases for LCO 3.8.4, "DC Sources—Operating."

The secondary AC electrical power distribution system for each train includes the safety related load centers, motor control centers, and distribution panels shown in Table B 3.8.9-1. Motor control centers shown in Table B 3.8.9-1 also include all submotor control centers such as EMXA1, EMXA2, EMXB1, EMXB2, 1EMXH1, etc.

The 120 VAC vital buses are arranged in two load groups per train and are normally powered from the inverters. The alternate power supply for the vital buses is from the regulated voltage transformers and their use is governed by LCO 3.8.7, "Inverters—Operating." The regulated voltage transformer is powered from a non-Class 1E AC bus.

The list of all required distribution buses is presented in Table B 3.8.9-1.

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 1), and in the UFSAR, Chapter 15 (Ref. 2), assume ESF systems are OPERABLE. The AC, DC,

APPLICABLE SAFETY ANALYSES (continued)

and AC vital bus electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the AC, DC, and AC vital bus electrical power distribution systems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining power distribution systems OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite power or all onsite AC electrical power; and

b. A worst case single failure.

The distribution systems satisfy Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

LCO

The required power distribution subsystems listed in Table B 3.8.9-1 ensure the availability of AC, DC, and AC vital bus electrical power for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. The AC, DC, and AC vital bus electrical power distribution subsystems are required to be OPERABLE.

Maintaining the Train A and Train B AC, channels of DC, and AC vital buses OPERABLE ensures that the redundancy incorporated into the design of ESF is not defeated. Therefore, a single failure within any system or within the electrical power distribution subsystems will not prevent safe shutdown of the reactor.

OPERABLE AC electrical power distribution subsystems require the associated buses, load centers, motor control centers, and distribution panels to be energized to their proper voltages. OPERABLE DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage from either the associated battery or charger. OPERABLE AC vital bus electrical power distribution subsystems require the associated buses to be energized to their proper voltage from the associated inverter via inverted DC voltage or regulated voltage transformer.

B

Given the following conditions on Unit 1:

- The unit is at 100% RTP
- A loss of Battery Charger EVCA occurred
- Battery EVCA voltage lowered to 109 VDC

Following restoration, conditions are:

- Battery EVCA voltage is currently 129 VDC
- For two connected cells, the Specific Gravity is 1.180
- For all connected cells, the average Specific Gravity is 1.202
- Electrolyte temperature is 76°F

Battery EVCA is considered ___(1)___. The operability of the DC Distribution System ensures that as a MINIMUM, at least ONE DC ___(2)___ is available assuming a loss of off-site OR on-site power coincident with a worst case single failure.

Which ONE (1) of the following completes the statements above?

REFERENCE PROVIDED

A. 1. OPERABLE but Degraded
   2. Train

B. 1. INOPERABLE
   2. Train

C. 1. OPERABLE but Degraded
   2. Channel

D. 1. INOPERABLE
   2. Channel

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EXAM BANK QUESTION: 2979 MNS B

General Discussion

Answer A Discussion

A.Incorrect. Operable but degraded would be related to Category A or B parameter out of limits. In this case, the applicant must determine that specific gravity is out of limit for category C, making the battery inoperable

Answer B Discussion

B.Correct.

Answer C Discussion

C.Incorrect. See A

Answer D Discussion

D.Incorrect. Operability is correct, but basis seeks to ensure that one Train is available rather than one channel as a minimum

Basis for meeting the KA

KA matched because the applicant must determine operability of selected equipment related to selected APE. (Loss of DC)

Basis for Hi Cog

Basis for SRO only

SRO level because a determination of operability, and basis for operability, are the required knowledge items for this test item

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	MNS 2008 NRC Q81

Development References
Technical Reference(s)TS 3.8.6 and basis EL-EPL Rev 22 Learning Objective:EL-EPL # 3

Student References Provided
Copy of TS 3.8.6

KA	KA_desc
APE058 2.2.37	APE058 GENERICAbility to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Q89 References

A. <u>Purpose</u>

This procedure provides guidance on how to respond to Main Generator voltage regulator malfunctions and to voltage and/or frequency disturbances on the Electrical Grid.

Q89 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
__ 1. **Announce occurrence on page.**	
__ 2. **Ensure dispatcher is aware of problem.**	
__ 3. **Notify Unit 2 to evaluate implementing AP/2/A/5500/05 (Generator Voltage and Electric Grid Disturbances).**	
__ 4. **Check Unit 1 Generator - TIED TO GRID.**	__ **GO TO Step 20.**
__ 5. **IF AT ANY TIME reactor power is greater than 100%, THEN reduce turbine load to maintain reactor power less than 100%.**	
__ 6. **Check Unit 1 Generator frequency - GREATER THAN 58.5 Hz.**	__ **IF Generator frequency does not immediately recover above 58.5 Hz, THEN GO TO Step 15 to separate from the grid.**

Q89 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. **Monitor Generator Capability Curve as follows:**	
NOTE In the following step, if Generator voltage is fluctuating above and below 24 KV, then assume voltage is less than 24 KV.	
__ a. Check Generator voltage - LESS THAN 24 KV.	a. Perform the following: __ 1) Monitor Generator Capability Curve **PER** Enclosure 1 (Generator Capability Curve - 24 KV). __ 2) **GO TO** Step 8.
__ b. Check OAC - IN SERVICE.	b. Perform the following: __ 1) Monitor Generator Capability Curve **PER** Enclosure 2 (Generator Capability Curve - 22.8 KV). __ 2) **GO TO** Step 8.
__ c. Monitor Generator Capability Curve **PER** OAC turn on code "GENCAP".	
__ 8. **Check Generator MVARs - WITHIN LIMITS OF GENERATOR CAPABILITY CURVE.**	__ **GO TO Step 11.**
__ 9. **IF AT ANY TIME capability curve exceeded, THEN perform Steps 11 and 12.**	
__ 10. **GO TO Step 13.**	

Q89 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
11. Adjust MVARs to within the capability curve by performing one of the following: __ • Depress "LOWER" on the "VOLTAGE ADJUST" to reduce lagging MVARs. OR __ • Depress "RAISE" on the "VOLTAGE ADJUST" to reduce leading MVARs.	
__ **12. Check Generator MVARs - WITHIN LIMITS OF GENERATOR CAPABILITY.**	**<u>IF</u> actions in Step 11 do not restore MVARs, <u>THEN</u> perform the following:** a. <u>IF</u> voltage regulator in "AUTO", **<u>THEN</u>** perform the following: __ 1) Place voltage regulator in "MAN". __ 2) Adjust MVARs to within the capability curve. b. <u>IF</u> unable to maintain MVARs within limits, **<u>THEN</u>** remove Generator from service as follows: 1) **<u>IF</u>** greater than P-8, **<u>THEN</u>** perform the following: __ a) Trip reactor. __ b) **<u>GO TO</u>** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection). 2) **<u>IF</u>** less than P-8, **<u>THEN</u>** perform the following: __ a) Trip turbine. __ b) **<u>GO TO</u>** AP/1/A/5500/02 (Turbine Generator Trip).

Q89 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
13. **Monitor Generator frequency as follows:**	
__ a. Check Generator frequency - BETWEEN 59.9 - 60.1 Hz.	__ a. **GO TO** Step 13.d.
__ b. **IF AT ANY TIME** Generator frequency is abnormal **OR** TCC/SOC reports abnormal grid frequency condition, **THEN GO TO** Step 13.d.	
__ c. **GO TO** Step 16.	
__ d. Monitor Generator frequency using turn on code "APGENFRQ".	

CAUTION **If Generator frequency goes below 58.5 Hz, the unit must be separated from the grid within 10 minutes or a Generator lockout will occur.**

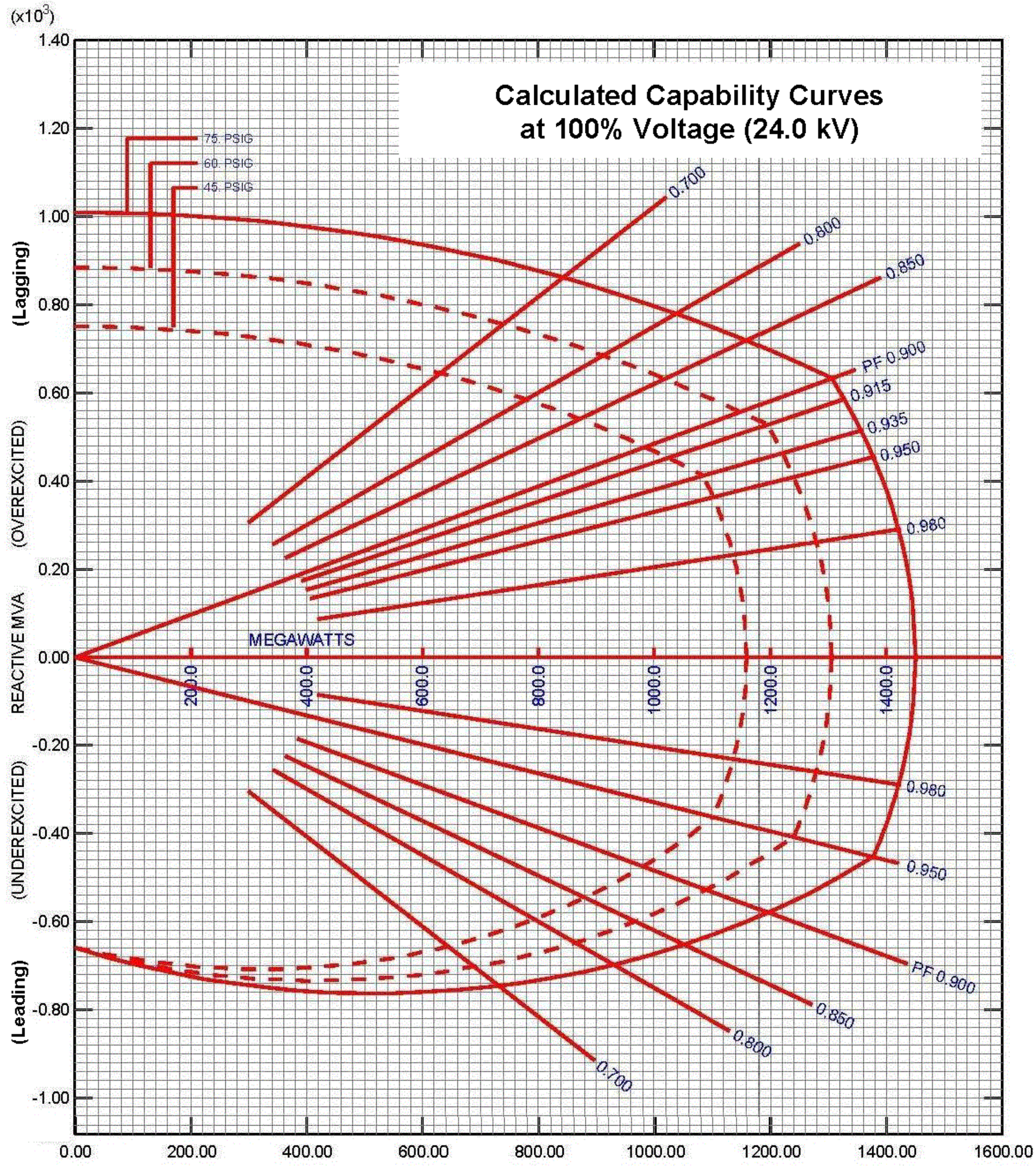
ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ e. **IF AT ANY TIME** Generator frequency goes below 58.5 Hz (LO LO alarm setpoint on OAC) **AND** does not immediately recover above 58.5 Hz, **THEN GO TO** Step 15 to separate from the grid.	
__ 14. **GO TO Step 16.**	

Q89 References

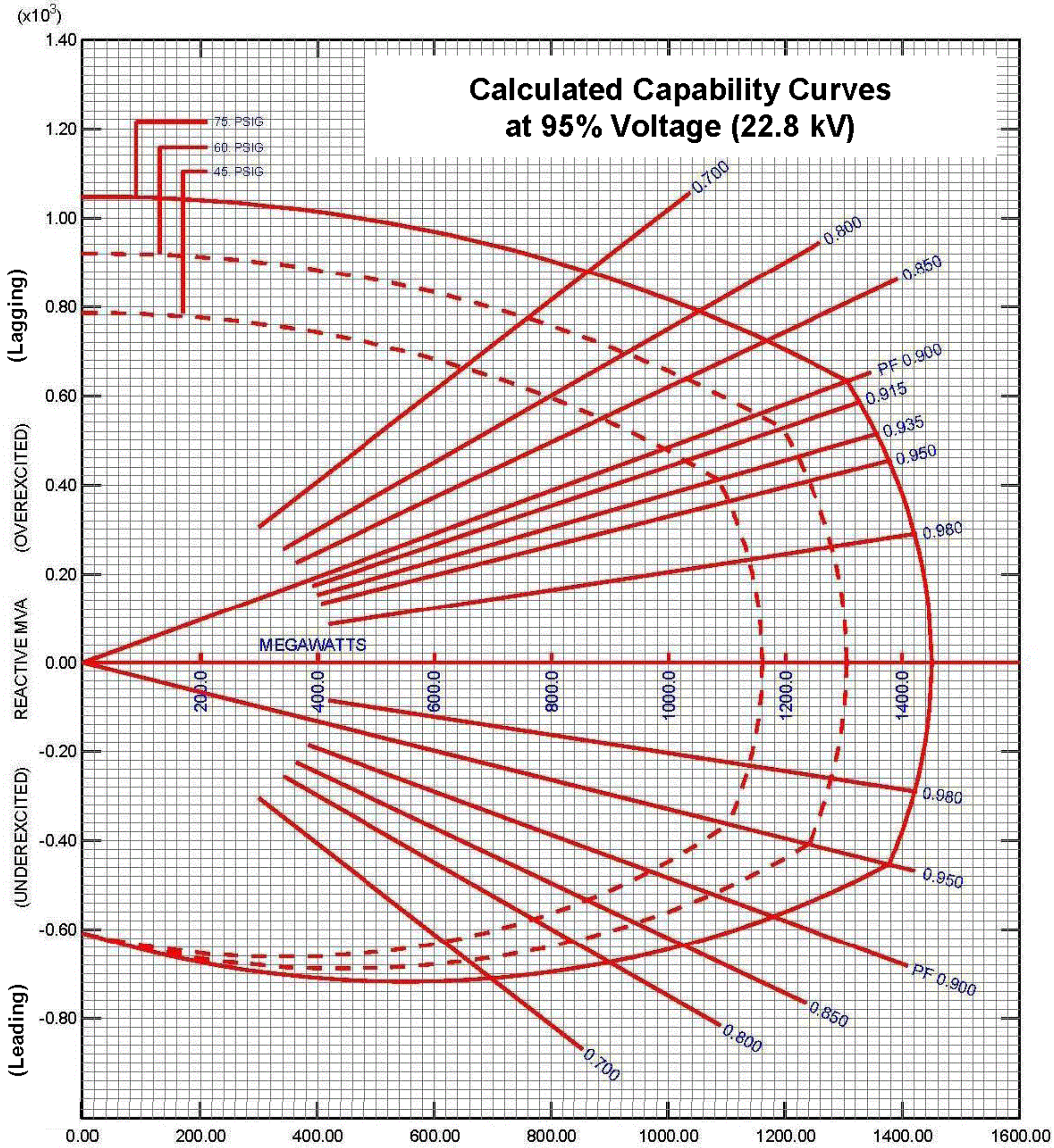
ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15. **Separate from the grid as follows:**	
__ a. Notify SOC that Unit 1 is separating from the grid.	
__ b. Ensure control rods in auto.	
__ c. Check Turbine inlet pressure - GREATER THAN 275 PSIG.	__ c. **GO TO** Step 15.k.
__ d. Check Turbine automatic control - AVAILABLE.	d. Perform the following: __ 1) Trip reactor. __ 2) Open PCB-8. __ 3) Open PCB-9. __ 4) Open PCB-11. __ 5) Open PCB-12. __ 6) **GO TO** EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).
__ e. Ensure Turbine control in "OPERATOR AUTO".	
__ f. Place "MW LOOP" in service.	
__ g. Enter target load of 300 MW.	
__ h. Enter load rate of 300 MW/MIN.	
__ i. Depress "GO".	
j. Do not continue until the following conditions are met: __ • Turbine inlet pressure - LESS THAN 275 PSIG __ • P/R meters - LESS THAN 60%.	
__ k. Notify Unit 2 Operator that Unit 1 is separating from the grid.	
__ l. Take "MW LOOP" out of service.	

Q89 References

MNS AP/1/A/5500/05 **UNIT 1**	GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES Enclosure 1 - Page 1 of 1 **Generator Capability Curve - 24 KV**	PAGE NO. 14 of 27 Rev. 13



Q89 References



Q89 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

__ 1. **Check 1ETA and 1ETB - BOTH SUPPLIED FROM UNIT ONE OFFSITE POWER.**

Perform the following:

__ a. **IF** Unit 2 generator tied to grid **AND** TCC has informed Unit 2 that "Real Time Contingency Analysis" (RTCA) indicates 525 KV switchyard (grid) voltage would not be adequate should the unit trip, **THEN** observe Notes prior to Step 2 and **GO TO** Step 2.

b. Evaluate the following Tech Specs and declare any system inoperable that is aligned to a degraded offsite power source:

- __ Offsite power sources (TS 3.8.1)

NOTE ECCS and shared systems must have an operable "normal" power source to be operable.

- __ ECCS (Tech Spec 3.5.2)
- Shared systems:
  - __ Shared RN valves (TS 3.7.7)
  - __ VC (Tech Spec 3.7.9)
  - __ YC (Tech Spec 3.7.10)
  - __ VA (Tech Spec 3.7.11).

__ c. Evaluate realigning inoperable systems to operable power source.

__ d. **GO TO** Step 21.

Q89 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE The TCC monitors grid voltage using the Real Time Contingency Analysis computer program and can estimate whether or not the nuclear units will have adequate offsite voltage available for safety system loads should a LOCA or a reactor trip occur.

While in this condition, offsite power is inoperable and both trains of ECCS are inoperable (LCO 3.5.2). Two inoperable ECCS trains require entry into LCO 3.0.3. Additionally, shared systems (shared RN valves, VC, YC, VA) require an operable "Normal" power source and may be affected.

The SOC has 2 hours to restore grid voltage to normal. If they cannot, IAE will be directed to install jumpers in the 4160 degraded voltage cabinets. The jumpers defeat the 10 second time delay circuit that is in series with ESF relay contact that closes when a S/I occurs. Once jumpers are in place for 1ETA and 1ETB, ECCS operability is restored, and LCO 3.0.3 due to ECCS can be exited. Offsite power remains inoperable until normal grid voltage is restored.

The jumpers do not make the degraded voltage relays inoperable per Tech Spec 3.3.5 (Loss of power Diesel Generator Start Instrumentation). The degraded voltage 10 minute time delay circuit is not affected.

If an S/I occurs with the jumpers installed, the 4160V incoming breakers trip open. The emergency D/Gs will carry the LOCA loads. This will prevent a "double sequencing" of essential loads during degraded grid conditions.

If a reactor trip occurs without an S/I and the jumpers are installed, 1ETA and 1ETB voltage may drop below the degraded voltage setpoint. If this condition lasts 10 minutes, the incoming breakers will trip, causing a B/O.

__ 2. **Start a 2 hour timer from time of receiving notification from TCC that switchyard voltage (grid) is degraded.**

3. **Enter L.C.O. 3.0.3, due to both trains of ECCS inoperable (Tech Spec 3.5.2).**

   __ a. Comply with L.C.O. 3.0.3, but minimize the load reduction during the first three hours. (Reducing load aggravates the grid disturbance.)

__ 4. **Declare both Unit 1 offsite power sources inoperable per Tech Spec 3.8.1.**

Duke Energy
McGuire Nuclear Station

Background Document
for

AP/1 & 2/A/5500/005 (Generator Voltage and Electric Grid Disturbances)

S. Hackney / 11/13/14
Prepared by Date

_______________________________/________
Reviewed by Date

_______________________________/________
Additional Review by Date

_______________________________/________
Additional Review by Date

_______________________________/________
Approved by Date

frequency by each unit doing its small share. As this scenario goes, if a unit or units of generation (or significant load) is lost to the grid, many units each doing a small part can make up for the loss. With the grid tied so tightly together, this compensation may occur over a large region (i.e., several utilities' units involved in the correction). This way, no one unit is overburdened.

For McGuire, the DEH is designed to pick up a maximum of 7.2 MW for every 0.1 Hz below 59.963 Hz, and to cut a maximum of 7.2 MW for every 0.1 Hz above 60.037 Hz. This control feature doesn't kick in until frequency is less than 59.963 Hz or greater than 60.037 Hz. The total compensation allowed for a load increase or decrease by this feature is 20 MW. If frequency continues to increase, DEH will cut a maximum of 31.52 MW for every 0.1 Hz above 60.35 Hz. The total load decrease is limited to 480 MW. Note that if frequency gets too high, an automatic turbine trip would occur at 110% speed (66 Hz).

Tech Specs require power to be maintained less than or equal to 100%. As noted above, if frequency is dropping, the turbine controls will automatically pick up some load in an attempt to maintain system frequency (refer to PIPs M-99-0713 & M-99-3021, Unit 1 power increase on grid frequency drop). The maximum increase allowed is 20 Mw. If the plant started out at 100% power, this could result in power going to 102%. The operator is cued in this step to reduce turbine load to maintain power less than 100%. If the operator were to reduce the reference load to 98% in this scenario, actual load on the turbine would be back down to 100%.

The question of a reactivity management concern has been raised following load increases by this feature. Several times, Duke Nuclear Units have temporarily gone over 100% because of this feature (refer to PIPs M-99-0713, M-99-03021). The concern with exceeding the licensed limit of 100% has been specifically addressed by PIP M-99-0874. An evaluation has determined this is acceptable. Note the following excerpt from the above PIP:

> A review of the 10CFR50.59 safety evaluation of MEVN-2467 & 2468 was performed. No significant concerns with the evaluation were found. The 10CFR50.59 safety evaluation was performed in 1990. The evaluation met or exceeded expectations that were in place at that time. The key issues associated with the modification are as follows:
>
> 1) The modification only involved software changes to a non-safety related control system (turbine control system).
>
> 2) All safety related protective control systems, such as ES and RPS, are not affected by the modification; they will continue to perform their respective safety functions.
>
> 3) The 20 mw limit assures that reactor power increases would be less that 2%.
>
> 4) Accident analysis performed assumes reactor power is at 102%.

DISCUSSION:
In the event that the grid disturbance may lead to a loss of offsite power, it is a prudent action to minimize testing and maintenance activities and take actions to return systems to normal.

REFERENCE:
PIP M-04-0255 CA # 6
PIP G-07-761

STEPS 24 & 25:

PURPOSE:
Provide instructions for operators in response to notification of Degraded Grid Conditions by the Transmission Control Center (TCC)

DISCUSSION:
PIP M-03-2961 identified a potential problem associated with degraded grid conditions that McGuire was not analyzed for. The Transmission Control Center (TCC) can determine when conditions exist that would cause the voltage supplied to a nuclear unit to fall below the degraded grid setpoint, if that unit were to trip. However, while the unit is online the degraded grid circuit does not actuate because the voltage is still being supported (held up) by the unit's main generator.

The TCC monitors system voltage using the Real Time Contingency Analysis (RTCA) computer program and can estimate whether or not the nuclear units will have adequate voltage available for the safety system loads should a LOCA event occur given the grid voltage and the actual system configuration at that point in time. The RTCA also is able to calculate expected grid voltages at a given time using system conditions assuming a generator trips off line.

Should a unit LOCA occur when the transmission power supply is degraded, the LOCA loads would begin to sequence onto the offsite power source. It was identified that at some point during the loading sequence the degraded grid protective relaying could disconnect the loads from the offsite power source under some degraded loading conditions. At that point, the loads would re-sequence onto the diesel generator resulting in what is referred to as a "double sequencing" event.

This "double sequencing" scenario potentially results in a delay/interruption of ECCS flow to the core, which is considered an unanalyzed event (Reference PIP M03-02961). If a degraded grid event occurs, offsite power sources cannot perform their intended function and are therefore considered INOPERABLE.

CIRCUIT DESIGN:

There is one Degraded Voltage relay per phase connected in a two-out-of-three (2/3) logic scheme to detect a Degraded Voltage Condition on the 4160 Volt Essential (4 kV) Bus. The Degraded Voltage relays are not part of the load sequencer circuitry, but they can initiate a Blackout.

Once the Degraded Voltage is detected on the 4 kV bus, two time delay relays begin timing to verify the event is sustained. If the first timer completes its cycle (10 seconds), an alarm will be initiated in the control room. Also, the first time delay duration is sufficient to not activate trip logic during voltage transients such as motor starts. The Auxiliary Feedwater pump motor requires the longest acceleration time of approximately 9 seconds at 80% voltage. Tech Spec 3.3.5 requires that this time delay be < 11 seconds. The second time delay relay is provided to allow additional time following the first time delay for the operators and/or the TCC to improve voltage. If the Degraded Voltage Condition is still present when the second timing cycle is complete (10 minutes), a blackout will be initiated on that train by opening the 4 kV bus Normal and Standby incoming circuit breakers. When these relays open the 4 kV Normal and Standby circuit breakers, the Loss of Voltage (UV) relays on the 4 kV bus will be actuated causing the load sequencer to start and load the emergency diesel generator.

Should a LOCA signal occur at any time after the first time delay relay completes its cycle, the circuit will automatically initiate separation from the offsite power source and transfer to the emergency diesel generators.

The enclosure step provides instructions for responding to TCC notification of a Degraded Grid Condition and to install jumpers per an enclosure "Defeat ETA and ETB Degraded Voltage Time Delay Relay" in the Degraded Voltage circuitry when a degraded grid condition has been identified with the unit generator on-line (Modes 1 and 2). The jumpers will bypass the degraded voltage relay logic and the first time delay relay such that a Blackout will be immediately initiated if a LOCA occurs with the jumper installed. The 2/3 Degraded Voltage logic scheme, the first time delay alarm initiation, and the second time delay relay (10 minutes) logic scheme are not affected by the jumpers.

SUMMARY:

The probability of this scenario is very unlikely, however, it has been determined that actions need to be in place to address this unlikely event. This scenario also applies to CNS and ONS. GO Regulatory Compliance has researched this issue and has determined the appropriate flow path within the McGuire Technical Specifications. Whenever the TCC calls the Control Room and informs Operations that the real time contingency analysis predicts there is inadequate voltage in the event of a unit LOCA with the unit tied to grid, then perform the following:

Enter TS 3.0.3 based on having a condition for which an associated action statement is not provided.

Enter TS 3.5.2 (ECCS) due to supporting systems being inoperable. Associated action statements do not have to be complied with based on TS 3.0.6.

Enter TS 3.8.1 due to both offsite power sources being inoperable.

AP/1 and 2/A/5500/005 (Generator Voltage and Electric Grid Disturbances)

Enter opposite unit's offsite power sources inoperable if being supplied from affected unit (refueling outage, S/D, etc).

As stated in the Tech Spec Bases for 3.7.7, 3.7.9, 3.7.10, and 3.7.11, shared systems (RN, VC, YC, and VA) require an operable “Normal” power source and therefore, may be affected as a result of a degraded grid condition. If the normal power source is INOPERABLE for both trains of shared systems (RN, VC, YC, and VA) then Tech Spec 3.0.3 is entered for RN, VC, and YC (per Tech Specs 3.7.7, 3.7.9, 3.7.10); and the required actions are taken for VA system per Tech Spec 3.7.11.

If the normal power source is INOPERABLE for only one train of shared systems (RN, VC, YC, and VA), then the appropriate required action is entered for that system.

Shared RN systems may also require entering 3.0.3 for Tech Spec 3.8.1 (AC Sources). Inoperable shared RN valves make associated RN train inoperable. Inoperable RN train makes associated D/G inoperable. Tech Spec 3.8.1 requires entering 3.0.3 based on two inoperable buslines plus one inoperable D/G.

Note that "A" train shared systems are typically powered from Unit 1 and "B" train shared systems are typically powered from Unit 2. Since both units would probably be affected by the degraded grid condition, it's likely that both trains of shared systems would be inoperable.

Regulatory Compliance will be notified if L.C.O. 3.0.3 is entered due to both trains of shared systems inoperable. Compliance will then evaluate requesting a NOED (Notice of Enforcement Discretion) from the NRC.

> From time to time, circumstances will arise where a power reactor licensee foresees that compliance with an NRC requirement would involve an unnecessary plant transient or plant shutdown, performance of testing, inspection, or system realignment is inappropriate with the specific plant conditions
>
> In these circumstances, the NRC staff may choose not to enforce the applicable technical specification, technical safety requirement, or other license or certificate condition. This type of enforcement discretion is designated as a NOED. The staff may also issue NOEDs in cases involving severe weather or other natural phenomena, based upon balancing the public health and safety or common defense and security of not operating, against the potential radiological or other hazards associated with continued operation, and a determination that safety will not be impacted unacceptably by exercising this discretion.
>
> NOEDs require justification from a licensee or certificate holder that documents the safety basis for the request and provides whatever other information the NRC staff deems necessary in making a decision on whether to issue a NOED.
>
> NOEDs may be issued where the noncompliance is temporary and nonrecurring when an amendment is not practical or if the expected noncompliance will occur

during the brief period of time it requires the NRC staff to process an emergency or exigent license amendment under the provisions of 10 CFR 50.91(a) (5) or (6) or a certificate amendment under 10 CFR 76.45.

The decision to issue a NOED does not change the fact that a violation will occur nor does it imply that enforcement discretion is being exercised for any violation that may have led to the violation at issue. In each case where the NRC staff has chosen to issue a NOED, enforcement action will normally be taken for the root causes, to the extent violations were involved, that led to the noncompliance for which enforcement discretion was used.

The NRC does not expect to issue NOEDs frequently. When the NRC does issue a NOED it will only do so if it is clearly satisfied that the action is consistent with protecting the public health and safety.

If ETA or ETB are being powered from the opposite unit via SATA or SATB, only components being powered from the inoperable offsite power source would be declared inoperable.

If Unit 2 enters AP05 and Unit 1 is being supplied offsite power from its own 230 KV switchyard, (1) Unit 1 offsite power source will be logged inoperable in order to meet GDC 17 requirements (Rock Springs Line). It does not matter which offsite source is logged.

This step provides guidance, upon notification of a Degraded Grid Condition by the TCC, to install jumpers in the 4160 Volt Essential Bus Degraded Voltage circuitry. This guidance is only necessary during modes 1 and 2 when the unit is on-line. The jumpers will cause an automatic initiation to separate the 4160 Volt Essential Bus from the offsite power source should a unit LOCA occur. The required LOCA loads will then be sequenced on the emergency diesel generators eliminating "double sequencing", which would delay/interrupt ECCS flow to the core. Once jumpers have been installed to prevent double sequencing, Tech Spec 3.0.3 and 3.5.2 for two trains of ECCS INOPERABLE can be exited and any other associated actions to comply with this specification can be terminated. However, offsite power sources will remain INOPERABLE per Tech Spec 3.8.1 until the Degraded Grid Condition is cleared and stable grid voltage is restored.

If grid voltage is not expected to be restored prior to Tech Spec required shutdown and the opposite unit's offsite power source is operable, the AP contains an option to swap one of the inoperable 4KV busses to the other unit through SATA or SATB. This should restore operability to the affected bus. The OP contains guidance for making this swap using the associated D/G to carry the bus while the swap is being made.

Once the grid voltage has been restored to a stable and normal condition, the installed jumpers will be removed per Enclosure 5 (Restore ETA Degraded Voltage Time Delay Relay), and Enclosure 6 (Restore ETB Degraded Voltage Time Delay Relay). It should be noted that the jumpers used do not affect the functionality of the Degraded Voltage function and therefore, Tech Spec 3.3.5 is not entered.

3.8 ELECTRICAL POWER SYSTEMS

3.8.1 AC Sources — Operating

LCO 3.8.1 The following AC electrical sources shall be OPERABLE:

a. Two qualified circuits between the offsite transmission network and the Onsite Essential Auxiliary Power System; and

b. Two diesel generators (DGs) capable of supplying the Onsite Essential Auxiliary Power Systems;

AND

The automatic load sequencers for Train A and Train B shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

--NOTE--

LCO 3.0.4.b is not applicable to DGs.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One offsite circuit inoperable.	A.1 Perform SR 3.8.1.1 for OPERABLE offsite circuit.	1 hour AND Once per 8 hours thereafter
	AND	
	A.2 Declare required feature(s) with no offsite power available inoperable when its redundant required feature(s) is inoperable.	24 hours from discovery of no offsite power to one train concurrent with inoperability of redundant required feature(s)
	AND	
		(continued)

Q89 References

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.3 Restore offsite circuit to OPERABLE status.	72 hours <u>AND</u> 6 days from discovery of failure to meet LCO
B. One DG inoperable.	B.1 Perform SR 3.8.1.1 for the offsite circuit(s).	1 hour <u>AND</u> Once per 8 hours thereafter
	<u>AND</u>	
	B.2 Declare required feature(s) supported by the inoperable DG inoperable when its required redundant feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
	<u>AND</u>	
	B.3.1 Determine OPERABLE DG is not inoperable due to common cause failure.	24 hours
	<u>OR</u>	
	B.3.2 Perform SR 3.8.1.2 for OPERABLE DG.	24 hours
	<u>AND</u>	

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.4 Restore DG to OPERABLE status.	72 hours ** AND 6 days from discovery of failure to meet LCO
C. Two offsite circuits inoperable.	C.1 Declare required feature(s) inoperable when its redundant required feature(s) is inoperable.	12 hours from discovery of Condition C concurrent with inoperability of redundant required feature(s)
	AND	
	C.2 Restore one offsite circuit to OPERABLE status.	24 hours

(continued)

** ‘A’ Train EDGs are allowed to be inoperable for a total of 14 days to address a non-conforming condition on the 'A' Train supply piping from the Standby Nuclear Service Water Pond (SNSWP). The 14 days may be taken consecutively or in parts until completion of the activity, or by March 31, 2019, whichever occurs first. During the period in which the 'A' Train NSWS supply piping from the SNSWP is not available, the ‘A’ Train NSWS will remain aligned to Lake Norman until the system is ready for post maintenance testing. Any maintenance that is performed on the remaining portions of ‘A’ Train NSWS during the period in which the ‘A’ NSWS from the SNSWP supply piping is not available will be limited to a 72 hour completion time. The latter will not count against the 14 day completion time. Allowance of the extended Completion Time is contingent on meeting the Compensatory Measures as described in MNS LAR submittal correspondence letter MNS-17-031.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One offsite circuit inoperable. AND One DG inoperable.	------------------NOTE------------------- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems — Operating," when Condition D is entered with no AC power source to any train. ---	
	D.1 Restore offsite circuit to OPERABLE status.	12 hours
	OR	
	D.2 Restore DG to OPERABLE status.	12 hours
E. Two DGs inoperable.	E.1 Restore one DG to OPERABLE status.	2 hours
F. One automatic load sequencer inoperable.	F.1 Restore automatic load sequencer to OPERABLE status.	12 hours
G. Required Action and associated Completion Time of Condition A, B, C, D, E, or F not met.	G.1 Be in MODE 3.	6 hours
	AND	
	G.2 Be in MODE 5.	36 hours
H. Three or more AC sources inoperable.	H.1 Enter LCO 3.0.3.	Immediately

C

Given the following:

- Unit 1 is at 100% RTP
- The TCC has reported that Real Time Contingency Analysis (RTCA) indicates INADEQUATE switchyard voltage
- The crew has entered AP/1/A/5500/037 (Generator Voltage and Electric Grid Disturbances)
- Main Generator operating conditions are as follows
  - Hydrogen Pressure (psig) 73
  - Generator VARS 750
  - Generator MW 1200

In accordance with AP/37:

the CRS will direct the OATC to _____(1)_____ .

once required jumpers are placed, both trains of offsite power _____(2)_____ remain inoperable.

REFERENCE PROVIDED

A. 1. decrease turbine load
   2. do

B. 1. decrease turbine load
   2. do NOT

C. 1. decrease generator voltage
   2. do

D. 1. decrease generator voltage
   2. do NOT

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EXAM BANK QUESTION: 6677 CNS

C

General Discussion

AP/37 contains steps to adjust generator voltage in order to maintain operation within the limits of the Capability Curve. There is no guidance for a load reduction other than removing the turbine from service via trip.

Inadequate switchyard voltage indicated by the Real Time Contingency Analysis will require ECCS, Offsite Power, NSW, and shared ventilation systems to be declared inoperable. Installation of jumpers for the purpose of preventing "Double Sequencing" will allow the unit to exit inoperability actions for ECCS ONLY. Offsite power will remain inoperable.

Answer A Discussion

Part 1 is plausible because AP/37 Case II (Abnormal Generator or Grid Frequency) does contain guidance for decreasing turbine load.

Part 2 is correct.

Answer B Discussion

Part 1 is plausible because AP/37 Case II (Abnormal Generator or Grid Frequency) does contain guidance for decreasing turbine load.

Part 2 is plausible because ECCS is no longer inoperable once jumpers are installed.

Answer C Discussion

CORRECT. See explanation above.

Answer D Discussion

Part 1 is correct.

Part 2 is plausible because ECCS is no longer inoperable once jumpers are installed.

Basis for meeting the KA

The applicant is required to demonstrate the ability to interpret an operating point on the generator capability curve and apply to procedural guidance. The applicant is also required to determine Tech Spec required actions for an Electric Grid Disturbance.

Basis for Hi Cog

The applicant is required to apply given data to a chart requiring more than one mental step.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):
1) This question can NOT be answered by knowing less than 1 hour Tech Specs
2) This question can NOT be answered by knowing information listed "above-the-line".
3) This question can NOT be answered by knowing the TS Safety Limits or their bases.
4) This question requires the applicant to have knowledge of the Tech Spec Basis. Specifically, it requires the applicant to have knowledge of the Design-Basis requirements for offsite circuitry along with Tech Spec application of an additional requirement based on discovery of an unanalyzed event.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	ILT15 CNS NRC Examination

Development References

T.S.B 3.8.1 (AC Sources - Operating), Rev. 5, LCO
OP-CN-EL-EPA (Main Power Distribution), Rev. 101, Section 7.1.2
AP/1/A/5500/037 (Generator Voltage and Electric Grid Disturbances), Rev. 03, Step 3 and 15 RNO b.

Student References Provided

Generator Capability Curve.

KA	KA_desc
APE077 AA2.01	Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: (CFR: 41.5 and 43.5 / 45.5, 45.7, and 45.8)Operating point on the generator capability curve........................

A. Purpose

To identify actions required in the event of a loss of condenser vacuum.

Q90 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

B. Symptoms

- **Condenser vacuum going down**
- **Hotwell temperature going up**
- **"CONDENSER LO VACUUM (PRETRIP)" alarm**
- **Main generator load going down**
- **Loss of condensate flow**
- **Loss of RC pumps.**

C. Operator Actions

__ 1. **Announce occurrence on page.**

2. **Check if turbine trip required:**

   __ • Main condenser vacuum - LESS THAN 20" HG.

   Perform the following:

   __ a. **IF AT ANY TIME** condenser vacuum goes below 20" Hg **OR** "CONDENSER LO VACUUM TURB TRIP" (2AD-1, A-7) alarms, **THEN GO TO** Step 3.

   __ b. **IF AT ANY TIME** "TURB EXH HOOD HI-HI TEMP" (2AD-1, F-8) alarms **AND** condenser vacuum is degraded **THEN GO TO** Step 3.

   __ c. Observe Note prior to Step 5 and **GO TO** Step 5.

__ 3. **Check turbine - TRIPPED.**

   Perform the following:

   __ a. Trip reactor.

   __ b. **GO TO** EP/2/A/5000/E-0 (Reactor Trip or Safety Injection) while continuing with this AP as time allows.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ 4. **Check reactor - TRIPPED.**	**Perform the following:** __ a. Trip reactor. __ b. **GO TO** EP/2/A/5000/E-0 (Reactor Trip or Safety Injection) while continuing with this AP as time allows.

NOTE Reducing turbine generator load will only help in maintaining vacuum during scenarios involving a reduction in RC cooling.

5. **Perform the following as necessary to assist in maintaining vacuum:**

- __ Reduce turbine generator load.
- __ Start additional RC pumps.
- __ Dispatch operator to start main vacuum pumps **PER** OP/2/B/6300/006 (Main Vacuum and Vacuum Priming), Enclosure 4.4 (ZM Pump Startup).

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

6. **Protect low pressure turbine blading as follows:**

__ a. Check turbine - LATCHED.

__ a. **IF** turbine tripped, **THEN GO TO** Step 7.

NOTE The following guidance prevents low pressure turbine blading damage during extended low vacuum conditions.

b. **IF AT ANY TIME** main condenser vacuum is less than value in table below, **THEN**:

__ 1) Trip Reactor.

__ 2) **GO TO** EP/2/A/5000/E-0 (Reactor Trip or Safety Injection) while continuing with this AP as time allows.

LOAD (MW)	CONDENSER VACUUM (IN Hg)
830 - 1200	22.0
800 - 830	22.2
750 - 800	22.6
700 - 750	23.0
650 - 700	23.4
600 - 650	23.8
550 - 600	24.2
0 - 550	24.6

Duke Energy
McGuire Nuclear Station

Background Document
for

AP/1&2/A/5500/023 (Loss of Condenser Vacuum)

GW Crump ______ / 7/08/15
Prepared by Date

______ / ______
Reviewed by Date

______ / ______
Additional Review by Date

______ / ______
Additional Review by Date

______ / ______
Approved by Date

INTRODUCTION

The purpose of this procedure is to identify actions required in the event of a loss of condenser vacuum.

Summary

This procedure provides guidance to the operator in responding to a loss of condenser vacuum. The actions do not defeat any safety functions or prevent the required operational features of any safety system from performing as required

For the situations that result in entry into the Emergency Procedures (i.e., E-0 for Reactor Trip or Safety Injection), the operation of equipment should be as directed by the applicable EP.

ENTRY CONDITIONS

This procedure can be entered any time the listed symptoms are encountered.

STEP DESCRIPTION FOR AP

STEP 1:

PURPOSE:
Alert plant personnel of the loss of condenser vacuum.

DISCUSSION:
Plant pages of abnormal conditions can have the benefit of both alerting personnel that actions they have taken could have led to the abnormal condition (with the expectation that they contact the CR), or alerting personnel to help with the abnormal condition (STA to the CR, NEOs mobilized, etc).

STEP 2:

PURPOSE:
Flow-path-controlling step to bypass the next couple of steps if the following conditions are not true: 1) condenser low vacuum trip is reached (less than 20”-23” Hg) or the condenser low vacuum turbine trip annunciator is in, 2) or if condenser vacuum is degraded and the Turb Exh Hood Hi-Hi Temp alarm is in.

DISCUSSION:
If neither of these conditions are true, the operator is directed to continuously monitor for these conditions and meanwhile, bypass the next couple of steps and continue on in the AP trying to diagnose and correct the problem with vacuum. If the conditions are true, then turbine trip is required for it's protection. The reactor is always tripped to initiate the turbine trip, to ensure an automatic reactor protection trip is not challenged.

STEP 3:

PURPOSE:
Protect the turbine from damage due to loss of condenser vacuum. The turbine manual states condenser vacuum less than approx. 24” with high steam flow (30%) or less than approx. 26” with low steam flow (<30%) can cause turbine blade damage.

DISCUSSION:
This step is reached if condenser low vacuum trip is reached. If this is the case, the turbine should have tripped automatically (the auto trip comes in between 20-23” Hg). This step can also be reached if condenser vacuum is lower than normal coincident with HI-HI exhaust hood temperature (indicates the increasing windage is not being cooled sufficiently by the steam flow). If the turbine is not tripped, the RNO gives direction to trip the reactor. This is consistent with the philosophy of tripping the reactor to prevent challenging an auto reactor trip. An auto reactor trip that is likely with no steam dumps is High Pzr Press, since condenser dumps are likely not available. Without condenser dumps, steam pressure and temperature have to increase until the reactor powers’ worth of steam flow is passing through the S/G PORVs and Safeties. This results in a rapid rise in NC pressure.

STEP 4:

PURPOSE:
For scenarios where the turbine automatically tripped while at a reactor power of less than P-8, the reactor may not have tripped. This step ensures the reactor gets tripped for these type scenarios.

DISCUSSION:
It's a conservative action to trip the reactor on a loss of condenser vacuum that causes a loss of turbine. A loss of steam dumps to the condenser is likely; (loss of C-9 Interlock) causing elevated T-ave and loss of secondary inventory (through S/G PORVs and Safeties).

STEP 5:

PURPOSE:
Actions to take to assist in maintaining vacuum.

DISCUSSION:
First action listed is to reduce turbine generator load. This will reduce the heat input to the condenser, allowing more thorough condensing of the steam that is still entering the condenser. This should help maintain condenser vacuum especially on scenarios involving a reduction in RC cooling. Reducing turbine load on scenarios involving buildup on non-condensable gas (air in-leakage or improper Air Ejector operation) can temporarily slow the vacuum decrease, but if the non-condensable problem is not resolved, vacuum will eventually be lost.

The next action listed is to start additional RC pumps. This should drop the saturation temperature in the condenser, which should reduce the back-pressure from the steam. Like the above action, this is most effective for scenarios involving an insufficient amount of RC cooling.

The next action listed is to start Main Vacuum Pumps. This action should be most effective in scenarios involving the buildup of non-condensable gas Vs insufficient RC cooling. This can also be effective in cases of SJAE "stalling". McGuire has experienced this phenomenon with two known excursions on Unit 1. What occurs is the SJAEs fail to remove the non-condensable gases and the inner core of the tubes stop condensing steam. This forces the outer tubes to increase heat removal and the RC outlet temperature, which is measured on the outer piping, goes up faster than is possible without drastic increase in reactor power. During that event, RC temperatures increased about 8°F, while power deceased. So with the Main Vacuum Pumps started, vacuum will still deteriorate slowly, but unless there is a breach that is not going to be able to be repaired, vacuum should stabilize at about 5 to 7 "HgA Vacuum"(Backpressure). This is above the Turbine trip set point and unit load will have to be reduced, but at least with the vacuum pumps in service, the condenser can be maintained if the SJAE fail.

REFERENCES:
PIP 99-05243

STEP 6:

PURPOSE:
Trip the turbine if condenser vacuum for given generator load drops below a certain value while the turbine is latched.

DISCUSSION:
Even though the given condenser vacuum setpoints are greater than the required turbine trip setpoints, we are required to trip the turbine below these values to minimize low pressure turbine blading damage during extended low vacuum conditions.

Per Engineering (Don Gabriel)
The OEM states that the turbine "should be tripped immediately if the limits in (Westinghouse Drawing) CT-25134 are exceeded". This information is intended to prevent turbine blade failure due to high backpressure on the last stage blades. In fact, the turbine blades will not fail immediately when the "do not operate" region of the drawing is entered. However, once in this region, the turbine should be returned immediately to the "operate in" region or tripped. From the operator's view, it may be better to have them trip the turbine than take the time necessary to decide if (1) the condition is valid and (2) it is not recoverable.

The limits on turbine operation with low vacuum at low loads is more restrictive than at higher loads. This is due to increased heating and blade loading forces at low steam flow (both high backpressure and reduced load are contributors). This should only be an issue at low load operation (less than 800 MW) because the low vacuum trip setting should protect (trip) the turbine above 800 MW without operator intervention.

The RNO will direct the operator around the step if the turbine is not latched.

REFERENCE:
Westinghouse DWG #CT-25134 - Backpressure (HgA) vs Load (mw)
PIP #M-01-04454

STEP 7:

PURPOSE:
Ensure sufficient AS header pressure for efficient air ejector operation.

DISCUSSION:
Very little reduction in steam pressure can cause the jets performance to drop significantly (refer to PIP M-4-00572 elevated secondary O2 levels). The jets are designed to operate with as little as 110 PSIG steam inlet pressure, but this is for dry steam (Main Steam). McGuire supplies the jets from Auxiliary Steam (wet steam), which doesn’t have the energy content of dry steam for a given pressure. The jets need approximately 140 PSIG or more to operate properly when being supplied the wet steam like McGuires’ Auxiliary Steam.

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EXAM BANK QUESTION: 3091 MNS **A**

Given the following conditions on Unit 2:

- The unit is at 45% RTP
- A failure of the RC system has occurred resulting in a severe reduction in RC flow to the Main Condenser
- Main Condenser vacuum is at 21" Hg and degrading and the crew has entered AP-23 (Loss of Condenser Vacuum)
- Annunciator 2AD-1, F8 (TURB EXH HOOD HI-HI TEMP) alarms

Which ONE (1) of the following actions would be required to mitigate the current plant conditions?

A. Trip the reactor, transition to E-0 (Reactor Trip or Safety Injection).

B. Reduce Turbine Generator load and start additional RC pumps per AP-23.

C. Trip the turbine, transition to AP-02 (Main Turbine Trip), stabilize reactor power at 12-15%.

D. Reduce Turbine Generator load and dispatch operators to start Main Vacuum pumps per AP-23.

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EXAM BANK QUESTION: 3091 MNS

A

General Discussion

For the given plant a condition, the Main condenser vacuum is above the trip setpoint of 20". This directs the crew to the RNO column for Step 2. The presence of the Turbine Exhaust Hood Hi-Hi Temperature directs the crew to Step 3 which checks the Turbine tripped. Since the turbine is not tripped at this time the crew is directed to the RNO column for Step 3 which directs the crew to Trip the reactor and transition to E-0 while continuing with AP-23 as time allows.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Plausible because both of these actions are directed in Step 5 of AP-23. It is plausible that the applicant could misunderstand that the Exhaust Hood Hi-Hi Temperature alarm requires tripping the reactor.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because tripping the turbine is appropriate. However, in this particular case, tripping the reactor to initiate the turbine trip is the desired course of action.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because reducing turbine load would be appropriate if the Turbine Exhaust Hood Hi-Hi Temperature was not present. Starting Main Vacuum pumps would be appropriate if the loss of vacuum were due to in-leakage.

Basis for meeting the KA

KA is matched because the plant condition given is a loss of condenser vacuum and the question requires the candidate to evaluate the plant conditions and choose the correct actions associated with a required Turbine and Reactor trip

Basis for Hi Cog

The Analysis Cog level is justified because the question requires the candidate to evaluate overall plant conditions and understand multiple indications (Main Vacuum below trip setpoint, Steam Dumps not available) in order to determine the correct course of action and procedural flowpath.

Basis for SRO only

This Question is linked to 10CFR55.43 (b)(5) Procedures. Justification for SRO level is that system knowledge alone is not enough to correctly answer. The question requires the candidate to assess plant conditions and recall specific actions required which are not simply entry conditions or immediate actions and requires an understanding of one of the major strategies associated with the loss of vacuum AP.

Distracter analysis changed after question was changed to be more SRO level knowledge which also changed correct answer.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2009 MNS NRC Q76 (Bank 3091)

Development References

References:
AP-23, Loss of Condenser Vacuum Background Doc. (Rev 3) Pg 4
AP-23, Loss of Condenser Vacuum (Rev 7) Pg 2

Learning Objectives:
OP-MC-AP-23 Obj. 2

Student References Provided

EAL - COLD MODES 5, 6 & No Mode

McGuire Nuclear Station
Classification of Emergency
RP/0/A/5700/000 Revision 029

DUKE ENERGY

	GENERAL EMERGENCY	SITE AREA EMERGENCY	ALERT	UNUSUAL EVENT

R — Abnorm. Rad Levels / Rad Effluent

1 Rad Effluent

RG1 Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE
Modes: 1 2 3 4 5 6 NM

RG1.1
Reading on **any** Table R-1 effluent radiation monitor > column "GE" for ≥ 15 min. (Notes 1, 2, 3, 4)

RG1.2
Dose assessment using actual meteorology indicates doses > 1,000 mrem TEDE or 5,000 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

RG1.3
Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:
- Closed window dose rates > 1,000 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 5,000 mrem for 60 min. of inhalation.

(Notes 1, 2)

RS1 Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE
Modes: 1 2 3 4 5 6 NM

RS1.1
Reading on **any** Table R-1 effluent radiation monitor > column "SAE" for ≥ 15 min. (Notes 1, 2, 3, 4)

RS1.2
Dose assessment using actual meteorology indicates doses > 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

RS1.3
Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:
- Closed window dose rates > 100 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 500 mrem for 60 min. of inhalation.

(Notes 1, 2)

RA1 Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE
Modes: 1 2 3 4 5 6 NM

RA1.1
Reading on **any** Table R-1 effluent radiation monitor > column "ALERT" for ≥ 15 min. (Notes 1, 2, 3, 4)

RA1.2
Dose assessment using actual meteorology indicates doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

RA1.3
Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY for 60 min. of exposure (Notes 1, 2)

RA1.4
Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:
- Closed window dose rates > 10 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 50 mrem for 60 min. of inhalation.

(Notes 1, 2)

RU1 Release of gaseous or liquid radioactivity greater than 2 times the SLC limits for 60 minutes or longer
Modes: 1 2 3 4 5 6 NM

RU1.1
Reading on **any** Table R-1 effluent radiation monitor > column "UE" for ≥ 60 min. (Notes 1, 2, 3)

RU1.2
Sample analysis for a gaseous or liquid release indicates a concentration or release rate > 2 x SLC limits for ≥ 60 min. (Notes 1, 2)

2 Irradiated Fuel Event

RG2 Spent fuel pool level cannot be restored to at least the top of the fuel racks for 60 minutes or longer
Modes: 1 2 3 4 5 6 NM

RG2.1
Spent fuel pool level cannot be restored to > -25 ft. (746 ft. ele.) (KFP5350 or NVPG6530) for ≥ 60 min. (Note 1)

RS2 Spent fuel pool level at the top of the fuel racks
Modes: 1 2 3 4 5 6 NM

RS2.1
Spent fuel pool level ≤ -25 ft. (746 ft. ele.) (KFP5350 or NVPG6530)

RA2 Significant lowering of water level above, or damage to, irradiated fuel
Modes: 1 2 3 4 5 6 NM

RA2.1
Uncovery of irradiated fuel in the REFUELING PATHWAY

RA2.2
Damage to irradiated fuel resulting in a release of radioactivity
AND
A Trip 2 radiation alarm on **any** of the following radiation monitor indications:
- 1EMF17 (2EMF4) Spent Fuel Building Refueling Bridge
- 1EMF16 (2EMF3) Containment Building Refueling Bridge (Mode 6)
- 1EMF42 (2EMF42) Fuel Building Ventilation
- 1EMF39 (2EMF39) Containment Gas

RA2.3
Spent fuel pool level ≤ -15 ft. (756 ft. ele.) (KFP5350 or NVPG6530)

RU2 Unplanned loss of water level above irradiated fuel
Modes: 1 2 3 4 5 6 NM

RU2.1
UNPLANNED water level drop in the REFUELING PATHWAY as indicated by low water level alarm or indication
AND
UNPLANNED rise in corresponding area radiation levels as indicated by **EITHER** of the following radiation monitors:
- 1EMF17 (2EMF4) Spent Fuel Building Refueling Bridge
- 1EMF16 (2EMF3) Containment Building Refueling Bridge (Mode 6)

Table R-1 Effluent Monitor Classification Thresholds

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Unit Vent Noble Gas Low	1(2)EMF36L	-------	-------	4.85E+6 cpm	3.10E+3 cpm
Gaseous	Unit Vent Noble Gas High	1(2)EMF36H	2.61E+4 cpm	2.61E+3 cpm	2.70E+2 cpm	-------
Liquid	Liquid Waste Effluent Line High	EMF49H	-------	-------	-------	2.15E+2 cpm
Liquid	CVUCDT High	1(2)EMF44H	-------	-------	-------	4.29E+2 cpm

3 Area Rad Levels

Table R-2 Safe Operation & Shutdown Rooms/Areas

Bldg. Elevation	Unit 1 Room/Area	Unit 2 Room/Area	Modes
Auxiliary 716'	P/C, RHole, near 1NI-185, Outside CAD 212	ABPC thru CAD Door, FF59	4
Auxiliary 750'	800 (1EMXA)	820 (2EMXA)	3, 4
	803 (1ETA)	805 (2ETA)	3, 4
Auxiliary 733'	702 (Elec. Pene.)	713 (Elec. Pene.)	3
	722 (1EMXB-1)	724 (2EMXB-1)	3, 4
	705 (1ETB)	716 (2ETB)	3, 4

RA3 Radiation levels that IMPEDE access to equipment necessary for normal plant operations, cooldown or shutdown
Modes: 1 2 3 4 5 6 NM

RA3.1
Dose rates > 15 mR/hr in **EITHER** of the following areas:
- Control Room (1EMF12)
- **OR**
- Central Alarm Station (by survey)

RA3.2
An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to **any** Table R-2 rooms or areas (Note 5)

Unusual Event: None

H — Hazards

1 Security

HG1 Hostile Action resulting in loss of physical control of the facility
Modes: 1 2 3 4 5 6 NM

HG1.1
A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervision
AND EITHER of the following has occurred:
- **Any** of the following safety functions cannot be controlled or maintained
  - Reactivity control
  - Core cooling
  - NCS heat removal
- **OR**
- Damage to spent fuel has occurred or is IMMINENT

HS1 HOSTILE ACTION within the Protected Area
Modes: 1 2 3 4 5 6 NM

HS1.1
A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervision

HA1 HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat within 30 minutes
Modes: 1 2 3 4 5 6 NM

HA1.1
A HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLLED AREA as reported by the Security Shift Supervision

HA1.2
A validated notification from NRC of an aircraft attack threat within 30 min. of the site

HU1 Confirmed SECURITY CONDITION or threat
Modes: 1 2 3 4 5 6 NM

HU1.1
A SECURITY CONDITION that does **not** involve a HOSTILE ACTION as reported by the Security Shift Supervision

HU1.2
Notification of a credible security threat directed at the site

HU1.3
A validated notification from the NRC providing information of an aircraft threat

2 Seismic Event

General Emergency: None

Site Area Emergency: None

Alert: None
[Refer to EAL CA6.1 OR SA9.1 for escalation due to seismic event]

HU2 Seismic event greater than OBE levels
Modes: 1 2 3 4 5 6 NM

HU2.1
Seismic event > OBE as indicated by OBE EXCEEDED alarm on 1AD-13, E7

3 Natural or Tech. Hazard

Alert: None
[Refer to EAL CA6.1 OR SA9.1 for escalation due to natural or technological hazard]

HU3 Hazardous event
Modes: 1 2 3 4 5 6 NM

HU3.1
A tornado strike within the PROTECTED AREA

HU3.2
Internal room or area FLOODING of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component needed for the current operating mode

HU3.3
Movement of personnel within the PROTECTED AREA is IMPEDED due to an offsite event involving hazardous materials (e.g., an offsite chemical spill or toxic gas release)

HU3.4
A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles (Note 7)

NOTES

Note 1: The Emergency Coordinator/EOF Director should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: If the effluent flow past an effluent monitor is known to have stopped, indicating that the release path is isolated, the effluent monitor reading is no longer VALID for classification purposes.

Note 4: The pre-calculated effluent monitor values presented in EALs RA1.1, RS1.1 and RG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Note 5: If the equipment in the listed room or area was already inoperable or out-of-service before the event occurred, then no emergency classification is warranted.

Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is not required.

Note 7: This EAL does not apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.

Note 8: A manual trip action is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and **does not** include manually driving in control rods or implementation of boron injection strategies.

Note 9: In the absence of reliable NCS temperature indication caused by the loss of decay heat removal capability, classification should be based on the NCS pressure increase criteria when in Mode 5 or based on time to boil data when in Mode 6.

Note 10: If the loss of containment cooling threshold is exceeded due to loss of both trains of VX-CARF, this EAL only applies if at least one train of VX-CARF is not operating, per design, after the 10 minute actuation delay for greater than or equal to 15 minutes.

4 Fire

Table H-1 Fire Areas
- Containment
- Auxiliary Building
- Diesel Generator Rooms
- FWST
- Dog Houses
- Standby Shutdown Facility (SSF)

[Refer to EAL CA6.1 OR SA9.1 for escalation due to FIRE]

Alert: None

HU4 FIRE potentially degrading the level of safety of the plant
Modes: 1 2 3 4 5 6 NM

HU4.1
A FIRE is **not** extinguished within 15 min. of **any** of the following FIRE detection indications (Note 1):
- Report from the field (i.e., visual observation)
- Receipt of multiple (more than 1) fire alarms or indications
- Field verification of a single fire alarm

AND
The FIRE is located within any Table H-1 area

HU4.2
Receipt of a single fire alarm (i.e., no other indications of a FIRE)
AND
The fire alarm is indicating a FIRE within any Table H-1 area
AND
The existence of a FIRE is not verified within 30 min. of alarm receipt (Note 1)

HU4.3
A FIRE within the plant PROTECTED AREA not extinguished within 60 min. of the initial report, alarm or indication (Note 1)

HU4.4
A FIRE within the plant PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish

5 Hazardous Gases

Table H-2 Safe Operation & Shutdown Rooms/Areas

Bldg. Elevation	Unit 1 Room/Area	Unit 2 Room/Area	Modes
Auxiliary 716'	P/C, RHole, near 1NI-185, Outside CAD 212	ABPC thru CAD Door, FF59	4
Auxiliary 750'	800 (1EMXA)	820 (2EMXA)	3, 4
	803 (1ETA)	805 (2ETA)	3, 4
Auxiliary 733'	702 (Elec. Pene.)	713 (Elec. Pene.)	3
	722 (1EMXB-1)	724 (2EMXB-1)	3, 4
	705 (1ETB)	716 (2ETB)	3, 4

HA5 Gaseous release IMPEDING access to equipment necessary for normal plant operations, cooldown or shutdown
Modes: 3 4

HA5.1
Release of a toxic, corrosive, asphyxiant or flammable gas into **any** Table H-2 rooms or areas
AND
Entry into the room or area is prohibited or IMPEDED (Note 5)

Unusual Event: None

6 Control Room Evacuation

General Emergency: None

HS6 Inability to control a key safety function from outside the Control Room
Modes: 1 2 3 4 5 6

HS6.1
An event has resulted in plant control being transferred from the Control Room to the Auxiliary Shutdown Panels or Standby Shutdown Facility (SSF)
AND
Control of **any** of the following key safety functions is not reestablished within 15 min. (Note 1):
- Reactivity (Modes 1, 2 and 3 **only**)
- Core Cooling
- NCS heat removal

HA6 Control Room evacuation resulting in transfer of plant control to alternate locations
Modes: 1 2 3 4 5 6 NM

HA6.1
An event has resulted in plant control being transferred from the Control Room to the Auxiliary Shutdown Panels or Standby Shutdown Facility (SSF)

Unusual Event: None

7 EC Judgment

HG7 Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of a General Emergency
Modes: 1 2 3 4 5 6 NM

HG7.1
Other conditions exist which in the judgment of the Emergency Coordinator/EOF Director indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area

HS7 Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of a Site Area Emergency
Modes: 1 2 3 4 5 6 NM

HS7.1
Other conditions exist which in the judgment of the Emergency Coordinator/EOF Director indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the SITE BOUNDARY.

HA7 Other conditions exist that in the judgment of the Emergency Coordinator warrant declaration of an Alert
Modes: 1 2 3 4 5 6 NM

HA7.1
Other conditions exist which, in the judgment of the Emergency Coordinator/EOF Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

HU7 Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of a UE
Modes: 1 2 3 4 5 6 NM

HU7.1
Other conditions exist which in the judgment of the Emergency Coordinator/EOF Director indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.

E — ISFSI

Table E-1 ISFSI Dose Limits

NAC Magnastor	NAC UMS	Transnuclear (TN-32)
- 190 mrem/hr (gamma) on the side of the cask (excludes air inlet/outlet ports)	- 100 mrem/hr (neutron + gamma) on the side of the cask	- 120 mrem/hr (gamma) or 20 mrem/hr (neutron) on top of the cask
- 10 mrem/hr (gamma) on the side of the cask (excludes air inlet/outlet ports)	- 100 mrem/hr (neutron + gamma) on the top of the cask	- 340 mrem/hr (gamma) or 40 mrem/hr (neutron) on the sides of the radial neutron shield
- 900 mrem/hr (neutron + gamma) on the top of the cask (excludes air inlet/outlet ports)	- 200 mrem/hr (neutron + gamma) at air inlets and outlets	- 560 mrem/hr (gamma) or 280 mrem/hr (neutron) on the side surfaces above the radial neutron shield region
		- 220 mrem/hr (gamma) or 400 mrem/hr (neutron) on the side surfaces below the radial neutron shield region

EU1 Damage to a loaded cask CONFINEMENT BOUNDARY
Modes: 1 2 3 4 5 6 NM

EU1.1
Damage to a loaded canister CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading on the surface of a loaded spent fuel cask > **any** Table E-1 dose limit

Modes: 1 Power Operations | 2 Startup | 3 Hot Standby | 4 Hot Shutdown | 5 Cold Shutdown | 6 Refuel | NM No Mode

C — Cold SD/ Refuel System Malfunct.

1 NCS Level

CG1 Loss of NCS inventory affecting fuel clad integrity with containment challenged
Modes: 5 6

CG1.1
NCS water level **cannot** be monitored for ≥ 30 min. (Note 1)
AND
Core uncovery is indicated by **any** of the following:
- UNPLANNED increase in **any** Table C-6 sump or tank level due to a loss of NCS inventory
- Visual observation of UNISOLABLE NCS leakage
- Reactor Building Refueling Bridge Monitor 1EMF16 (2EMF3) reading > 9,000 mR/hr
- Erratic Source Range or Wide Range Flux Monitor indication

AND
Any Containment Challenge indication, Table C-1

CS1 Loss of NCS inventory affecting core decay heat removal capability
Modes: 5 6

CS1.1
NCS water level cannot be monitored for ≥ 30 min. (Note 1)
AND
Core uncovery is indicated by **any** of the following:
- UNPLANNED increase in **any** Table C-6 sump or tank level due to a loss of NCS inventory
- Visual observation of unisolable NCS leakage
- Reactor Building Refueling Bridge Monitor 1EMF16 (2EMF3) reading > 9000 mR/hr (Mode 6)
- Erratic Source Range or Wide Range Flux Monitor indication

CA1 Loss of NCS inventory
Modes: 5 6

CA1.1
Loss of NCS inventory as indicated by NCS water level < 5 in. above hotleg centerline

CA1.2
NCS water level cannot be monitored for ≥ 15 min. (Note 1)
AND EITHER
- UNPLANNED increase in **any** Table C-6 sump or tank level due to a loss of NCS inventory
- Visual observation of unisolable NCS leakage

CU1 UNPLANNED loss of NCS inventory for 15 minutes or longer
Modes: 5 6

CU1.1
UNPLANNED loss of reactor coolant results in NCS water level less than a required lower limit for ≥ 15 min. (Note 1)

CU1.2
NCS water level cannot be monitored
AND EITHER
- UNPLANNED increase in **any** Table C-6 sump or tank level due to a loss of NCS inventory
- Visual observation of unisolable NCS leakage

Table C-1 Containment Challenge Indications
- CONTAINMENT CLOSURE **not** established (Note 6)
- Containment hydrogen concentration > 6%
- UNPLANNED rise in containment pressure

Table C-6 Sumps/Tanks
- NCDT
- PRT
- CFAE sump
- ND/NS sump
- RHT
- WDT
- WEFT
- SRST

Table C-2 AC Power Sources

Offsite
- ATC (Train A)
- SATA (Train A)
- ATD (Train B)
- SATB (Train B)

Onsite
- D/G 1(2) A (Train A)
- D/G 1(2) B (Train B)

2 Loss of Essential AC Power

CA2 Loss of **all** offsite and **all** onsite AC power to essential buses for 15 minutes or longer
Modes: 5 6 NM

CA2.1
Loss of **all** offsite and **all** onsite AC power capability to essential 4160V buses 1(2)ETA and 1(2)ETB for ≥ 15 min. (Note 1)

CU2 Loss of all but one AC power source to essential buses for 15 minutes or longer
Modes: 5 6 NM

CU2.1
AC power capability, Table C-2, to essential 4160V buses 1(2)ETA and 1(2)ETB reduced to a single power source for ≥ 15 min. (Note 1)
AND
Any additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS

3 NCS Temp.

Table C-3 NCS Heat-up Duration Thresholds

NCS Status	Containment Closure Status	Heat-up Duration
Intact (but **not** reduced inventory)	N/A	60 min.*
Not intact **OR** At reduced inventory	established	20 min.*
	not established	0 min.

* If an NCS heat removal system is in operation within this time frame and NCS temperature is being reduced, the EAL is **not** applicable

CA3 Inability to maintain plant in cold shutdown
Modes: 5 6

CA3.1
UNPLANNED increase in NCS temperature to > 200°F for > Table C-3 duration (Notes 1,9)
OR
UNPLANNED NCS pressure increase > 20 psig due to a loss of NCS cooling (this does **not** apply during water-solid plant conditions)

CU3 UNPLANNED increase in NCS temperature
Modes: 5 6

CU3.1
UNPLANNED increase in NCS temperature to > 200°F due to loss of decay heat removal capability

CU3.2
Loss of **all** NCS temperature and NCS level indication for ≥ 15 min. (Note 1)

4 Loss of Vital DC Power

General Emergency: None

Table C-4 Communication Methods

System	Onsite	ORO	NRC
Public Address	X		
Internal Telephones	X		
Onsite Radios	X		
DEMNET		X	
Offsite Radio System		X	
Commercial Telephones		X	X
NRC Emergency Telecommunications System (ETS)			X

CU4 Loss of Vital DC power for 15 minutes or longer
Modes: 5 6

CU4.1
< 105 VDC bus voltage indications on Technical Specification **required** 125 VDC buses for ≥ 15 min. (Note 1)

5 Loss of Comm.

General Emergency: None

Site Area Emergency: None

CU5 Loss of **all** onsite or offsite communications capabilities
Modes: 5 6 NM

CU5.1
Loss of **all** Table C-4 onsite communication methods
OR
Loss of **all** Table C-4 ORO communication methods
OR
Loss of **all** Table C-4 NRC communication methods

6 Hazardous Event Affecting Safety Systems

General Emergency: None

Table C-5 Hazardous Events
- Seismic event (earthquake)
- Internal or external FLOODING event
- High winds or tornado strike
- FIRE
- EXPLOSION
- Other events with similar hazard characteristics as determined by the Shift Manager

CA6 Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode
Modes: 5 6

CA6.1
The occurrence of **any** Table C-5 hazardous event
AND EITHER:
- Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM needed for the current operating mode
- The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure needed for the current operating mode

Unusual Event: None

EAL Identifier
XXX.X
Category (R, H, E, C, S, F)
Emergency classification (G, S, A, U)
Sequential number within subcategory/classification
Subcategory number (1 if no subcategory)

EAL - COLD MODES 5, 6 & No Mode

R – Abnorm. Rad Levels / Rad Effluent

1 – Rad Effluent

GENERAL EMERGENCY

RG1 Release of gaseous radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

RG1.1
Reading on **any** Table R-1 effluent radiation monitor > column "GE" for ≥ 15 min. (Notes 1, 2, 3, 4)

RG1.2
Dose assessment using actual meteorology indicates doses > 1,000 mrem TEDE or 5,000 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

RG1.3
Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:
- Closed window dose rates > 1,000 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 5,000 mrem for 60 min. of inhalation.

(Notes 1, 2)

SITE AREA EMERGENCY

RS1 Release of gaseous radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

RS1.1
Reading on **any** Table R-1 effluent radiation monitor > column "SAE" for ≥ 15 min. (Notes 1, 2, 3, 4)

RS1.2
Dose assessment using actual meteorology indicates doses > 100 mrem TEDE or 500 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

RS1.3
Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:
- Closed window dose rates > 100 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 500 mrem for 60 min. of inhalation.

(Notes 1, 2)

ALERT

RA1 Release of gaseous or liquid radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

RA1.1
Reading on **any** Table R-1 effluent radiation monitor > column "ALERT" for ≥ 15 min. (Notes 1, 2, 3, 4)

RA1.2
Dose assessment using actual meteorology indicates doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY (Note 4)

RA1.3
Analysis of a liquid effluent sample indicates a concentration or release rate that would result in doses > 10 mrem TEDE or 50 mrem thyroid CDE at or beyond the SITE BOUNDARY for 60 min. of exposure (Notes 1, 2)

RA1.4
Field survey results indicate **EITHER** of the following at or beyond the SITE BOUNDARY:
- Closed window dose rates > 10 mR/hr expected to continue for ≥ 60 min.
- Analyses of field survey samples indicate thyroid CDE > 50 mrem for 60 min. of inhalation.

(Notes 1, 2)

UNUSUAL EVENT

RU1 Release of gaseous or liquid radioactivity greater than 2 times the SLC limits for 60 minutes or longer

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

RU1.1
Reading on **any** Table R-1 effluent radiation monitor > column "UE" for ≥ 60 min. (Notes 1, 2, 3)

RU1.2
Sample analysis for a gaseous or liquid release indicates a concentration or release rate > 2 x SLC limits for ≥ 60 min. (Notes 1, 2)

2 – Irradiated Fuel Event

GENERAL EMERGENCY

RG2 Spent fuel pool level cannot be restored to at least the top of the fuel racks for 60 minutes or longer

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

RG2.1
Spent fuel pool level cannot be restored to > -25 ft. (746 ft. ele.) (KFP5350 or NVPG6530) for ≥ 60 min. (Note 1)

SITE AREA EMERGENCY

RS2 Spent fuel pool level at the top of the fuel racks

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

RS2.1
Spent fuel pool level ≤ -25 ft. (746 ft. ele.) (KFP5350 or NVPG6530)

ALERT

RA2 Significant lowering of water level above, or damage to, irradiated fuel

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

RA2.1
Uncovery of irradiated fuel in the REFUELING PATHWAY

RA2.2
Damage to irradiated fuel resulting in a release of radioactivity
AND
A Trip 2 radiation alarm on **any** of the following radiation monitor indications:
- 1EMF17 (2EMF4) Spent Fuel Building Refueling Bridge
- 1EMF16 (2EMF3) Containment Building Refueling Bridge (Mode 6)
- 1EMF42 (2EMF42) Fuel Building Ventilation
- 1EMF39 (2EMF39) Containment Gas

RA2.3
Spent fuel pool level ≤ -15 ft. (756 ft. ele.) (KFP5350 or NVPG6530)

UNUSUAL EVENT

RU2 Unplanned loss of water level above irradiated fuel

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

RU2.1
UNPLANNED water level drop in the REFUELING PATHWAY as indicated by low water level alarm or indication
AND
UNPLANNED rise in corresponding area radiation levels as indicated by **EITHER** of the following radiation monitors:
- 1EMF17 (2EMF4) Spent Fuel Building Refueling Bridge
- 1EMF16 (2EMF3) Containment Building Refueling Bridge (Mode 6)

Table R-1 Effluent Monitor Classification Thresholds

	Release Point	Monitor	GE	SAE	Alert	UE
Gaseous	Unit Vent Noble Gas Low	1(2)EMF36L	--------	--------	4.85E+6 cpm	3.10E+3 cpm
Gaseous	Unit Vent Noble Gas High	1(2)EMF36H	2.61E+4 cpm	2.61E+3 cpm	2.70E+2 cpm	--------
Liquid	Liquid Waste Effluent Line High	EMF49H	--------	--------	--------	2.15E+2 cpm
Liquid	CVUCDT High	1(2)EMF44H	--------	--------	--------	4.29E+2 cpm

3 – Area Rad Levels

Table R-2 Safe Operation & Shutdown Rooms/Areas

Bldg. Elevation	Unit 1 Room/Area	Unit 2 Room/Area	Modes
Auxiliary 716'	P/C, RHole, near 1NI-185, Outside CAD 212	ABPC thru CAD Door, FF59	4
Auxiliary 750'	800 (1EMXA)	820 (2EMXA)	3, 4
	803 (1ETA)	805 (2ETA)	3, 4
Auxiliary 733'	702 (Elec. Pene.)	713 (Elec. Pene.)	3
	722 (1EMXB-1)	724 (2EMXB-1)	3, 4
	705 (1ETB)	716 (2ETB)	3, 4

ALERT

RA3 Radiation levels that IMPEDE access to equipment necessary for normal plant operations, cooldown or shutdown

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

RA3.1
Dose rates > 15 mR/hr in **EITHER** of the following areas:
Control Room (1EMF12)
OR
Central Alarm Station (by survey)

RA3.2
An UNPLANNED event results in radiation levels that prohibit or IMPEDE access to **any** Table R-2 rooms or areas (Note 5)

UNUSUAL EVENT

None

H – Hazards

1 – Security

GENERAL EMERGENCY

HG1 Hostile Action resulting in loss of physical control of the facility

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HG1.1
A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervision
AND EITHER of the following has occurred:
Any of the following safety functions cannot be controlled or maintained
- Reactivity control
- Core cooling
- NCS heat removal

OR
Damage to spent fuel has occurred or is IMMINENT

SITE AREA EMERGENCY

HS1 HOSTILE ACTION within the Protected Area

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HS1.1
A HOSTILE ACTION is occurring or has occurred within the PROTECTED AREA as reported by the Security Shift Supervision

ALERT

HA1 HOSTILE ACTION within the OWNER CONTROLLED AREA or airborne attack threat within 30 minutes

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HA1.1
A HOSTILE ACTION is occurring or has occurred within the OWNER CONTROLLED AREA as reported by the Security Shift Supervision

HA1.2
A validated notification from NRC of an aircraft attack threat within 30 min. of the site

UNUSUAL EVENT

HU1 Confirmed SECURITY CONDITION or threat

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HU1.1
A SECURITY CONDITION that does **not** involve a HOSTILE ACTION as reported by Security Shift Supervision

HU1.2
Notification of a credible security threat directed at the site

HU1.3
A validated notification from the NRC providing information of an aircraft threat

2 – Seismic Event

GENERAL EMERGENCY: None

SITE AREA EMERGENCY: None

ALERT: None

[Refer to EAL CA6.1 OR SA9.1 for escalation due to seismic event]

UNUSUAL EVENT

HU2 Seismic event greater than OBE levels

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HU2.1
Seismic event > OBE as indicated by OBE EXCEEDED alarm on 1AD-13, E7

3 – Natural or Tech. Hazard

ALERT: None

[Refer to EAL CA6.1 OR SA9.1 for escalation due to natural or technological hazard]

UNUSUAL EVENT

HU3 Hazardous event

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HU3.1
A tornado strike within the PROTECTED AREA

HU3.2
Internal room or area FLOODING of a magnitude sufficient to require manual or automatic electrical isolation of a SAFETY SYSTEM component needed for the current operating mode

HU3.3
Movement of personnel within the PROTECTED AREA is IMPEDED due to an offsite event involving hazardous materials (e.g., an offsite chemical spill or toxic gas release)

HU3.4
A hazardous event that results in on-site conditions sufficient to prohibit the plant staff from accessing the site via personal vehicles (Note 7)

4 – Fire

ALERT: None

[Refer to EAL CA6.1 OR SA9.1 for escalation due to FIRE]

Table H-1 Fire Areas
- Containment
- Auxiliary Building
- Diesel Generator Rooms
- FWST
- Dog Houses
- Standby Shutdown Facility (SSF)

UNUSUAL EVENT

HU4 FIRE potentially degrading the level of safety of the plant

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HU4.1
A FIRE is **not** extinguished within 15 min. of **any** of the following FIRE detection indications (Note 1):
- Report from the field (i.e., visual observation)
- Receipt of multiple (more than 1) fire alarms or indications
- Field verification of a single fire alarm

AND
The FIRE is located within any Table H-1 area

HU4.2
Receipt of a single fire alarm (i.e., no other indications of a FIRE)
AND
The fire alarm is indicating a FIRE within any Table H-1 area
AND
The existence of a FIRE is not verified within 30 min. of alarm receipt (Note 1)

HU4.3
A FIRE within the plant PROTECTED AREA not extinguished within 60 min. of the initial report, alarm or indication (Note 1)

HU4.4
A FIRE within the plant PROTECTED AREA that requires firefighting support by an offsite fire response agency to extinguish

NOTES

Note 1: The Emergency Coordinator/EOF Director should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded.

Note 2: If an ongoing release is detected and the release start time is unknown, assume that the release duration has exceeded the specified time limit.

Note 3: If the effluent flow past an effluent monitor is known to have stopped, indicating that the release path is isolated, the effluent monitor reading is no longer VALID for classification purposes.

Note 4: The pre-calculated effluent monitor values presented in EALs RA1.1, RS1.1 and RG1.1 should be used for emergency classification assessments until the results from a dose assessment using actual meteorology are available.

Note 5: If the equipment in the listed room or area was already inoperable or out-of-service before the event occurred, then no emergency classification is warranted.

Note 6: If CONTAINMENT CLOSURE is re-established prior to exceeding the 30-minute time limit, declaration of a General Emergency is not required.

Note 7: This EAL does not apply to routine traffic impediments such as fog, snow, ice, or vehicle breakdowns or accidents.

Note 8: A manual trip action is any operator action, or set of actions, which causes the control rods to be rapidly inserted into the core, and **does not** include manually driving in control rods or implementation of boron injection strategies.

Note 9: In the absence of reliable NCS temperature indication caused by the loss of decay heat removal capability, classification should be based on the NCS pressure increase criteria when in Mode 5 or based on time to boil data when in Mode 6.

Note 10: If the loss of containment cooling threshold is exceeded due to loss of both trains of VX-CARF, this EAL only applies if at least one train of VX-CARF is not operating, per design, after the 10 minute actuation delay for greater than or equal to 15 minutes.

5 – Hazardous Gases

Table H-2 Safe Operation & Shutdown Rooms/Areas

Bldg. Elevation	Unit 1 Room/Area	Unit 2 Room/Area	Modes
Auxiliary 716'	P/C, RHole, near 1NI-185, Outside CAD 212	ABPC thru CAD Door, FF59	4
Auxiliary 750'	800 (1EMXA)	820 (2EMXA)	3, 4
	803 (1ETA)	805 (2ETA)	3, 4
Auxiliary 733'	702 (Elec. Pene.)	713 (Elec. Pene.)	3
	722 (1EMXB-1)	724 (2EMXB-1)	3, 4
	705 (1ETB)	716 (2ETB)	3, 4

ALERT

HA5 Gaseous release IMPEDING access to equipment necessary for normal plant operations, cooldown or shutdown

Modes: 3 | 4

HA5.1
Release of a toxic, corrosive, asphyxiant or flammable gas into **any** Table H-2 rooms or areas
AND
Entry into the room or area is prohibited or IMPEDED (Note 5)

UNUSUAL EVENT: None

6 – Control Room Evacuation

GENERAL EMERGENCY: None

SITE AREA EMERGENCY

HS6 Inability to control a key safety function from outside the Control Room

Modes: 1 | 2 | 3 | 4 | 5 | 6

HS6.1
An event has resulted in plant control being transferred from the Control Room to the Auxiliary Shutdown Panels or Standby Shutdown Facility (SSF)
AND
Control of **any** of the following key safety functions is not reestablished within 15 min. (Note 1):
- Reactivity (Modes 1, 2 and 3 **only**)
- Core Cooling
- NCS heat removal

ALERT

HA6 Control Room evacuation resulting in transfer of plant control to alternate locations

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HA6.1
An event has resulted in plant control being transferred from the Control Room to the Auxiliary Shutdown Panels or Standby Shutdown Facility (SSF)

UNUSUAL EVENT: None

7 – EC Judgment

GENERAL EMERGENCY

HG7 Other conditions exist which in the judgment of the Emergency Coordinator warrant declaration of a General Emergency

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HG7.1
Other conditions exist which in the judgment of the Emergency Coordinator/EOF Director indicate that events are in progress or have occurred which involve actual or IMMINENT substantial core degradation or melting with potential for loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area

SITE AREA EMERGENCY

HS7 Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of a Site Area Emergency

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HS7.1
Other conditions exist which in the judgment of the Emergency Coordinator/EOF Director indicate that events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or HOSTILE ACTION that results in intentional damage or malicious acts, (1) toward site personnel or equipment that could lead to the likely failure of or, (2) that prevent effective access to equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA Protective Action Guideline exposure levels beyond the SITE BOUNDARY.

ALERT

HA7 Other conditions exist that in the judgment of the Emergency Coordinator warrant declaration of an Alert

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HA7.1
Other conditions exist which, in the judgment of the Emergency Coordinator/EOF Director, indicate that events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

UNUSUAL EVENT

HU7 Other conditions existing that in the judgment of the Emergency Coordinator warrant declaration of a UE

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

HU7.1
Other conditions exist which in the judgment of the Emergency Coordinator/EOF Director indicate that events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of SAFETY SYSTEMS occurs.

E – ISFSI

Table E-1 ISFSI Dose Limits

NAC Magnastor	NAC UMS	Transnuclear (TN-32)
- 190 mrem/hr (gamma) on the side of the cask (excludes air inlet/outlet ports) - 10 mrem/hr (neutron) on the side of the cask (excludes air inlet/outlet ports) - 900 mrem/hr (neutron + gamma) on the top of the cask (excludes air inlet/outlet ports)	- 100 mrem/hr (neutron + gamma) on the side of the cask - 100 mrem/hr (neutron + gamma) on the top of the cask - 200 mrem/hr (neutron + gamma) at air inlets and outlets	- 120 mrem/hr (gamma) or 20 mrem/hr (neutron) on top of the cask - 340 mrem/hr (gamma) or 40 mrem/hr (neutron) on the sides of the radial neutron shield - 560 mrem/hr (gamma) or 280 mrem/hr (neutron) on the side surfaces above the radial neutron shield region - 220 mrem/hr (gamma) or 400 mrem/hr (neutron) on the side surfaces below the radial neutron shield region

UNUSUAL EVENT

EU1 Damage to a loaded cask CONFINEMENT BOUNDARY

Modes: 1 | 2 | 3 | 4 | 5 | 6 | NM

EU1.1
Damage to a loaded canister CONFINEMENT BOUNDARY as indicated by an on-contact radiation reading on the surface of a loaded spent fuel cask > **any** Table E-1 dose limit

Modes: 1 Power Operations | 2 Startup | 3 Hot Standby | 4 Hot Shutdown | 5 Cold Shutdown | 6 Refuel | NM No Mode

McGuire Nuclear Station
Classification of Emergency
RP/0/A/5700/000 Revision 029

S – System Malfunct.

1 – Loss of Essential AC Power

GENERAL EMERGENCY

SG1 Prolonged loss of **all** offsite and **all** onsite AC power to essential buses

Modes: 1 | 2 | 3 | 4

SG1.1
Loss of **all** offsite and **all** onsite AC power capability to essential 4160V buses 1(2)ETA and 1(2)ETB
AND EITHER:
- Restoration of at least one essential bus in < 4 hours is **not** likely (Note 1)
- Core Cooling RED PATH conditions met

SG1 Loss of **all** essential AC and vital DC power sources for 15 minutes or longer

Modes: 1 | 2 | 3 | 4

SG1.2
Loss of **all** offsite and **all** onsite AC power capability to essential 4160V buses 1(2)ETA and 1(2)ETB for ≥ 15 min.
AND
Loss of **all** 125 VDC power based on battery bus voltage indications < 105 VDC on **both** vital DC buses EVDA and EVDD for ≥ 15 min.
(Note 1)

SITE AREA EMERGENCY

SS1 Loss of **all** offsite and **all** onsite AC power to essential buses for 15 minutes or longer

Modes: 1 | 2 | 3 | 4

SS1.1
Loss of **all** offsite and **all** onsite AC power capability to essential 4160V buses 1(2)ETA and 1(2)ETB for ≥ 15 min. (Note 1)

ALERT

SA1 Loss of **all but one** AC power source to essential buses for 15 minutes or longer

Modes: 1 | 2 | 3 | 4

SA1.1
AC power capability, Table S-1, to essential 4160V buses 1(2)ETA and 1(2)ETB reduced to a single power source for ≥ 15 min. (Note 1)
AND
Any additional single power source failure will result in loss of **all** AC power to SAFETY SYSTEMS

Table S-1 AC Power Sources

Offsite
- ATC (Train A)
- SATA (Train A)
- ATD (Train B)
- SATB (Train B)

Onsite
- D/G 1(2) A (Train A)
- D/G 1(2) B (Train B

UNUSUAL EVENT

SU1 Loss of **all** offsite AC power capability to essential buses for 15 minutes or longer

Modes: 1 | 2 | 3 | 4

SU1.1
Loss of **all** offsite AC power capability, Table S-1, to essential 4160V buses 1(2)ETA and 1(2)ETB for ≥ 15 min. (Note 1)

2 – Loss of Vital DC Power

SITE AREA EMERGENCY

SS2 Loss of all vital DC power for 15 minutes or longer

Modes: 1 | 2 | 3 | 4

SS2.1
Loss of **all** 125 VDC power based on battery bus voltage indications < 105 VDC on **both** vital DC buses EVDA and EVDD for ≥ 15 min. (Note 1)

ALERT: None

UNUSUAL EVENT: None

3 – Loss of CR Indications

GENERAL EMERGENCY: None

Table S-3 Significant Transients
- Reactor trip
- Runback > 25% thermal power
- Electrical load rejection > 25% electrical load
- Safety injection actuation

ALERT

SA3 UNPLANNED loss of Control Room indications for 15 minutes or longer with a significant transient in progress

Modes: 1 | 2 | 3 | 4

SA3.1
An UNPLANNED event results in the inability to monitor one or more Table S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)
AND
Any significant transient is in progress, Table S-3

UNUSUAL EVENT

SU3 UNPLANNED loss of Control Room indications for 15 minutes or longer

Modes: 1 | 2 | 3 | 4

SU3.1
An UNPLANNED event results in the inability to monitor one or more Table S-2 parameters from within the Control Room for ≥ 15 min. (Note 1)

4 – NCS Activity

GENERAL EMERGENCY: None

SITE AREA EMERGENCY: None

Table S-2 Safety System Parameters
- Reactor power
- NCS level
- NCS pressure
- Core exit T/C temperature
- Level in at least one S/G
- Auxiliary feed flow in at least one S/G

UNUSUAL EVENT

SU4 NCS activity greater than Technical Specification allowable limits

Modes: 1 | 2 | 3 | 4

SU4.1
NCS activity > **any** of the following Technical Specification 3.4.16 limits:
- Dose Equivalent I-131 > 1.0 µCi/gm for > 48 hrs.
- Dose Equivalent I-131 > 60 µCi/gm
- Dose Equivalent Xe-133 > 280 µCi/gm

5 – NCS Leakage

GENERAL EMERGENCY: None

SITE AREA EMERGENCY: None

ALERT: None

UNUSUAL EVENT

SU5 NCS leakage for 15 minutes or longer

Modes: 1 | 2 | 3 | 4

SU5.1
NCS unidentified or pressure boundary leakage > 10 gpm for ≥ 15 min.
OR
NCS identified leakage > 25 gpm for ≥ 15 min.
OR
Leakage from the NCS to a location outside containment > 25 gpm for ≥ 15 min.
(Note 1)

6 – RPS Failure

GENERAL EMERGENCY: None

SITE AREA EMERGENCY

SS6 Inability to shut down the reactor causing a challenge to core cooling or NCS heat removal

Modes: 1

SS6.1
An automatic or manual trip fails to shut down the reactor as indicated by reactor power ≥ 5%
AND
All actions to shut down the reactor are **not** successful as indicated by reactor power ≥ 5%
AND EITHER:
- Core Cooling RED PATH conditions met
- Heat Sink RED PATH conditions met

ALERT

SA6 Automatic or manual trip fails to shut down the reactor and subsequent manual actions taken at the reactor control consoles are not successful in shutting down the reactor

Modes: 1

SA6.1
An automatic or manual trip fails to shut down the reactor as indicated by reactor power ≥ 5%
AND
Manual trip actions taken at the reactor control console (manual reactor trip switches or turbine manual trip) are **not** successful in shutting down the reactor as indicated by reactor power ≥ 5% (Note 8)

UNUSUAL EVENT

SU6 Automatic or manual trip fails to shut down the reactor

Modes: 1

SU6.1
An automatic trip did **not** shut down the reactor as indicated by reactor power ≥ 5% after **any** RPS setpoint is exceeded
AND
A subsequent automatic trip or manual trip action taken at the reactor control console (manual reactor trip switches or turbine manual trip) is successful in shutting down the reactor as indicated by reactor power < 5% (Note 8)

SU6.2
A manual trip did **not** shut down the reactor as indicated by reactor power ≥ 5% after **any** manual trip action was initiated
AND
A subsequent automatic trip or manual trip action taken at the reactor control console (manual reactor trip switches or turbine manual trip) is successful in shutting down the reactor as indicated by reactor power < 5% (Note 8)

Table S-4 Communication Methods

System	Onsite	ORO	NRC
Public Address	X		
Internal Telephones	X		
Onsite Radios	X		
DEMNET		X	
Offsite Radio System		X	
Commercial Telephones		X	X
NRC Emergency Telecommunications System (ETS)			X

7 – Loss of Comm.

GENERAL EMERGENCY: None

SITE AREA EMERGENCY: None

UNUSUAL EVENT

SU7 Loss of **all** onsite or offsite communications capabilities

Modes: 1 | 2 | 3 | 4

SU7.1
Loss of **all** Table S-4 onsite communication methods
OR
Loss of **all** Table S-4 ORO communication methods
OR
Loss of **all** Table S-4 NRC communication methods

8 – CMT Failure

GENERAL EMERGENCY: None

SITE AREA EMERGENCY: None

ALERT: None

UNUSUAL EVENT

SU8 Failure to isolate containment or loss of containment pressure control

Modes: 1 | 2 | 3 | 4

SU8.1
EITHER:
Any penetration is **not** isolated within 15 min. of a VALID containment isolation signal (Note 1)
OR
Containment pressure > 3 psig with **EITHER** a failure of both trains of NS **OR** failure of both trains of VX-CARF for ≥ 15 min. (Notes 1, 10)

9 – Hazardous Event Affecting Safety Systems

GENERAL EMERGENCY: None

Table S-5 Hazardous Events
- Seismic event (earthquake)
- Internal or external FLOODING event
- High winds or tornado strike
- FIRE
- EXPLOSION
- Other events with similar hazard characteristics as determined by the Shift Manager

ALERT

SA9 Hazardous event affecting a SAFETY SYSTEM needed for the current operating mode

Modes: 1 | 2 | 3 | 4

SA9.1
The occurrence of **any** Table S-5 hazardous event
AND EITHER:
- Event damage has caused indications of degraded performance in at least one train of a SAFETY SYSTEM needed for the current operating mode
- The event has caused VISIBLE DAMAGE to a SAFETY SYSTEM component or structure needed for the current operating mode

UNUSUAL EVENT: None

Table F-2 Containment Radiation - R/hr (EMF51A & B)

Time After S/D (Hrs)	FC Loss	NCS Loss	CMT Potential Loss
0 - 1	550	8.8	5500
1 - 2	400	8.4	4000
2 - 8	160	7.0	1600
>8	100	6.2	1000

F – Fission Product Barriers

GENERAL EMERGENCY

FG1.1 (Modes: 1 | 2 | 3 | 4)
Loss of **any** two barriers
AND
Loss **OR** potential loss of third barrier (Table F-1)

SITE AREA EMERGENCY

FS1.1 (Modes: 1 | 2 | 3 | 4)
Loss **OR** potential loss of **any** two barriers (Table F-1)

ALERT

FA1.1 (Modes: 1 | 2 | 3 | 4)
Any loss **OR any** potential loss of either Fuel Clad or NCS (Table F-1)

UNUSUAL EVENT: None

Table F-1 Fission Product Barrier Threshold Matrix

	Fuel Clad (FC) Barrier		Reactor Coolant System (NCS) Barrier		Containment (CMT) Barrier	
	Loss	Potential Loss	Loss	Potential Loss	Loss	Potential Loss
A. NCS or SG Tube Leakage	None	None	1. An automatic or manual ECCS (SI) actuation required by **EITHER**: • UNISOLABLE NCS leakage • SG tube RUPTURE	1. Operation of a standby charging pump is required by **EITHER**: • UNISOLABLE NCS leakage • SG tube leakage 2. Integrity-RED PATH conditions met	1. A leaking or RUPTURED SG is FAULTED outside of containment	None
B. Inadequate Heat Removal	1. Core Cooling-RED PATH conditions met	1. Core Cooling-ORANGE PATH conditions met 2. Heat Sink-RED PATH conditions met **AND** Heat Sink is required	None	1. Heat Sink-RED PATH conditions met **AND** Heat Sink is required	None	1. Core Cooling-RED PATH conditions met **AND** Restoration procedures **not** effective within 15 min. (Note 1)
C. CMT Radiation / NCS Activity	1. EMF51A/B > Table F-2 column "FC Loss" 2. Dose equivalent I-131 coolant activity > 300 µCi/gm	None	1. EMF51A/B > Table F-2 column "NCS Loss"	None	None	1. EMF51A/B > Table F-2 column "CMT Potential Loss"
D. CMT Integrity or Bypass	None	None	None	None	1. Containment isolation is required **AND EITHER** • Containment integrity has been lost based on EC judgment • UNISOLABLE pathway from Containment to the environment exists 2. Indications of NCS leakage outside of containment	1. Containment-RED PATH conditions met 2. Containment hydrogen concentration > 6% 3. Containment pressure > 3 psig with **EITHER** a failure of both trains of NS **OR** failure of both trains of VX-CARF for ≥ 15 min. (Notes 1, 10)
E. EC Judgment	1. **Any** condition in the opinion of the Emergency Coordinator/EOF Director that indicates loss of the fuel clad barrier	1. **Any** condition in the opinion of the Emergency Coordinator/EOF Director that indicates potential loss of the fuel clad barrier	1. **Any** condition in the opinion of the Emergency Coordinator/EOF Director that indicates loss of the NCS barrier	1. **Any** condition in the opinion of the Emergency Coordinator/EOF Director that indicates potential loss of the NCS barrier	1. **Any** condition in the opinion of the Emergency Coordinator/EOF Director that indicates loss of the containment barrier	1. **Any** condition in the opinion of the Emergency Coordinator/EOF Director that indicates potential loss of the containment barrier

EAL Identifier

XXX.X

Category (R, H, E, C, S, F)
Emergency classification (G, S, A, U)
Subcategory number (1 if no subcategory)
Sequential number within subcategory/classification

EAL- HOT MODES 1, 2, 3 & 4

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EXAM BANK QUESTION: 5904 MNS C

Given the following plant conditions:

- Due to a plant event, the unit was tripped at 0830
- An unexplained increase in plant radiation levels is occurring and RP is currently attempting to determine the source of the increased radiation levels
- The SM is preparing to declare an Emergency based on observation of the following OAC EMF Graphic indications:

		TIME		
Units	**EMF**	**08:30**	**08:50**	**09:10**
mR/hr	1EMF-1	6.00E+02	2.00E+03	1.00E+04
	2EMF-4	1.50E+00	2.50E+00	3.00E+01
	1EMF-5	3.00E+02	2.50E+03	3.80E+04
	2EMF-9	2.00E+03	2.00E+04	3.00E+04
	1EMF-51A	90 R/hr	80 R/hr	50 R/hr
CPM	EMF-36L	2.00E+02	4.50E+04	1.00E+06
	EMF-36H	1.80E+02	3.80E+03	4.80E+03

The Emergency Classification in accordance with RP-000 (EMERGENCY CLASSIFICATION) based on OAC radiation monitor indications at 08:30 is ___(1)___.

After the Initial Notification, the SM re-evaluates the OAC radiation monitor indications at 09:10 and the Emergency Classification is ___(2)___.

Which ONE (1) of the following completes the statements above?

REFERENCE PROVIDED

A. 1. Unusual Event
   2. Alert

B. 1. Alert
   2. Site Area Emergency

C. 1. Unusual Event
   2. Site Area Emergency

D. 1. Alert
   2. Alert

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EXAM BANK QUESTION: 5904 MNS

C

General Discussion

Based on the OAC EMF data provided and RP-000 (EMERGENCY CLASSIFICATION) the applicant should determine that, at 08:30 the Emergency Classification is an Unusual Event. This is based on Enclosure 4.10 (Radiation Monitor Readings for Enclosure 4.3 EALs) of RP-000. Analyzing the 08:30 EMF data would reveal that EMF-1 indicates >500 mR/hr which results in an Unusual Event.

Upon re-evaluation at 09:10, the applicant should determine that the Emergency Classification is now a Site Area Emergency. This is based on EMF-36H being >3.4E+03 for greater than 15 minutes. To make this determination the applicant must look at the EMF data from 08:50 at which time EMF-36H indication is already >3.4E+03 (actually 3.8E+03) and then at 09:10 EMF-36H is still >3.4E+03 (actually 4.8E+03). In accordance with RP-000 4.3.S.1-1, this results in a Site Area Emergency.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
The first part is correct.

The second part is plausible because an analysis of the fission product barriers at this time would result in an Alert based on 1EMF-51A being greater than 43 R/hr at time 0.5-2 hrs after shutdown. This would give 5 points on the fission product barrier analysis which would result in an alert. If the applicant stops at this point and does not continue with evaluation of the enclosures, they will not identify the SAE caused by EMF-36.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
The first part is plausible if the applicant misreads the radiation monitor readings or misapplies RP-000 to the indications provided.

The second part is correct.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
The first part is plausible if the applicant misreads the radiation monitor readings or misapplies RP-000 to the indications provided.

The second part is plausible because an analysis of the fission product barriers at this time would result in an Alert based on 1EMF-51A being greater than 43 R/hr at time 0.5-2 hrs after shutdown. This would give 5 points on the fission product barrier analysis which would result in an alert. If the applicant stops at this point and does not continue with evaluation of the enclosures, they will not identify the SAE caused by EMF-36.

Basis for meeting the KA

The K/A is matched because it requires the applicant to use plant computer indications to evaluate the plant's Emergency status.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, it requires the applicant to evaluate the radiation monitor indications provided to determine the plant Emergency Action Level.

Next, it requires the applicant to evaluate a change in radiation monitor indications to determine if the Emergency Action Level status has changed and, if so, what the new Emergency Action Level is.

Basis for SRO only

This question is SRO level because it requires the applicant to evaluate plant conditions and determine the Emergency Action Level based on application of RP-000 (Emergency Classification).

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	ILT31 MNS Audit Examination

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EXAM BANK QUESTION: 5904 MNS C

Development References
References: F-0 (CRITICAL SAFETY FUNCTION STATUS TREES) FR-P.1 (RESPONSE TO IMMINENT PRESSURIZED THERMAL SHOCK CONDITION) Learning Objectives: EPFRP003

Student References Provided
RP-000 (CLASSIFICATION OF EMERGENCY)

KA	KA_desc
APE061 2.1.19	APE061 GENERICAbility to use plant computers to evaluate system or component status. (CFR: 41.10 / 45.12)

provided if automatic function is lost. The operator is directed to cycle the drain valves at different times based on different power levels.

Operator Fundamental Focus; Knowledge

Understanding how important valves operate and how they fail.

***Reinforce** that operators need to understand component purpose, design and function. Operators must be ready to perform manual actions if automatic actions fail or if the component does not perform as intended.*

2.3 Power Operated Relief Valves (PORV's)

The main steam lines rise to the upper portions of the doghouses where a six inch line taps off the top of each line for the PORV.

Objective # 9

The PORV's assist the lowest setting safety valve during transients. The PORV lift setpoint is 1125 psig. This ensures the PORV is open prior to the first safety valve setpoint (1170 psig) being reached. They provide a margin for safety valve reseating.

The PORV recloses at 1092 psig. This pressure is low enough to ensure the safety valves reseat.

They also provide a means of removing heat from the NCS if the steam dumps or turbines are not available.

The PORV's are air operated valves that FAIL CLOSED on loss of instrument air pressure (VI), loss of power to valve solenoid or receipt of a Main Steam line isolation signal.

2.3.1 PORV Controls

- PORV Mode select switch (Auto or Manual)
- Manual loader - 0 to 100%

Objective # 9

2.3.2 PORV's Modes of operation (Refer to STM-SM-2)

Automatic

The manual loader is normally in auto set at 100% open. Steam line pressure increases to open setting (1125 psig). Limit switch opens 3-way solenoid valve to admit VI to open the PORV.

The VI pressure must pass through the manual loader. The setting of the manual loader (normally set at 100% open) determines how far the PORV will open when/if the setpoint is reached.

2.4 Steam line Pressure Instruments

2.4.1 Three pressure instruments tap off the main steam lines in the doghouses. Pressure signals are sent to the Process 7300 Protection Cabinets for the following;

- Low steam line pressure input for steam line isolation (2/3 logic) above P-11.
- High negative steam line pressure rate (2/3 logic) below P-11.
- Steam line pressure indication on 1MC2, CA Pump Control Panels and CA Pump Turbine Control Panel.
- OAC indication and input to thermal calculations.
- Pressure compensation for steam flow used for feedwater control.

2.5 Main Steam Safety Valves (Located on 34" line)

Operability of the safety valves ensures that main steam pressure is limited to within 110% of the design pressure of 1185 psig during the most severe anticipated system operational transient (Trip from 100% Rated Thermal Power (RTP) with loss of condenser heat sink).

Objective # 7

Set points at different pressures to limit steam release transients.

Only the number of valves required to control the pressure transient are open. If pressure can be controlled using only one or two safety valves, then why open more than that. This prevents all valves from cycling around the same setpoint (chattering).

Set points 1170, 1190, 1205, 1220 and 1225 psig.

Safety valves design capacity criteria is 110% steam flow @ 110% design pressure.

Located inside of SM Doghouse and provided with discharge tailpieces and vent stacks so that exhaust is vented above the roof.

2.6 Main Steam Isolation Valves (MSIV's) (SM1, 3, 5 & 7)

2.6.1 Located in each 34" main steam line (in doghouses).

Provided to isolate the S/G's in the event of a main steam line break, to limit the cooldown of NCS and to limit the peak containment pressure that would be achieved if the steam break is located inside containment.

<u>Description of Operation</u> (Drawing 7.4 and 7.5)

The normal flow direction is overseat. The valve has been designed to close against overseat (forward) or underseat flow (reverse flow) during a guillotine pipe rupture event and with line pressure. The valves are equipped with pneumatic actuators used to open the valve and with mechanical springs to close the valve. The valve is a balanced disk

A. Purpose

This procedure provides actions to respond to a failure of the SM PORVs and condenser dump valves.

B. Symptoms or Entry Conditions

This procedure is entered from EP/1/A/5000/F-0 (Critical Safety Function Status Trees) (Heat Sink), on a yellow condition.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

C. <u>Operator Actions</u>

<u>NOTE</u> Throughout this procedure, "affected" refers to any S/G in which pressure is greater than 1170 PSIG.

__ 1. **<u>IF</u> <u>AT</u> <u>ANY</u> <u>TIME</u> affected S/G(s) N/R level goes above 92% (82% ACC), <u>THEN</u> steam should not be released from the affected S/G(s).**

2. **Restore normal steam dump capability for affected S/G(s) using SM PORV as follows:**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
__ a. Check VI header pressure - GREATER THAN 85 PSIG.	__ a. Restore VI **<u>PER</u>** AP/1/A/5500/22 (Loss Of VI).
__ b. Check affected S/G(s) SM PORV isolation valve - OPEN.	b. Perform the following: __ 1) Open affected S/G(s) SM PORV isolation valve. __ 2) **<u>IF</u>** affected S/G(s) SM PORV isolation valve will not open, **<u>THEN</u>** dispatch operator to open affected S/G(s) SM PORV isolation valve. __ 3) **<u>IF</u>** affected S/G(s) SM PORV isolation valve can not be opened, **<u>THEN</u> <u>GO</u> <u>TO</u>** Step 3.

A. Purpose

This procedure provides actions for an overpressure condition affecting any S/G where pressure has gone above the highest steamline safety valve setpoint.

B. Symptoms or Entry Conditions

This procedure is entered from EP/1/A/5000/F-0 (Critical Safety Function Status Trees) (Heat Sink), on a yellow condition.

Q92 References

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
C. Operator Actions	
NOTE Throughout this procedure, "affected" refers to any S/G in which pressure is greater than 1225 PSIG.	
__ 1. **Check any S/G pressure - GREATER THAN 1225 PSIG.**	__ **RETURN TO procedure and step in effect.**
__ 2. **Check Feedwater Isolation status light (1SI-4) for affected S/G(s) - LIT.**	__ **Close valves on affected S/G PER Enclosure 1 (Feedwater Isolation Valves).**
__ 3. **Check affected S/G(s) N/R level - LESS THAN 92% (82% ACC).**	__ **GO TO EP/1/A/5000/FR-H.3 (Response To Steam Generator High Level).**
4. **Dump steam from the affected S/G(s) SM PORV:**	
__ a. Check affected S/G(s) SM PORV isolation valve - OPEN.	a. Perform the following: __ 1) Open affected S/G(s) SM PORV isolation valve. __ 2) **IF** affected S/G(s) SM PORV isolation valve can not be opened, **THEN GO TO** Step 5.

B 3.7 PLANT SYSTEMS

B 3.7.4 Steam Generator Power Operated Relief Valves (SG PORVs)

BASES

BACKGROUND

The SG PORVs provide a method for cooling the unit to residual heat removal (RHR) entry conditions should the preferred heat sink via the Steam Dump System to the condenser not be available, as discussed in the UFSAR, Section 10.3 (Ref. 1). This is done in conjunction with the Auxiliary Feedwater System providing cooling water from the condensate storage system (CSS). The SG PORVs may also be required to meet the design cooldown rate during a normal cooldown when steam pressure drops too low for maintenance of a vacuum in the condenser to permit use of the Steam Dump System.

One SG PORV line for each of the four steam generators is provided. Each SG PORV line consists of one SG PORV and an associated block valve.

The SG PORVs are provided with upstream block valves to permit their being tested at power, and to provide an alternate means of isolation. The SG PORVs are equipped with pneumatic controllers to permit control of the cooldown rate.

A description of the SG PORVs is found in Reference 1. The SG PORVs are OPERABLE when they are capable of fully opening and closing manually using the handwheel.

APPLICABLE SAFETY ANALYSES

The design basis of the SG PORVs is established by the capability to cool the unit to RHR entry conditions. The PORVs were sized to achieve a 50° F/hr cooldown rate. At cooldown inception, the PORVs will slowly open to maintain the desired cooldown rate. As S/G pressure decreases, the PORVs will eventually be wide open and the cooldown rate will gradually decrease. Therefore, the cooldown time from hot standby to RHR initiation is a function of the chosen maximum cooldown rate, the number of PORVs operating, and the time spent at MODE 3.

In the accident analysis presented in Reference 2, the SG PORVs are assumed to be used by the operator to cool down the unit to RHR entry conditions for accidents accompanied by a loss of offsite power. Prior to operator actions to cool down the unit, the SG PORVs and main steam safety valves (MSSVs) are assumed to operate automatically to relieve steam and maintain the steam generator pressure below the design

APPLICABLE SAFETY ANALYSES (continued)

value. For the recovery from a steam generator tube rupture (SGTR) event, the operator is also required to perform a limited cooldown to establish adequate subcooling as a necessary step to terminate the primary to secondary break flow into the ruptured steam generator. The time required to terminate the primary to secondary break flow for an SGTR is more critical than the time required to cool down to RHR conditions for this event and also for other accidents. Thus, the SGTR is the limiting event for the SG PORVs. The number of SG PORVs required to be OPERABLE to satisfy the SGTR accident analysis requirements depends upon the number of unit loops and consideration of any single failure assumptions regarding the failure of one SG PORV to open on demand. SG PORVs are credited to be operated manually using the handwheel for safety analysis assumptions.

The SG PORVs are equipped with block valves in the event an SG PORV spuriously fails to close during use.

The SG PORVs satisfy Criterion 3 of 10 CFR 50.36 (Ref. 3).

LCO

Three SG PORV lines are required to be OPERABLE. One SG PORV line is required from each of three steam generators to ensure that at least one SG PORV line is available to conduct a unit cooldown following an SGTR, in which one steam generator becomes unavailable, accompanied by a single, active failure of a second SG PORV line on an unaffected steam generator. The block valves must be OPERABLE to isolate a failed open SG PORV line. A closed block valve does not render it or its SG PORV line inoperable if operator action time to open the block valve is supported in the accident analysis.

Failure to meet the LCO can result in the inability to cool the unit to RHR entry conditions following an event in which the condenser is unavailable for use with the Steam Dump System.

An SG PORV line is considered OPERABLE when the SG PORV and its associated block valve are capable of fully opening and closing manually using the handwheel.

APPLICABILITY

In MODES 1, 2, and 3, and in MODE 4, when a steam generator is being relied upon for heat removal, the SG PORVs are required to be OPERABLE.

In MODE 5 or 6, an SGTR is not a credible event.

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C

Given the following conditions on Unit 2:

- The unit has tripped from 100% RTP
- The crew has implemented EP/2/A/5000/F-0, (Critical Safety Function Status Trees)
- 2B S/G pressure is being maintained at approximately 1210 psig following failure of the associated S/G PORV

To mitigate this event, the CRS would enter _____(1)_____.

Per T.S. 3.7.4 (SG PORVs), the most limiting event, assumed in the safety analysis, requiring operation of S/G PORVs is a _____(2)_____ .

Which ONE (1) of the following completes the statements above?

Procedure Legend:
EP/2/A/5000/FR-H.2 (Response to Steam Generator Overpressure)
EP/2/A/5000/FR-H.4 (Response to Loss of Normal Steam Release Capabilities)

A. 1. FR-H.2
2. NC cooldown following a S/G tube rupture

B. 1. FR-H.2
2. NC cooldown with a coincident loss of offsite power

C. 1. FR-H.4
2. NC cooldown following a S/G tube rupture

D. 1. FR-H.4
2. NC cooldown with a coincident loss of offsite power

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EXAMP BANK QUESTION: 6488 CNS

C

General Discussion

The lift setpoints for the SG PORVs and safeties are as follows:

1125 psig - PORV
1175 psig - Safety
1190 psig - Safety
1205 psig - Safety
1220 psig - Safety
1230 psig - Safety

For the given conditions (1B S/G pressure at 1210 psig), 3 safety valves will have already failed to control pressure. They have NOT functioned as designed, since pressure has risen above their lift setpoints.

In accordance with F-0, Critical Safety Function Status Trees for Heat Sink, if pressure is less 1230 psig, but greater than 1175 psig, the SRO implements FR-H.4.

Answer A Discussion

Part 1 is correct.

Part 2 is plausible because S/G pressure has experienced an overpressure condition due to the failure of the PORV and three Safety Valves.

Answer B Discussion

Part 1 is plausible if the applicant incorrectly recalls the setpoint of S/G Safety Valves.

Part 2 is plausible because S/G pressure has experienced an overpressure condition due to the failure of the PORV and three Safety Valves.

Answer C Discussion

CORRECT. See explanation above.

Answer D Discussion

Part 1 is plausible if the applicant incorrectly recalls the setpoint of S/G Safety Valves.

Part 2 is correct.

Basis for meeting the KA

The K/A requires testing of the purpose and/or function of the Steam Generator Overpressure system. The question also had to be written at the SRO level. The K/A is matched because the applicant must apply system knowledge of the S/G PORVs, and code safeties to aid in making a decision on which FR to implement. The other aspect of matching this K/A (including at the SRO level) is that the applicant must recall detailed information from the F-0, Critical Safety Function Status Trees, evaluate the conditions given in the stem, and combine those items with knowledge of the purpose of the Steam Generator Overpressure system, to arrive at a conclusion for which yellow path (FR) applies.

Basis for Hi Cog

This is a high cognitive level question because it involves a level of analysis of a given set of conditions, and applying system knowledge to make a conclusion on which success path is implemented for the conditions.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in the "Clarification Guidance for SRO-only Questions (Rev 1 dated 03/11/2010)" under the Screening Criteria for question linked to 10CFR55.43(b)(5) (Assessment and Selection of Procedures):
1) The question can NOT be answered by knowing systems knowledge alone.
2) The question can NOT be answered by knowing immediate Operator actions.
3) The question can NOT be answered by knowing AOP or EOP entry conditions.
4) The question can NOT be answered by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.
5.)The question requires the applicant to assess plant conditions, and then select the FR procedure transition for mitigation. Yellow Path FR procedures entry conditions and mitigative strategy knowledge requirements apply to SROs only.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	ILT16 CNS Audit Examination

Development References

EP/1/A/5000/F-0 (Critical Safety Function Status Trees), Rev. 9, Heat Sink
OP-CN-STM-SM (Main Steam System Lesson Plan), Rev. 101, Section 2.3

Student References Provided

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EXAM BANK QUESTION: 6488 CNS C

KA	KA_desc
WE13 EA2.2	Ability to determine and interpret the following as they apply to the (Steam Generator Overpressure) (CFR: 43.5 / 45.13)Adherence to appropriate procedures and operation within the limitations in the facility*s license and amendments.

Q93 References

3.9 REFUELING OPERATIONS

3.9.3 Nuclear Instrumentation

LCO 3.9.3 Two source range neutron flux monitors shall be OPERABLE.

APPLICABILITY: MODE 6.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required source range neutron flux monitor inoperable.	A.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the boron concentration of LCO 3.9.1.	Immediately
B. Two required source range neutron flux monitors inoperable.	B.1 Initiate action to restore one source range neutron flux monitor to OPERABLE status.	Immediately
	AND	
	B.2 Perform SR 3.9.1.1.	Once per 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.3.1	Perform CHANNEL CHECK.	In accordance with the Surveillance Frequency Control Program
SR 3.9.3.2	---------------------------------NOTE-------------------------------- Neutron detectors are excluded from CHANNEL CALIBRATION. --- Perform CHANNEL CALIBRATION.	In accordance with the Surveillance Frequency Control Program

B 3.9 REFUELING OPERATIONS

B 3.9.3 Nuclear Instrumentation

BASES

BACKGROUND

The source range neutron flux monitors are used during refueling operations to monitor the core reactivity condition. The installed source range neutron flux monitors are part of the Nuclear Instrumentation System (NIS) while the Wide Range Neutron Flux Monitoring System (Gamma-Metrics) are not. Source range indication is provided via the NIS source range channels and the Gamma-Metrics shutdown monitors using detectors located external to the reactor vessel. These detectors monitor neutrons leaking from the core. Neutron flux indication for these monitors are provided in counts per second.

The NIS Source Range Channels, utilizing fission chamber detectors, have a range of 0.1 to 1E6 cps. The Wide Range (Gamma-Metrics) channels are fission chambers with a range of 0.1 to 1E5 cps (in the startup range). The NIS source range channels and the Gamma-Metrics shutdown monitors provide continuous visible count rate indication in the control room and a high flux control room alarm to alert operators to any unexpected positive reactivity additions. Since TS 3.9.2 requires isolation of unborated water sources, the shutdown monitors (Gamma-Metrics) audible alarm, NIS source range audible indication and audible alarm are not required for OPERABILITY in Mode 6.

The NIS source range detectors and the Gamma-Metrics are designed in accordance with the criteria presented in Reference 1.

APPLICABLE SAFETY ANALYSES

Two OPERABLE source range neutron flux monitors (any combination of the two NIS source range monitors and the two Gamma-Metrics wide range monitors) are required to provide an indication to alert the operator to unexpected changes in core reactivity such as with a boron dilution accident (Ref. 2) or an improperly loaded fuel assembly.

The source range neutron flux monitors satisfy Criterion 3 of 10 CFR 50.36 (Ref. 3).

LCO

This LCO requires that two source range neutron flux monitors be OPERABLE to ensure that redundant monitoring capability is available to detect changes in core reactivity. To be operable, each monitor must provide a visual indication in the Control Room. The visual indication can be, but not limited to, either a gauge, chart recorder, CRT, or some other recording device. The two required source range neutron flux monitors may consist of any combination of the two NIS source range monitors and the two Gamma-Metrics wide range shutdown monitors.

LCO (continued)

As required by LCO 3.9.2, "Unborated water source isolation valves", all isolation valves for reactor makeup water sources containing unborated water that are connected to the Reactor Coolant System (RCS) must be closed to prevent unplanned boron dilution of the reactor coolant during MODE 6 and thus avoid a reduction in shutdown margin. As such, the required source range monitors OPERABILITY includes only a visual monitoring function. A high flux alarm is not a required function for OPERABILITY.

APPLICABILITY

In MODE 6, the source range neutron flux monitors must be OPERABLE to determine changes in core reactivity. There are no other direct means available to check core reactivity levels. In MODES 2, 3, 4, and 5, the NIS source range detectors and circuitry are also required to be OPERABLE by LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation." The Gamma-Metrics wide range shutdown monitors do not provide an automatic reactor trip protective function .

ACTIONS

A.1 and A.2

With only one required source range neutron flux monitor OPERABLE, redundancy has been lost. Since these instruments are the only direct means of monitoring core reactivity conditions, CORE ALTERATIONS and introduction of coolant into the RCS with boron concentration less than required to meet the minimum boron concentration of LCO 3.9.1 must be suspended immediately. Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that which would be required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Performance of Required Action A.1 shall not preclude completion of movement of a component to a safe position.

B.1

With no required source range neutron flux monitor OPERABLE, action to restore a monitor to OPERABLE status shall be initiated immediately. Once initiated, action shall be continued until a source range neutron flux monitor is restored to OPERABLE status.

B.2

With no required source range neutron flux monitor OPERABLE, there are no direct means of detecting changes in core reactivity. However, since CORE ALTERATIONS and positive reactivity additions are not to be made, the core reactivity condition is stabilized until the source range neutron flux monitors are OPERABLE. This stabilized condition is

ACTIONS (continued)

determined by performing SR 3.9.1.1 to ensure that the required boron concentration exists.

The Completion Time of once per 12 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration and ensures that unplanned changes in boron concentration would be identified. The 12 hour Frequency is reasonable, considering the low probability of a change in core reactivity during this time period.

SURVEILLANCE REQUIREMENTS

SR 3.9.3.1

SR 3.9.3.1 is the performance of a CHANNEL CHECK, which is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that the two indication channels should be consistent with core conditions. Changes in fuel loading and core geometry can result in significant differences between source range channels, but each channel should be consistent with its local conditions.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.9.3.2

SR 3.9.3.2 is the performance of a CHANNEL CALIBRATION. The CHANNEL CALIBRATION ensures that the monitors are calibrated. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 13, GDC 26, GDC 28, and GDC 29.

2. UFSAR, Sections 4.2, 15.4.6.

3. 10 CFR 50.36, Technical Specifications, (c)(2)(ii).

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EXAM BANK QUESTION: 6680 CNS

D

Given the following:

- Unit 1 is in Mode 6 offloading fuel
- N-31 and N-32 are in service
- 1A and 1B BDMS are in service

Subsequently:

- Source Range Instrument (N-31) fails

The CRS _____(1)_____ required to enter the action statement of LCO 3.9.2 (Nuclear Instrumentation).

In order to meet the operability requirements of LCO 3.9.2, source range audible indication _____(2)_____ required.

A. 1. is
   2. is

B. 1. is
   2. is NOT

C. 1. is NOT
   2. is

D. 1. is NOT
   2. is NOT

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EXAM BANK QUESTION: 6680 CNS

D

General Discussion

T.S. 3.9.2 requires 2 of the 4 available neutron flux monitors (2 BDMS and 2 Nis) to be operable in Mode 6. The failure of one SR NI will not require entry into the actions of the LCO. The background section of the bases for this TS states that audible indication and alarm are not required for operability. Only visual indication is required.

Answer A Discussion

Part 1 is plausible because in TS applications (3.3.1) for other shutdown modes, both SR Nis are required and no other monitor can be used to satisfy the requirement.

Part 2 is plausible because audible indication would be expected to be in operation during fuel movement, is required by the shutdown procedure, and is also addressed in the AP for Malfunction of Nuclear Instrumentation.

Answer B Discussion

Part 1 is plausible because in TS applications (3.3.1) for other shutdown modes, both SR NIs are required and no other monitor can be used to satisfy the requirement.

Part 2 is correct.

Answer C Discussion

Part 1 is correct.

Part 2 is plausible because audible indication would be expected to be in operation during fuel movement, is required by the shutdown procedure, and is also addressed in the AP for Malfunction of Nuclear Instrumentation.

Answer D Discussion

CORRECT. See explanation above.

Basis for meeting the KA

The applicant is required to apply information contained in the LCO bases to determine specific component operability. The applicant is also required to determine minimum requirements of the LCO given specific data.

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):
1) This question can NOT be answered by knowing less than 1 hour Tech Specs
2) This question can NOT be answered by knowing information listed "above-the-line".
3) This question can NOT be answered by knowing the TS Safety Limits or their bases.
4) This question requires the applicant to have knowledge of the Tech Spec Basis. Specifically, it requires the applicant to have knowledge of the operability requirements related to Source Range Instrumentation contained in the Tech Spec Basis.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	ILT15 CNS NRC Examination

Development References
T.S. 3.9.2 (Nuclear Instrumentation), Rev. 215/209 T.S.B 3.9.2 (Nuclear Instrumentation), Rev. 4, Applicability and Background

Student References Provided

KA	KA_desc
APE032 2.2.25	APE032 GENERICKnowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits. (CFR: 41.5 / 41.7 / 43.2)

5.0 ADMINISTRATIVE CONTROLS

5.1 Responsibility

5.1.1 The Plant Manager shall be responsible for overall unit operation and shall delegate in writing the succession to this responsibility during his absence.

5.1.2 The Control Room Supervisor (CRS) shall be responsible for the control room command function. During any absence of the CRS from the control room while the unit is in MODE 1, 2, 3, or 4, an individual [other than the Shift Technical Advisor (STA)] with an active Senior Reactor Operator (SRO) license shall be designated to assume the control room command function. During any absence of the CRS from the control room while the unit is in MODE 5 or 6, an individual with an active SRO license or Reactor Operator license shall be designated to assume the control room command function.

On occasion when there is a need for both the CRS and the relief SRO to be absent from the control room in MODE 1, 2, 3, or 4, an STA with an active SRO license on the unit shall be allowed to assume the control room command function and serve as the SRO in the control room provided that:

a. the CRS or the relief SRO is available to return to the control room within 10 minutes, and

b. the assumption of CRS duties by the STA is limited to periods not in excess of 15 minutes duration and a total time not to exceed 1 hour during any shift.

Information Use

NUCLEAR OPERATING FLEET

ADMINISTRATIVE PROCEDURE

AD-OP-ALL-1000

CONDUCT OF OPERATIONS

REVISION 13

Effective Dates:

07/26/2018	07/26/2018	07/26/2018	07/26/2018	07/26/2018
Brunswick	Catawba	Harris (HNP)	McGuire	Oconee
07/26/2018	07/26/2018			
Robinson	NGO			

5.5.18 Resetting Protective Devices (continued)

a. If a relay target is found dropped, then the following actions shall be taken:

(1) Contact the CRS and inform them of the discovered condition.

(2) Reset the dropped relay target with CRS permission.

(3) If the dropped relay target is not expected, then write an NCR with the breaker status at the time the dropped target was discovered.

(4) If the target does not reset, then write a Work Request and include the Work Request number in the NCR.

5.5.19 Short Term Relief

1. Temporary reliefs and turnovers are conducted in a manner such that the relieving watchstander has the knowledge of current station status and conditions and is prepared to continue safe operation of the station. {7.1.28}

2. During all cases the operator requiring short term relief shall have adequate communication with the Control Room and be capable of responding to the Control Room within 20 minutes.

3. If an on duty Control Room Staff member is required to leave the Control Room, the following shall occur:

a. A briefing shall take place, to discuss the following (as a minimum):

(1) Plant status

(2) Work/evolutions in progress

(3) A review of lit annunciators

(4) Pertinent plant operations information [7.3.20]

(5) Reactor Operators shall notify the CRS before leaving.

(6) The CRS shall provide a verbal announcement to the control room staff before leaving the Control Room.

b. When the operator returns to the Control Room, a briefing shall take place discussing any conditions that have changed and any pertinent communications that had been made.

5.5.19 Short Term Relief (continued)

4. Whenever a watch station is relieved for greater than one hour, this information shall be entered in a Narrative Log Program, a formal turnover and shift turnover sheet will be completed, including the logs signed over.

5.5.20 Technical Specification Related Equipment

1. Senior Reactor Operators shall authorize the return of Technical Specification, safety related, and risk significant equipment or systems to operable status following the confirmation of the following information as appropriate:

    a. All required testing for the component or system has been satisfactorily completed for existing plant conditions, and any remaining testing has been properly deferred and controlled.

    b. All active clearances / tagging orders that could affect the component, system, or required support systems have been released.

    c. The component or system is in the proper configuration for the existing plant conditions as defined in plant operating diagrams and procedures including being filled, vented and inspected for leaks.

    d. All modification turnovers that affect operability of component or system have been completed including tests.

    e. All necessary support equipment for the component or system is operable and capable of supporting the operability of the component or system (e.g., cooling water, lubrication, seal water). This includes conditions not normally controlled by procedures or clearances / tagging orders (e.g., insulation, supports, floor plugs).

    f. Reviewed all work orders associated with the component or system.

    g. Required surveillance testing is satisfactorily completed or within grace period and controlled appropriately.

    h. No temporary alterations or contingencies are in affect that could impact component or system operability.

    i. When applicable, verify with other work groups that all outstanding issues that affect operability have been addressed satisfactorily, including outstanding condition reports.

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EXAM BANK QUESTION: 5024 MNS **A**

Per Tech Spec 5.1 (RESPONSIBILITY), an active licensed STA may assume the duties of the Control Room Supervisor provided:

1) the CRS or relief SRO is available to return to the control room within ________ minutes

   AND

2) the periods during which the STA assumes SRO duties do not exceed ________ minutes in duration.

(Assume MODE 1 conditions)

A. 1. 10
   2. 15

B. 1. 15
   2. 10

C. 1. 15
   2. 15

D. 1. 10
   2. 10

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EXAM BANK QUESTION: 5024 MNS A

General Discussion

Technical Specifications allows the Shift Technical Advisor to assume the control room command function and perform the duties of the control room SRO in Modes 1, 2, 3, and 4 during periods when the CRSRO and the relief SRO are required to be absent from the control room. However, the following requirements must be met:

- The STA must hold an SRO license for the unit.
- The CRSRO or relief SRO must be available to return to the control room within 10 minutes.
- The periods during which the STA may perform the control room SRO duties may not exceed 15 minutes in duration or a total of 1 hour for the entire shift.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE: This answer is plausible if the applicant confuses the time for the CRSRO or relief SRO to return to the control room with the allowable duration of the relief by the STA.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE: This answer is plausible if the applicant confuses the time for the CRSRO or relief SRO to return to the control room with the allowable duration of the relief by the STA.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE: This answer is plausible if the applicant confuses the time for the CRSRO or relief SRO to return to the control room with the allowable duration of the relief by the STA.

Basis for meeting the KA

KA is matched because the candidate must understand the control room manning requirements for the individual fulfilling the control room command function.

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 for screening questions linked to 10CFR55.43(b)(1 & 2) (Tech Specs):

1) This question can NOT be answered by knowing less than 1 hour Tech Specs. These requirements are in 5.1.2 which has no action statements.
2) This question can NOT be answered by knowing information listed "above-the-line". These are administrative requirements. There is no "above-the-line" knowledge.
3) This question can NOT be answered by knowing the TS Safety Limits or their bases. This is TS 5.1.2. not TS Safety Limits.
4) This question requires the applicant to have knowledge of TS administrative requirements contain in Section 5 of Tech Specs. This is SRO level knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	2009 MNS SRO Exam

Development References

Learning Objective:
1) OP-MC-ADM-OMP, Obj 3

References:
1) Technical Specification 5.1.2, amendment 213 and 194

Student References Provided

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EXAM BANK QUESTION: 5024 MNS A

KA	KA_desc
GEN2.1 2.1.4	Conduct of OperationsKnowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, no-solo operation, maintenance of active license status, 10CFR55, etc. (CFR: 41.10 / 43.2)

3.9 REFUELING OPERATIONS

3.9.5 Residual Heat Removal (RHR) and Coolant Circulation — High Water Level

LCO 3.9.5 One RHR loop shall be OPERABLE and in operation.

---NOTE---
The required RHR loop may be removed from operation for ≤ 1 hour per 8 hour period, provided no operations are permitted that would cause introduction of coolant into the Reactor Coolant System with boron concentration less than required to meet the minimum required boron concentration of LCO 3.9.1.

APPLICABILITY: MODE 6 with the water level ≥ 23 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RHR loop requirements not met.	A.1 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the boron concentration of LCO 3.9.1	Immediately
	AND	
	A.2 Suspend loading irradiated fuel assemblies in the core.	Immediately
	AND	
	A.3 Initiate action to satisfy RHR loop requirements.	Immediately
	AND	
		(continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.4 Close the containment equipment hatch and secure with four bolts	4 hours
	<u>AND</u>	
	A.5 Close one door in each air lock.	4 hours
	<u>AND</u>	
	A.6.1 Close each penetration providing direct access from the containment atmosphere to the outside atmosphere with a manual or automatic isolation valve, blind flange, or equivalent.	4 hours
	<u>OR</u>	
	A.6.2 Verify each penetration is capable of being closed on a high containment radiation signal.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.5.1	Verify one RHR loop is in operation and circulating reactor coolant at a flow rate of $\geq$ 1000 gpm and RCS temperature is $\leq$ 140°F.	In accordance with the Surveillance Frequency Control Program
SR 3.9.5.2	Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	In accordance with the Surveillance Frequency Control Program

B 3.9 REFUELING OPERATIONS

B 3.9.5 Residual Heat Removal (RHR) and Coolant Circulation–High Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 6 is to remove decay heat and sensible heat from the Reactor Coolant System (RCS), as required by GDC 34, to provide mixing of borated coolant and to prevent boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the RHR heat exchanger(s), where the heat is transferred to the Component Cooling Water System. The coolant is then returned to the RCS via the RCS cold leg(s). Operation of the RHR System for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant and component cooling water through the RHR heat exchanger(s). Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the RHR System.

APPLICABLE SAFETY ANALYSES

If the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to a loss of coolant in the reactor vessel. Additionally, boiling of the reactor coolant could lead to a reduction in boron concentration in the coolant due to boron plating out on components near the areas of the boiling activity. The loss of reactor coolant and the reduction of boron concentration in the reactor coolant would eventually challenge the integrity of the fuel cladding, which is a fission product barrier. One train of the RHR System is required to be operational in MODE 6, with the water level ≥ 23 ft above the top of the reactor vessel flange, to prevent this challenge. The LCO does permit de-energizing the RHR pump for short durations, under the condition that the boron concentration is not diluted. This conditional de-energizing of the RHR pump does not result in a challenge to the fission product barrier.

The RHR System satisfies Criterion 4 of 10 CFR 50.36 (Ref. 2).

LCO

Only one RHR loop is required for decay heat removal in MODE 6, with the water level ≥ 23 ft above the top of the reactor vessel flange. Only one RHR loop is required to be OPERABLE, because the volume of water above the reactor vessel flange provides backup decay heat removal capability. At least one RHR loop must be OPERABLE and in operation to provide:

LCO (continued)

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of criticality; and

c. Indication of reactor coolant temperature.

An OPERABLE RHR loop includes an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs. The operability of the operating RHR train and the supporting heat sink is dependent on the ability to maintain the desired RCS temperature. Management of gas voids is important to RHR System OPERABILITY.

The LCO is modified by a Note that allows the required operating RHR loop to be removed from service for up to 1 hour per 8 hour period, provided no operations are permitted that would dilute the RCS boron concentration with coolant at boron concentrations less than required to meet the minimum boron concentration of LCO 3.9.1. Boron concentration reduction with coolant at boron concentrations less than required to assure minimum required RCS boron concentration is maintained is prohibited because uniform concentration distribution cannot be ensured without forced circulation. This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles and RCS to RHR isolation valve testing. During this 1 hour period, decay heat is removed by natural convection to the large mass of water in the refueling cavity.

The acceptability of the LCO and the LCO NOTE is based on preventing boiling in the core in the event of the loss of RHR cooling. However, it has been determined that when the upper internals are in place in the reactor vessel there is insufficient communication with the water above the core for adequate decay heat removal by natural circulation. As a result, boiling in the core could occur in a relatively short time if RHR cooling is lost. Therefore, during the short period of time that the upper internals are installed, administrative processes are implemented to reduce the risk of core boiling. The availability of additional cooling equipment, including equipment not required to be OPERABLE by the Technical Specifications, contributes to this risk reduction. The plant staff assesses these cooling sources to assure that the desired minimal level of risk is maintained. This is commonly referred to as defense-in-depth. This strategy is consistent with NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management." (Ref.3)

APPLICABILITY

One RHR loop must be OPERABLE and in operation in MODE 6, with the water level ≥ 23 ft above the top of the reactor vessel flange, to provide decay heat removal. The 23 ft water level was selected because it corresponds to the 23 ft requirement established for fuel movement in LCO 3.9.7, "Refueling Cavity Water Level." Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level < 23 ft are located in LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation–Low Water Level."

ACTIONS

RHR loop requirements are met by having one RHR loop OPERABLE and in operation, except as permitted in the Note to the LCO.

A.1

If RHR loop requirements are not met, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that which would be required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation.

A.2

If RHR loop requirements are not met, actions shall be taken immediately to suspend loading of irradiated fuel assemblies in the core. With no forced circulation cooling, decay heat removal from the core occurs by natural convection to the heat sink provided by the water above the core. A minimum refueling water level of 23 ft above the reactor vessel flange provides an adequate available heat sink. Suspending any operation that would increase decay heat load, such as loading a fuel assembly, is a prudent action under this condition.

A.3

If RHR loop requirements are not met, actions shall be initiated and continued in order to satisfy RHR loop requirements. With the unit in MODE 6 and the refueling water level ≥ 23 ft above the top of the reactor vessel flange, corrective actions shall be initiated immediately.

Q95 References

<< NC Level Instrument Overlap >>

Table 1, NC Level Instrument Overlap

Pzr Cold Cal 1NCP-5173 (%)	NC WR Level 1NCP-5990[1] (inches)	NC NR Level 1NCP-5991[1] (inches)	NC Sightglass 1NCLG-7940[1] (inches)	RVLIS[3] Upper Range[2] (%/inches)	Ultrasonics 1NCLT8460 1NCLT8470 (inches)	Elevation	Physical Reference
High Tap 100% = 801' + 9.75"							
------34.8-----	-------400--------	-------------------	-------------------	-------------------	-------------------	--773' + 7.25"-	
------29.6-----	------372.75----	-------------------	-------------------	-------------------	-------------------	----771' + 4"-----	Refueling Canal Water Level
-------20-------	-------322.9------						
------15.5-----	--------300-------						
-------10------	--------271-------						
--------0-------	-------219.75----	-------------------	-------------------	-------------------	-------------------	--758' + 6.25"--	Pzr Level Low Tap
	-------195.5------	-------------------	-------------------	106% / 196.74"	-------------------	--756' + 6"-----	Top of RVLIS Standpipe[3]
	-------155--------	-------------------	---------155---------	97.55%/154.99"	-------------------	-------------------	Top of Sightglass
	-------100--------		---------100---------				
	-----84.75----	-------------------	---------84.75------	83% / 83.12"	-------------------	--747' + 4" -----	Top Rx Vessel Flange
	---------60-------	-------------------	----------60---------	78% / 58.42"	-------------------	---745' + 2.5"---	Reduced Inventory
	---------28--------	-------------------	----------28---------	72% / 28.78"	-------------------	--742' + 6.25"--	S/G 'B' Spillover
	---------25--------	---------25--------	----------25---------	71% / 23.84"	-------------------	--742' + 3.25"--	Top of NR Transmitter
	--------14.5------	-------14.5-------	---------14.5--------	68% / 13.96"	-------14.5-------	--741' + 4.75"-	Ultrasonics upper range
	----------0--------	----------0---------	----------0---------	66% / 0.00"	----------0--------	--740' + 2.25"--	(C/L) C Hotleg
	-------------------	--------11-------	---------11---------	64%/ -10.74"	---------11--------	--739' + 3.5"----	Bottom of Sightglass
		-------12.5-------	-------------------	-------------------	-------12.5-------	----739' + 2"-----	Hotleg tap for UR and LR RVLIS
		-------14.5-------	-------------------	--63% / -15.68"---	------14.5--------	--738' + 11.75"-	Ultrasonics lower range
		--------25--------	-------------------	-------------------	-------------------	--738' + 1.25"--	Bottom of NR Transmitter

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EXAM BANK QUESTION: 6397 CNS **A**

Given the following conditions on Unit 2:

- Refueling is in progress
- NC W/R Level is 98% and stable
- No water additions are being made to the system
- 2A ND train is OPERABLE and has been in continuous operation for the previous 24 hours
- 2B ND train is INOPERABLE

Subsequently:

- Fuel Handling SRO desires stopping the 2A ND Pump to aid in inserting a fuel assembly
- Fuel Handling SRO expects to restart the 2A ND pump in approximately 15 minutes, after the fuel assembly is verified inserted

Based on the given conditions, and in accordance with the appropriate Tech Spec:

When the 2A ND pump is stopped, the crew _____(1)_____ required to enter one or more Tech Spec CONDITIONs/REQUIRED ACTIONs.

Tech Spec bases states that only one RHR loop is required to be OPERABLE, because _____(2)_____ provides adequate backup decay heat removal capablity.

Which ONE (1) of the following completes the statements above?

A. 1. is NOT
   2. the volume of water above the reactor vessel flange

B. 1. is
   2. the volume of water above the reactor vessel flange

C. 1. is NOT
   2. the Spent Fuel Cooling system

D. 1. is
   2. the Spent Fuel Cooling system

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EXAM BANK QUESTION: 6397 CNS

A

General Discussion

Tech Spec 3.9.4 requires that one RHR loop shall be OPERABLE and in operation in Mode 6 with the water level > or equal to 23 ft above the top of the reactor vessel flange. A note at the top of this LCO states "The required RHR loop may be removed from operation for < 1 hour per 8 hour period, provided no operations are permitted that would cause introduction of coolant into the Reactor Coolant System with boron concentration less than required to meet the minimum required boron concentration of LCO 3.9.1."

The bases of Tech Spec 3.9.4 states "Only one RHR loop is required to be OPERABLE, because the volume of water above the reactor vessel flange provides backup decay heat removal capability."

Answer A Discussion

CORRECT - See discussion above.

Answer B Discussion

INCORRECT:

Part 1 is plausible because the LCO states that one RHR loop shall be operable and in operation. If the applicant forgets the note allowing the pump to be stopped, then they will believe that this is correct.

Part 2 is CORRECT.

Answer C Discussion

INCORRECT:

Part 1 is CORRECT.

Part 2 is plausible since Spent Fuel Cooling (SFC) helps to provide decay heat removal but is not the basis for requiring only one operable ND pump.

Answer D Discussion

INCORRECT:

Part 1 is plausible because the LCO states that one RHR loop shall be operable and in operation. If the applicant forgets the note allowing the pump to be stopped, then they will believe that this is correct.

Part 2 is plausible since Spent Fuel Cooling (SFC) helps to provide decay heat removal but is not the basis for requiring only one operable ND pump.

Basis for meeting the KA

The KA is matched because the applicant is required to have knowledge of the refueling process including whether an ND pump may be stopped for the given conditions.

Basis for Hi Cog

Basis for SRO only

This question meets the following SRO only screening criteria linked to 10 CFR 55.43(b)(2) for Tech Specs:

Question can not be answered solely by knowing less than or equal to 1 hour TS Action.
Question can not be answered solely by knowing the LCO information listed "above the line".
Question can not be answered solely by knowing the TS Safety Limits.
Question does require applicants to apply knowledge of TS bases information that is required to analyze TS required actions and terminology, therefore the question is SRO-only.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	ILT16 CNS NRC Examination

Development References
Tech Spec 3.9.4 Tech Spec 3.9.4 Bases (Rev

Student References Provided

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EXAM BANK QUESTION: 6397 CNS A

KA	KA_desc
GEN2.1 2.1.41	Conduct of OperationsKnowledge of the refueling process. (CFR: 41.2 / 41.10 / 43.6 / 45.13)

Information Use

NUCLEAR OPERATING FLEET

ADMINISTRATIVE PROCEDURE

AD-OP-ALL-0106

CONDUCT OF INFREQUENTLY PERFORMED TESTS OR EVOLUTIONS

REVISION 4

Effective Dates:

02/22/2018	02/22/2018	02/22/2018	02/22/2018	02/22/2018
Brunswick	Catawba	Harris (HNP)	McGuire	Oconee
02/22/2018	02/22/2018			
Robinson	NGO			

5.0 INSTRUCTIONS

5.1 Identification of Infrequently Performed Tests or Evolutions (IPTE)

1. The Department Managers of any organization performing Tests or Evolutions will ensure evaluation of work activities for consideration as IPTE using Attachment 1, Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE) and Attachment 3, IPTE Examples. {7.1.3.a}

2. If Attachment 1, Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE), determines that a review by the Operations Manager is required, then perform the following:

   a. Complete Department Manager review in Attachment 1 Section 1.0, Department Applicability Screening

   b. Forward a copy of Tests or Evolutions with Attachment 1, Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE), to the Operations Manager for review and approval as an IPTE.

3. The Operations Manager shall document this review in Attachment 1 Section 2.0, Operations Manager.

   a. If the Operations Manager does not designate the activity as an IPTE, Attachment 1 shall be returned to the requesting department manager.

      (1) When activities are not designated as an IPTE, then ensure HRE aspects are governed by alternate processes and appropriate controls, and oversight is established.

   b. If the Operations Manager determines that the Test or Evolution is an IPTE, then designate the activity as an IPTE and forward a copy of the Test or Evolution with Attachment 1, Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE), to the Plant Manager.

4. For all activities designated as IPTE, the Plant Manager, or designee, shall designate the IPTE Manager and alternates, as required in Attachment 1 Section 2.0, Operations Manager. {7.1.3.a}

NOTE

Attachment 1, Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE), is not a required record but kept for informational purposes until the completion of the IPTE.

5. During performance of the IPTE, the IPTE Manager is responsible to maintain a copy of Attachment 1, Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE), in an accessible location.

5.1 Identification of Infrequently Performed Tests or Evolutions (IPTE) (continued)

a. A copy of Attachment 1, Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE), shall be kept with the master procedure or work package.

b. A copy of Attachment 1, Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE), shall be kept on the Operations Control Room Supervisor's desk. This copy can be discarded at the completion of the evolution.

5.2 <u>Preparation of Infrequently Performed Tests or Evolutions (IPTE)</u>

1. Training shall review training materials used in initial and continuing training for licensed operators, non-licensed operators, engineers, supervisors, and managers involved in reviewing procedures for or performance of the conduct of infrequent tests or evolutions to ensure that they discuss the lessons learned from SOER 91-01, Conduct of Infrequently Performed Tests or Evolutions, as well as examples from other pertinent in house or industry experience. {7.1.7.f}

2. Infrequently Performed Tests or Evolutions shall be controlled using specific written guidance. This guidance may be in the form of a procedure or a work order.

   a. Engineering shall review the test or evolution procedure(s) for technical accuracy. {7.1.3.a} {7.1.7.b} {7.1.10}

   b. Written direction must be easily accessible to all work groups when multiple organizations are involved in the test or evolution.

3. Evaluate requirements of AD-WC-ALL-0410, Work Activity Integrated Risk Management, for use of a Complex or Critical plan during all IPTEs.

   a. A Complex or Critical Plan does not alleviate the requirements to complete Attachment 1, Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE), of this procedure.

4. Consider the need for additional management oversight or personnel involvement. {7.1.7.d}

   a. Duties, authority, and responsibility of any additional personnel shall be explicitly delineated in writing. {7.1.7.d}

5.2 Preparation of Infrequently Performed Tests or Evolutions (IPTE) (continued)

b. Augmentation of the shift crew may be desired as follows: {7.1.9.a}

- Specific personnel to monitor or control vitally important parameter beyond normal operations
- Additional Reactor Engineering oversight for reactivity manipulations
- Data takers for collection of data in remote locations
- IPTE Test or Evolution Coordinator

5. Written guidance shall include identification of differences between the test and normal operating procedures and practices. {7.1.7.b}

a. Required plant conditions and expected plant responses for the test or evolution shall be clearly stated.

b. Conditions that warrant stopping the test or evolution shall be clearly identified. {7.1.7.c}

c. Contingency actions required for unexpected conditions or equipment responses shall be included.

6. Consider Just-in-Time-Training (JITT) to ensure plant conditions and the activity are understood by those involved. {7.1.4}

a. Personnel involved in the review of procedures for or the conduct of IPTE procedures shall review Operating Experience from applicably industry and fleet events. {7.1.7.f}

b. When practical, the test or evolution should be replicated on the simulator to ensure personnel better understand the expected equipment response and procedure applications. {7.1.7.f}

c. Validation of the test or evolution procedure may also be performed using walkdowns or table-top simulations as appropriate. {7.1.7.b}

d. Consider additional training related to special or infrequently used test or monitoring equipment that is required for the IPTE.

5.2 Preparation of Infrequently Performed Tests or Evolutions (IPTE) (continued)

7. The IPTE Manager shall ensure that brief is completed with all personnel directly involved with performance of the test or evolution. The brief shall be conducted in accordance with Attachment 2, Pre-IPTE Briefing Checklist. {7.1.6.a} {7.1.7.c}

   a. The Pre-IPTE Briefing is not intended to take the place of the normal pre-job brief but can be included as part of a Pre-Job Brief. The Pre-IPTE Briefing is specifically intended for plant senior management to emphasize the importance of conservative operations. The brief should focus on the importance of recognizing and avoiding activities that unnecessarily reduce nuclear safety margins; that is, activities that impact safe operating limits. {7.1.9.a}

   b. The Pre-IPTE Briefing should include all personnel directly involved with performance of the test or evolution. The IPTE Manager, the Test or Evolution Coordinator, and Operations Shift Manager (or designee) shall attend the briefing. If the IPTE extends beyond a single shift, then additional, equally rigorous, briefings should occur for the oncoming shifts with alternate IPTE management.

   c. IPTE Briefings will be performed within 7 days prior to execution. If an IPTE Brief is scheduled greater than 72 hours before execution, then the IPTE Manager shall evaluate the need for a refocus brief prior to task execution.

      (1) It is acceptable to perform refuel outage related IPTE Briefings up to 7 days prior to the unit shutdown.

      (2) It is acceptable to perform one IPTE Brief for projects and job continuation activities (e.g., activities performed as part of refueling a reactor, activities part of the same project or scope of work) expected to remain in progress over multiple days.

      (3) The IPTE Manager will evaluate and consider performance of additional IPTE Briefs for transitions in or changing work scope (e.g., transitioning from construction or modification to certification or post-modification testing warrants consideration for performance of an additional IPTE Brief).

   d. Individuals not directly involved with controlling the test or evolution (e.g., operators performing system lineups, engineers performing inspections during a hydrostatic test) are not required to attend the IPTE Brief. If critical test data is being collected, then the IPTE Manager should consider requiring data collection individuals attend the brief.

<< Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE) >>

1.0 DEPARTMENT APPLICABILITY SCREENING (continued)

	YES	NO
If the answer to Step 4 is yes, then the procedure or evolution requires a review by the Operations Manager. **Otherwise, exit the procedure, this evolution is not an IPTE.**		

Review By: ______________________________ Date: ________________
Department Manager

Recommendations for IPTE Manager(s):

____

____

If the Tests or Evolutions do **NOT** require the utilization of an IPTE Manager and are not considered as an infrequently performed Tests or Evolutions, then return this Attachment to the applicable Department Manager.

2.0 OPERATIONS MANAGER

I have reviewed the proposed Tests or Evolutions and have determined that the Tests or Evolutions

Does ____Does **NOT** ____ qualify as an infrequently performed Tests or Evolutions.

____
Operations Manager

<< IPTE Examples >>

Listed below are activities that have been pre-screened as Infrequently Performed Tests or Evolutions (IPTEs) based on the coordination or complexity and the need for additional management oversight. This list is not all-inclusive; it is intended to be used with Attachment 1, Guidelines for Identifying Infrequently Performed Tests or Evolutions (IPTE), to determine if an IPTE exists.

- Entry into lowered inventory conditions
- Integrated Leak Rate Testing
- Integrated Safety System Testing
- Large System Hydrostatic Tests
- Reactor Physics Testing
- [PWR] Conditions that could cause an inadvertent dilution
- Reactor Vessel Lower Internals Removal and Installation

Standard Reactor Vessel Disassembly, Reassembly and associated lifting and rigging of Reactor components are not required to utilize the IPTE process. These activities are HREs conducted by Fleet Reactor Services which are governed by site specific procedures. These activities are classified and controlled as Complex Lifts governed in AD-MN-ALL-0009, Nuclear Rigging, Lifting, and Material Handling, and require adherence to and oversight by the Quality Critical Maintenance (QCM) process per AD-WC-ALL-0290, Quality Critical Maintenance Identification and Oversight.

Information Use

NUCLEAR OPERATING FLEET

ADMINISTRATIVE PROCEDURE

AD-OP-ALL-0200

CLEARANCE AND TAGGING

REVISION 19

Effective Dates:

02/04/2019	02/04/2019	02/04/2019	02/04/2019	02/04/2019
Brunswick	Catawba	Harris (HNP)	McGuire	Oconee
02/04/2019	02/04/2019			
Robinson	NGO			

REVISION SUMMARY

PRR 02098261
DESCRIPTION

- Throughout: Made editorial corrections to align procedure with writers guidance (PRR 02212974 and PRR 02246104).
- Section 5.3.4.d, Table 1: Deleted table of mechanical and electrical circuit examples.
- Section 5.5.14.a.(1): Added guidance for electrical circuits (PRR 02163003).
- Section 5.5.16: Revised to add reference to Attachment 12.
- Section 5.5.18.d: Revised to delete "number".
- Section 5.5.18.f.(4): Revised to delete removed with the effort abandoned guidance.
- Section 5.8.4.2.d: Revised to add marking clearance as exceptional guidance (PRR 02140908 and PRR 02225735).
- Section 5.8.11.5 and Section 5.8.11.6: Revised guidance for ground truck device(s) (PRR 02173558).
- Section 5.12.2: Added guidance for performing a Clearance Holder challenge (PRR 02207255).
- Section 5.13.10.a, third bullet: Revised to incorporate reviewing the Clearance boundary (PRR 02233463).
- Section 5.13.10.d: Added guidance for workers signing into Attachment 9 (PRR 2247040 and PRR 02247480).
- Section 5.13.11.c: Revised to incorporate Attachment 9 and to clarify guidance.
- Section 5.24.1.a: Revised to clarify adding Work Order tasks to existing Clearances guidance.
- Section 5.24.1.b: Revised to refer to Attachment 5 (PRR 02168959).
- Section 5.27.4.a, and 5.27.4.a, second bullet: Revised to incorporate "all" and to revise 45 days to 60 days.
- Section 5.27.4.c: Revised to incorporate adding AD Assignment Number in the Clearance Details Tab (PRR 02116328).
- Section 5.31.3, first bullet: Added guidance for not using Danger Release Tags as shared tags (PRR 02249973).
- Section 5.31.6.a.(3), and Section 5.3.1.6.a.(4) and sub-steps: Totally revised to remove note guidance, and to add clarifying guidance for clearances shared under one DRT.
- Section 6.0: Created Section 6.1 and Section 6.2 to differentiate QA and Business records.
- Section 7.1: Revised order of commitment references to alphanumerical order to align with writers guidance. Aligned commitment annotations throughout procedure.
- Section 7.1.1, Section 7.1.7, Section 7.1.16, Section 7.1.21, Section 7.1.25, Section 7.1.31, Section 7.1.32, Section 7.1.33, Section 7.1.34, Section 7.1.35, Section 7.1.36, and Section 7.1.38: Operations and the Procedure Writer performed review of CR 439609, OE 27792, AR 1807884, AR 1495536, CAPR CR 80615, CR 95-02709-4, CAP 94H0106, CAP 89H0394, CAP 91H0887, CR 96-00466-7, CAP 90H0634, and EC/ED 77173, and determined this is not a commitment reference in accordance with the writers guidance. Commitment reference deleted and associated commitment annotations.
- Section 7.1.2: Deleted INPO 01-002 as a commitment reference. This document is not considered a commitment in accordance to the writers guidance. Transferred reference to Section 7.3.5 and deleted associated commitment annotations.
- Section 7.1.4 and Section 7.1.24: Deleted SOER 98-1 and SOER 85-5 as a commitment reference in accordance with AD-PI-ALL-0401. Reference is identified as an expired event report in INPO 18-001, Appendix B. Deleted associated commitment annotations.
- Section 7.1.6: Commitment reference was mislabeled and is SER 2-05. SERs are not considered commitment references in accordance with the writers guidance. Deleted commitment reference and associated annotations.
- Section 7.1.8: Review completed by Operations and Performance Improvement, and determined this reference is not a commitment in accordance with the writers guidance. Deleted commitment reference and associated annotations.
- Section 7.1.18: Revised commitment reference to align with writers guidance.
- Section 7.1.21: Transferred commitment reference to Section 7.1.18. This is a duplicate commitment reference, and only to be annotated once in the commitment reference section. Revised all associated annotations.
- Section 7.1.23: Review of commitment reference determined wrong assignment number was referenced. Assignment number was revised from 18 to 10.
- Section 7.2.2, 7.2.10, 7.2.13, and Section 7.2.6: Deleted AD-HU-ALL-0001, AD-PI-ALL-0100, and OPS-NGGC-1303, and added AD-LS-ALL-0007 as procedure references.
- Section 7.2.11: Revised procedure reference to AD-PI-ALL-0106. AD-PI-ALL-0104 was superseded by AD-PI-ALL-0106.
- Section 7.3: Revised order of miscellaneous documents to alphanumerical order to align with writers guidance.
- Section 7.3.25: Transferred OMM-001 to Section 7.2.11 and revised to reflect current title of procedure.
- Section 7.3.26: Review of NCR 479306 determined that no CAPRs existed in the NCR, and no commitments in the procedure. Revised reference to NCR 479306.
- Attachment 5, Venting and Draining section: Added guidance for safety-related systems and components (PRR 02214179 and PRR 02251935)
- Attachment 6: Revised to align checklist with enterprise standards (PRR 02249824).
- Attachment 7, Prior to Workers Signing On section: Added parenthetical guidance to clarify eSOMS requirements (PRR 02247040).
- Attachment 9, Note: Revised to clarify eSOMS requirements (PRR 02247040).
- Attachment 19, Step 8: Added guidance for Emergent Clearance approvals (PRR 02208881)

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SECTION PAGE

ATTACHMENTS

1.0 PURPOSE

1. This procedure provides a standard clearance and tagging program with methods and guidelines to control Hazardous Energy and equipment status to provide protection for personnel and plant equipment during operation, maintenance, and modification activities. {7.1.1}

   a. Provisions of the procedure ensure that the status of safety related and other important equipment is independently verified when the equipment is restored to service.

2. This procedure outlines the steps necessary to afford employees the same level of protection equivalent to that provided by the implementation of a personal lockout or tagout device in accordance with OSHA 29 CFR 1910.269(d)(8)(ii), 29 CFR 1910.147(f)(3)(i) and 29 CFR 1910.146(b).

3. This procedure applies to all personnel working at Duke Energy who place their hands or other portions of their body within the area of the component or system where energy normally exists that is de-energized by the clearance.

2.0 SCOPE

1. Transmission equipment and auxiliaries, solely controlled by the transmission system, use the clearance program of the transmission system. Where transmission equipment is shared, then the fleet tagging program may be used in accordance with applicable interface agreements.

2. If vendor equipment is connected to plant controlled systems during maintenance activities and isolation from Hazardous Energy is required, then the requirements of this procedure shall be met for isolation of the vendor equipment from plant controlled systems or components.

3. The Clearance and Tagging Process may be used to perform the following when other tools are not used:

   a. Protect equipment while maintenance is being performed.

   b. Prevent inadvertent operation when equipment is in a degraded condition.

4. Operations Tagging shall be used for all systems, structures, and components tagged in the AD-OP-ALL-0200, Clearance and Tagging, process.

   a. If a procedure or Work Order instruction refers to 'Maintenance Red Tags', then either Operations Tagging or AD-OP-ALL-0211, Facilities Clearance and Tagging, (if within scope) shall be used.

3.0 DEFINITIONS

1. **Accepted:** Documentation that the Clearance Holder has signed-on to and agreed with the adequacy of the clearance.

2. **Active Clearance:** Clearances that are actively being developed or used in the clearance process.

3. **Additional Measures:** Actions Performed in addition to a Red Tag so that no single action could by itself un-isolate an energy isolation device. Also referred to as 'Tags Plus' or 'Blocking Devices'.

4. **Archived Clearance:** Clearances that have been closed out and transferred from the Active Clearance class. Archived clearances can be used as templates for Model or Active Clearances.

5. **Boundary:** The area in which a worker is safe to perform work established by isolating, de-energizing and tagging potential sources of energy and stored energy that could create a hazard for the worker.

6. **Boundary Verification:** The act of verifying clearance tags are installed on the correct components and component is positioned as specified.

7. **Clearance:** The combination of component manipulations, placement of tags and any Additional Measures necessary for removing equipment from service to establish a safe work boundary for a defined scope of work that details component configuration, tagging sequence, stored energy sources, hazards, and special instructions. It contains a sequential list of tags, equipment configurations, and tag placement or removal notes needed to remove and return equipment/components from or to service.

8. **Clearance Approver:** The individual who gives final approval for the tag hanger/remover to execute the Clearance.

9. **Clearance Holder:** A person who has accepted the clearance and is responsible for performing the Holders Safety Verification for their scope of work.

10. **Clearance Information Tag (CIT):** A printed tag used to indicate that a component is out of service or is affected by a clearance.

11. **Clearance Preparer:** An individual trained and qualified to develop and process clearances.

12. **Clearance Reviewer:** An individual qualified to review a Clearance following preparation, to ensure the proposed work can be done safely.

13. **Clearance Status:** Indication where the clearance stands in the work process. Refer to the eSOMS User Guides.

3.0 DEFINITIONS (continued)

14. **Comment Tag:** A virtual tag type that is used to specify operational information pertinent to performance of the clearance. These are for information only and not required to be signed for in eSOMS.

15. **Complex Clearance:** Boundary that is required to isolate multiple different sources of energy, a clearance where no drawing exists to support clearance preparation, or a clearance where 'point to point' validation cannot be easily followed on standard drawings or vendor prints. In addition, other examples of clearances that may be considered complex:

    - Low voltage electrical (controls, alarm circuits, relaying, heat trace)
    - Plant modifications/Engineering Changes
    - Non-routine emergent requests (requiring less than 72 hours turnaround time)
    - Emergent scope change (scope change occurs after clearance review)
    - Error likely based on plant specific OE (history of errors with specific equipment or job scope)

16. **Concurrent Verification (CV):** Verification technique described in AD-HU-ALL-0005, Human Performance Tools.

17. **Condition Dependent Clearance:** A clearance that takes credit for administrative control of a given plant condition or parameter to control the hazards for the planned work.

18. **Contact Open Check:** Voltage checks performed during the clearance hang process to verify all contacts opened on certain molded case circuit breakers with a history of failure to fully open.

19. **Danger Release Tag (DRT):** A Danger Tag that can be granted Operational Release by the Tagging Authority allowing electronic or hard copy tag lifts for the purpose of testing equipment. Danger Release Tags hold the same relevance to personal safety as Danger Tags.

20. **Danger Tag:** A printed Red tag controlled exclusively by the responsible Tagging Authority to position and maintain components in a configuration to provide a safe boundary for worker protection.

21. **Details Tab:** The eSOMS Details Tab relays pertinent information regarding the execution of the clearance. Details shall contain operational information regarding plant impacts, conditions, or clearance execution requirements.

3.0 DEFINITIONS (continued)

22. **Disconnected:** A physical separation between the equipment and energy source.

23. **Energy Isolation Device:** A mechanical device that physically prevents energy transmission or release (e.g., valve, electrical circuit breaker or disconnect, SG nozzle dam, freeze seal).

24. **Electronic Sign-On:** An electronic process to provide documentation of individual employee accountability. The sign-on provides for a record of all employees assigned to a particular job relying on clearance protection.

25. **Equipment Protection Tags (EQP):** Tags that are used to maintain equipment in an alignment required to maintain the safety of the equipment.

26. **eSOMS Tag Verifications:** There are four different types of verifications for eSOMS tags. These types are Concurrent Verification, Independent Verification, No Verification, and Single Verification.

27. **Exceptional Clearance:** A clearance that does not provide conventional isolation and removal of Hazardous Energy for the work to be performed per Attachment 3, Exceptional Clearances.

28. **External Energy Injection (EEI):** The introduction of an external energy source that could create a hazard to workers within the boundaries of an active clearance.

29. **External Energy Injection (EEI) Affected Employee:** Workers and holders that could be injured by the energy being injected who are not part of the work group associated with performing the External Energy Injection evolution.

30. **Gagging Device:** A device that physically holds a component in the desired position when normal isolation is or will be unavailable.

31. **Ground:** A device that when installed provides a connection between the de-energized equipment and a station grounding system.

32. **Ground Tag (GND):** Orange tags installed on Grounding Devices for the purpose of identifying and tracking installed Grounding Devices.

33. **Hazardous Energy:** Any energy, including mechanical, pneumatic, hydraulic, electrical, chemical, nuclear, and thermal (e.g., high or low temperature) energies, that could cause injury to employees. Danger is only present when energy may be released in quantities or at rates that could injure employees.

3.0 DEFINITIONS (continued)

34. **Holder's Safety Verification:** A verifications that includes a walkdown to verify effective isolation of the component(s) to be worked on, a boundary review to ensure adequacy, ensuring a Zero Energy Check is performed prior to commencing work, and briefings between the Clearance Holder and Worker(s).

35. **Independent Verification (IV):** Verification technique described in AD-HU-ALL-0005, Human Performance Tools.

36. **Investigatory Clearance**: Determines adequacy of isolation. Investigatory Clearances do not have any associated work orders and are not used for any maintenance.

37. **Low Voltage:** Isolation Points that are less than or equal to than nominal 120VAC or 125VDC.

38. **Model Clearance:** Clearances that serve as templates for the Active Clearance.

39. **Newly Installed:** Components that have been installed and may need to be used for tagging but not yet turned over via the EC turnover process.

40. **No Tag (N)**: A function without a physical tag used to maintain configuration control of a device within a clearance boundary that is not needed for personal protection.

41. **No Verification (NV):** When no verifications are required (e.g., 'No Tag' points on a Clearance Hang or Comment Steps).

42. **Operational Release**: Authorization from the Tagging Authority to remove and re-hang Danger Release Tags for the purposes of testing.

43. **Parameter Tag (P):** A virtual tag used to delineate specific system conditions being relied upon by Clearance Holders for worker protection.

44. **Shared Tag:** Tag used in more than one clearance. Tags can only be shared if they are in the same primary folder.

45. **Single Verification (SV):** When no other verification is required other than the initial verifier (e.g., Comment or Step Tags that can't be re-verified after performance).

46. **Source Voltage Verification**: A functional verification of isolation points that are to be used in a clearance boundary but cannot be confirmed with current documentation.

3.0 DEFINITIONS (continued)

47. **Step Tag (S):** A virtual tag type that may be used to direct performance of an approved procedure or instruction in support of a clearance hang or clearance lift activity. This tag type is required to be verified.

48. **Tag Hanger/Remover:** An individual qualified to manipulate equipment and hang and remove tags according to the provisions of this procedure.

49. **Tagging Authority:** A Senior Reactor Operator (SRO) assigned responsibility for approving and issuing clearances and keeping control room personnel informed of all plant status changes prior to establishing or removing a clearance.

50. **Temporary Lift:** A process used to temporarily restore equipment under clearance to service for testing or any other purpose deemed necessary.

51. **Turnover**: A newly installed SSC that is required to be tagged must meet the turnover requirements outlined in AD-EG-ALL-1132, Preparation and Control of Design Change Engineering Changes, for Turnover to OCG.

52. **Un-Verify:** Removal of an electronic signature to move an item backward within an approval-flow process.

53. **Verifier:** Person who performs the independent or concurrent verification function as it relates to clearance activities.

54. **Worker:** Person performing work within the tagged out boundaries of a Clearance. Any individual whose duties may include servicing or maintenance covered under the clearance. This includes support functions, (e.g., surveys, inspections, walkdowns) such that the individual relies on the clearance for personal safety. The worker shall have an understanding of the energy or hazards that the applicable clearance is isolating.

55. **Worker Tracking List (WTL):** A hardcopy listing of workers, not in the electronic tracking system, that have been briefed on a particular job associated with a clearance. The list is used to document individual workers participation in the brief where their Boundary is discussed and tracks which workers are relying on the clearance. Refer to Attachment 9, Worker Tracking List.

56. **Zero Energy Check (ZEC):** Determination that a system or component is safe to begin work without personal safety threats due to Hazardous Energy levels (electrical, temperature, pressure, and toxic).

4.0 RESPONSIBILITIES

4.1 <u>All Site Personnel</u>

1. Ensure safety is maintained while working with clearances by following the requirements of this procedure.

    a. Do not manipulate a Danger or Danger Release Tagged component(s). There are specific actions which are not considered manipulations of Danger or Danger Release Tagged components and these are listed in Section 5.1 of this procedure.

2. Verify qualifications prior to performing any tasks.

4.2 <u>Operations Manager</u>

1. Owns and implements the Clearance and Tagging Program for the site.

2. Ensures that periodic audits and assessments are conducted to validate adequacy and accuracy of the clearance process, and to identify potential areas for improvement. The audits/assessments shall be performed on an annual interval.

4.3 <u>Section Managers</u>

1. Ensure all personnel (including supplemental workers) working for their section are trained to and comply with this procedure.

2. Ensure all personnel (including supplemental workers) working for their section are meeting the requirements for clearance briefs.

4.4 <u>Security Manager</u>

1. Ensure necessary Security personnel are informed of the Clearance requirements when contacted by a Maintenance or Operation Supervisor to place access on Administrative Hold for an individual.

4.5 <u>Site Training Manager:</u>

1. Development of a training program to qualify personnel on the clearance process and this procedure.

2. Training is provided on the clearance process and this procedure.

3. Clearance retraining is delivered annually.

4.6 Shift Manager

1. Determines appropriateness of the use of clearances in times of emergency.
2. Ensures plant status control is maintained in accordance with AD-OP-ALL-0204, Plant Status Control, and this procedure.
3. Approves Exceptional Clearances along with a Work Group Supervisor.

4.7 Clearance Approver

1. Maintains an active or current SRO license.
2. Approves EEI's, and the hang, temp lifts, removal of clearances.
3. Maintains Control Room personnel informed of all plant status changes prior to establishing or removing a clearance.
4. Ensures closeout of clearances.
5. Ensures the impact of clearances on the station is understood.

4.8 Clearance Requestor

1. Requests a clearance in accordance with the guidance of this procedure and AD-MN-ALL-0005, Nuclear Planning.
2. Typically this role is performed by the Maintenance Planner, with support from the craft supervisor as described in the Work Order Planning Process. However, other personnel may request a clearance.

4.9 Clearance Preparer

1. Designs the protection boundary for the work.
2. Verifies the clearance request contains a scope statement of sufficient detail to communicate the exact work scope to be included in the clearance boundary.
3. Applies systems and component knowledge, as well as knowledge of procedures, operating experience, and regulations to develop the clearance boundary.
4. Contacts the Clearance Requestor or Work Group Supervisor as necessary to ensure understanding of the work scope and clearance boundary needs.

4.10 Clearance Reviewer

1. Performs an independent review of the adequacy of the protection boundary.
2. Applies systems and component knowledge, as well as knowledge of procedures, operating experience, and regulations to confirm the technical accuracy of the clearance boundary.
3. Shares equal responsibility with the preparer.

4.11 Tag Hanger

1. Establishes the safe work boundary for the conduct of maintenance by implementing the protection boundary as designed.
2. Positions components in accordance with the clearance and plant procedures. Verifies the effects of component manipulations are as expected.
3. Hangs Tags in accordance with the clearance and this procedure.
4. Releases stored energy by positioning vents and drains as specified in the clearance.

4.12 Tag Verifier

1. Checks components are positioned in accordance with the clearance.
2. Installs or verifies Additional Measures installed.
3. Checks the tag(s) have been properly hung.

4.13 Clearance Holder

1. Electronically locks the clearance by signing on to prevent clearance modification.
2. Understands how the work group is being protected by the Clearance.
3. Ensures Holder Safety Verifications are performed.
4. Coordinates application of other required safety measures in accordance with the approved work plan (e.g., placement of grounds, electrical safety barriers).
5. Ensures all craft manipulated or added components have a documented method of restoration to the correct position.
6. Directs the manipulation of components that have been granted Operational Release by the Tagging Authority under a Danger Release Tag.

4.14 Worker

1. Obtains adequate brief on the work scope and safe work boundary of the clearance.
2. Understands the basis for their safety as provided by the tags applied by the clearance.
3. Verifies that a safe work environment has been established.
4. Ensures that Zero Energy Checks are performed prior to the start of work and after any of the following: {7.1.13}
   - Initial tag placement
   - Revisions
   - Shift change
5. Signs on the clearance for the applicable work order task at the beginning of (or when assigned to work on) the job and if applicable, at the beginning of each shift.
6. Signs off the work order when they are no longer required to work under the protection of the clearance or at the end of the work day.

4.15 Tag Remover

1. Removes only tags that have been approved for removal.
2. Removes Additional Measures.
3. Positions components in accordance with the clearance and plant procedures.
4. Verifies the effects of component manipulations are as expected.
5. Inspects the work area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact prior to lifting tags for a clearance removal or revisions.

4.16 Shift Manager - Work Control (Online or Outage)

1. Manages and provides oversight the Clearance and Tagging Program to ensure performance IAW with this procedure.
2. Lead/Facilitate the Site Clearance and Tagging Working Group.
3. Trend site performance.

4.16 Shift Manager - Work Control (Online or Outage) (continued)

4. Track clearance events.

5. Trend precursor events and implement actions to turn trends.

6. Observe clearance development and execution on a frequency defined by site management.

7. Meets quarterly with managers of departments that are involved in safety tagging to discuss clearance and tagging performance.

4.17 Tag Removal Verifier

1. Performs the following when Tag Verification is required:

   a. Checks the tag(s) have been properly removed.

   b. Checks components are positioned in accordance with the clearance.

4.18 Fleet Clearance and Tagging Working Group

1. Provides oversight for the Clearance and Tagging program, periodically assessing the effectiveness of the process. Based on internal and external requirements, recommendations, and operating experiences, implements the best practices that are most efficient without sacrificing safety. Agenda is located on the Clearance and Tagging SharePoint Page.

4.19 Site Clearance and Tagging Working Group

1. Provides oversight and analysis for the sites performance and implementation of the clearance process. The group analyzes performance and initiates actions to turn trends as required. Agenda is located on the Clearance and Tagging SharePoint page.

5.0 INSTRUCTIONS

5.1 General

1. Duke Energy has determined the below items will be used to define Hazardous Energy for the purposes of Clearance application and severity level determination.

   - 60 psig pressure
   - 120ºF temperature
   - 10" Hg vacuum
   - 50V (AC or DC) **AND** greater than 5mA (AC)
   - The presence of a caustic, acid, or corrosive material in concentrations and quantities which would cause injury if encountered.
   - The presence of liquefied gases (e.g., CO_2 or N_2).
   - Work in CO2 protected areas, only applicable if immediate egress is not possible.
   - If requested by Radiation Protection for a specified work task.
   - The presence of a flammable, explosive, or oxygen displacing gas in a concentration that poses a potential to combust, explode, or create an atmosphere that is immediately Dangerous to Life and Health (IDLH), except for in-place instrument calibrations.
   - The presence of potential crushing forces that if applied to a worker could cause injury.
     - ◊ This is separate from the motive force to cause the mechanical movement but the protection would be the same.

2. To determine if a Clearance is not required, refer to Attachment 1, When a Clearance is Not Required.

3. For facility locations that are not directly associated with the generation plant and generally not assigned to the Operations department for the purpose of plant status control, protection from the unexpected release of energy may use the facilities tagging process, AD-OP-ALL-0211, Facilities Tagging.

5.1 General (continued)

4. Tagging will be generated using the tagging module in eSOMS.

   a. Specific instructions for use of eSOMS is provided in the eSOMS User Guides.

   b. Paper tagging may be generated per the attachments in this procedure if the eSOMS clearance module is not available.

5. Any changes to this procedure shall be approved prior to implementation by:

   a. Corporate Clearance and Tagging process owner or Operations CFAM prior to implementation.

   b. OSHA subject matter expert for Clearance and Tagging.

   c. Representative of the Corporate Health and Safety Organization.

6. Clearances are not to be used with the sole intent of long-term disabling of equipment or in instances where a plant modification would be more appropriate.

7. Clearance Tags are used to indicate a piece of equipment is adequately isolated or de-energized to ensure worker safety and prevent injury.

   a. Other devices such as locks may supplement the tag, but the Clearance Tag is the primary means of control.

   b. If locks are used in conjunction with an Equipment Clearance, the WCC is to be notified.

   c. Provide the WCC with a method to disposition the lock in an emergency situation.

8. Where there is a difference between this procedure and any site specific procedures, this procedure will be the over-riding document.

9. Danger Tags

   a. A Danger Tag will override all other tag types in use at the facility.

   b. A component with a Danger Tag attached to it shall not be operated unless allowances of Section 5.1 Step 14 are applicable.

   c. A component with a Danger Tag attached to it shall not be removed from a system.

   d. Danger Tags shall be Red and contain "DANGER, DO NOT OPERATE".

5.1 General (continued)

e. A Danger Tag can be applied to a component bearing another Danger Tag or other tags provided the component positions do not conflict. The Danger Tag shall not be obstructed by the other tags.

f. Danger Tagged components shall not be used to maintain equipment energized.

g. Danger Tagged components shall not be used to maintain process flow.

10. Danger Release Tags

a. A Danger Release Tag is a Danger Tag that is used to designate operational release to another work group for the function of testing.

b. Danger Release Tags are to be treated as Danger Tags, with the following exceptions:

(1) Components with Danger Release Tags cannot be operated if a Danger Tag is on the same component.

(2) Danger Release Tags shall not be removed until the administrative requirements of this procedure have been met.

(3) Only one Clearance Holder will be allowed to hold a clearance that contains a Danger Release Tag.

11. Clearance Information Tags (CIT)

a. CITs are not used for isolation points or for equipment protection.

b. The components with CITs may be removed or have maintenance performed on the component.

c. CITs shall be white and black with a white description field and clearly say INFORMATION, or a suitable abbreviation.

d. Equipment with CITs can be manipulated, if required.

(1) When a specific equipment position is specified for the CIT tagged equipment, then the equipment may be operated after the Clearance is hung and verified as long as it is restored to its tagged position after manipulation.

(2) When no specific equipment position is specified for the CIT tagged equipment, then the equipment may be operated as necessary.

5.1 General (continued)

12. Equipment Protection Tags

    a. Equipment Protection Tags are used when a component needs to be protected from use or manipulation and no other governing document positions the components.

        (1) If another governing document positions the components to the desired state, then exit this procedure and utilize Plant Status Control tags.

    b. Equipment Protection Tags are not for personnel safety and should not be used for clearance boundary points.

    c. [CNS, MNS, ONS] Until all procedures or work instructions referencing 'white tags' for status control are revised, the following guidance will apply:

        (1) For equipment protection: If directed to apply 'white tags' for equipment protection by another procedure or work instruction, then use Equipment Protection Tags.

        (2) For status control: If directed to apply 'white tags' for status control by another procedure, then determine the appropriate tag type using AD-OP-ALL-0204, Plant Status Control.

13. CITs, No Tags and Comment steps are used in the Clearance and Tagging Process for configuration management as appropriate; they are not clearance isolation points. Some examples of their uses are as follows:

    a. Applied to control stations/extension controls and indicators to inform Operations personnel how equipment is affected by the clearance.

    b. Used on components that are to be worked on or replaced under the clearance to aid in system restoration.

    c. On manual valves within the clearance boundary which may be manipulated, to aid in system restoration.

    d. Applied to vents and drains, and other points associated with a clearance that are not isolation points.

5.1 General (continued)

14. No device or equipment shall be operated while Danger, Danger Release, or Equipment Protection Tags are attached with the following exceptions:

    a. Qualified personnel performing position verification while placing or verifying tags.

    b. Qualified personnel to improve isolation of a clearance in 'Approved to Hang' status.

    c. Qualified personnel to improve isolation of a clearance in 'Active' status under a temporary lift.

15. Maintenance will be allowed on boundary isolation components provided that the work activity will not alter the ability of the boundary isolation component to perform its isolation function.

    a. Examples of work activities that can be performed on boundary isolation devices are as follows:

        - Limit switch grease inspection (where no operation of the hand wheel or declutch lever is required)
        - Flex conduit repairs
        - Re-lugging of wire connections
        - Electrical disconnect and reconnect of motor
        - Limitorque grease inspection for rising stem and gate valves
        - Anti-rotation device inspection

16. Danger Tags that are found to be either unattached or missing shall be reported immediately to the Work Control Center who will take the following actions:

    a. Determine affected clearance and status.

    b. Stop affected work if necessary for safety and lock the clearance.

    c. Evaluate the need to suspend or prevent Holders from accepting the affected clearance.

    d. If the tag is still required, then request the tag re-attached and re-verified as applicable.

    e. If the tag is not required, then dispose of the tag.

5.1 General (continued)

f. Document results in the Details Tab of the clearance.

g. If work was stopped, then unlock the clearance and allow work to resume.

17. Danger Tags can be placed on the same equipment as transmission tags, if the equipment is needed by both work groups.

5.2 Additional Measures

1. Because Duke Energy uses Danger Tags instead of locks, Additional Measures are required so that no single action could by itself unisolate the component.

2. Additional Measures can be manipulated, if required, provided the isolation component is not manipulated.

   a. If manipulating Additional Measures requires lifting and hanging a Tag (because the tag may be affixed to the Additional Measure) then a qualified Tagger with Tagger qualified concurrent verifier will verify the tag is replaced correctly with a copy of the Tag Hang List.

   b. If manipulating Additional Measures does not require movement of the hanging Tag, then the Additional Measure may be manipulated by a Tagger qualified individual with no additional actions required.

3. The following criteria apply to Additional Measures:

   a. Only one measure need be applied to each isolation point.

   b. Not required on:

      - Energy release paths (vents, drains, grounds)

      - Valves which have a built in method of latching in a required position (i.e., 90 degree ball valve with a spring release or installed latching mechanism)

   c. All electrical isolations that are capable of receiving an additional measure shall be blocked.

   d. Implementation of Additional Measures is to be discussed at the Pre-Job Brief for placing and removing the clearance and is considered a skill of the craft activity.

   e. Additional Measures shall be capable of withstanding the environment to which they are exposed.

   f. Additional Measures do not require separate tracking.

5.2 Additional Measures (continued)

g. Additional Measures do not require an additional review or signature.

h. Additional Measures do not require verification.

i. If Additional Measures devices or methodologies cannot be employed, then designate the clearance as Exceptional.

4. Additional Measures methods include but are not limited to the following:

a. Mechanical

- Manual valves restrained with a tie-wrap
- Valve hand wheel locked
- Two isolation points in series
- Hand wheel removed [although this practice requires not removing the hand wheel until the component has been verified. Consider this only when used for small hand wheels that have no other practical means to secure (e.g., ball valves)].
- Release devices secured on valve operators designed with a positive-release type operator (e.g., some ball valves are designed with a squeeze-to-operate handle)
- If an Additional Measure is to be installed on a Manual Ball/Plug valve and there is no practical way to install, generate a Work Request to have a hole drilled into the valve handle.

b. Electrical

- Operating devices secured with cable ties through the installed lockout device only if it prevents operation of the device
- Breakers with a blockable shutter that have the shutter blocked
- Lock hasps used on breakers with lockable operating handles
- Two isolation points in series
- Panel doors secured against entry (e.g., with a labeled hasp signifying no entry due to tagged components inside).

5.2 Additional Measures (continued)

- Low Voltage breakers are not normally capable of being locked. The blocking device will be installed on low voltage breakers to allow tags to be hung directly onto the breaker. Once a tag is hung on the blocking device for a low voltage breaker, it shall not be operated until the tag is properly removed.

- Breakers that are racked to a 'disconnect' position do not require additional measures if a single action could not compromise the isolation point.

5.3 <u>Clearance Request</u>

1. The Planner shall analyze the work to be performed and identify potential energy sources and other hazards that may adversely affect the outcome of the work, or cause equipment damage or personnel injury.

2. The Planner shall clearly identify the 'end state' condition in which the equipment must be placed (e.g., de-energized, de-pressurized, isolated, drained) to perform the maintenance safely and correctly along with a scope statement that clearly describes the work that requires protection from Hazardous Energy.

3. If the Work Order Task does not contain an EDB record and requires a tag-out, then the Planner shall consult with the Operations Tagging Group on the need for a marked up drawing.

4. The clearance request will have a defined scope statement of sufficient detail to communicate the exact work scope to be included in the clearance boundary. This will ensure adequate protection for personnel safety from the hazard and the conditions required for the work to be performed. The scope statement shall include the following:

   a. Which component(s) the work will directly and indirectly impact.

   b. Any information related to additional potential hazards associated with the work (e.g., system to be vented and drained to relieve pressure).

   c. Information as to how the system will be breached (e.g., mechanically, electrically).

5. Energy sources to be isolated and the energy sources that need to remain available. Other applicable items and any related information in each work order:

   a. Identify applicable grounds and their controlling mechanism (procedure or tags) and location (if known).

5.3 Clearance Request (continued)

b. Identify applicable revisions or temporary lifts if known.

c. Reference applicable drawings for performing the maintenance.

d. Evaluate the work being performed and request isolation or control of fire protection systems if needed (e.g., CO2, Halon).

e. If performing a partial procedure that requires a different boundary than if performing the entire procedure, then identify which sections or steps of the procedure will be performed that require personnel protection.

f. If External Energy Injection will be required to perform work or for required testing.

g. WR and WO Task info may be separated by a 'Work Order Starts Here' statement. {7.1.12}

h. If an Engineering Change (EC) is being implemented, coordinate with the responsible engineer or planner to ensure that the clearance request will provide enough information for the clearance preparers to establish the required boundaries.

i. If an Engineering Change (EC) is being implemented, coordinate with the responsible engineer or planner to ensure that the clearance request will provide enough information for the clearance preparers so the removal sequence and positions can establish the appropriate conditions for required testing or equipment restoration according to the EC instructions prior to full system restoration.

5.4 <u>Model Clearances</u>

1. Model Clearances are used to support routine work activities that are performed on a periodic basis, have limited work scope and require a limited consistent clearance boundary.

2. Model Clearances can be also be used as templates, or starting points for more complex clearances such as System outages.

   a. Active clearances created from model clearance templates must prepared per Section 2.0 of Attachment 5, Clearance Hang Preparation Checklist.

   b. When using a Model Clearance as a template, then the remainder of this section shall not be followed.

5.4 Model Clearances (continued)

3. Use of the model clearance process is optional, if the requirements for use of Model Clearances are not met then clearance development shall be per the applicable sections of this procedure.

4. Creating a Model Clearance

   a. For assistance with creating a Model Clearance, reference the eSOMS Users Guide.

   b. Model Clearances shall be created per Attachment 4, Model Clearance Creation / Revision Checklists

5. Revising a Model Clearance

   a. When a Model Clearance that is currently 'Approved for Use' requires revision, revise the Model per Attachment 4, Model Clearance Creation / Revision Checklists.

5.5 <u>Clearance Preparation</u>

1. For Active Clearances being prepared from a Model Clearance, use the guidance in Section 1.0 of Attachment 5, Clearance Hang Preparation Checklist. For all other Clearances or new Model Clearance generation continue in this section.

   a. If the Active Clearance is being prepared from a Model and does not meet any of the criteria in Section 1.0 of Attachment 5, Clearance Hang Preparation Checklist, then the Active Clearance shall be deleted or prepared and reviewed using the Section 2.0 of Attachment 5. Additionally, action shall be taken to revise the Model.

2. The Clearance Preparer shall understand the scope of the work, the hazards that the clearance will remove, and the plant conditions under which the work will be performed by using the clearance request, review of the WO task, walking down the component and work area if needed, and talking with planners or maintenance craft personnel for clarification if needed.

3. The Clearance Preparer shall evaluate the requested equipment against current or expected plant conditions and determine required lineups necessary to isolate and restore the component, using controlled and approved references. {7.1.19}

4. Clearance impacts must be evaluated to ensure that effects on systems and components outside of the boundary are identified and are acceptable, or properly dispositioned (e.g., evaluate effect of work on fire systems such as CO2 or Halon).

5.5 Clearance Preparation (continued)

5. Clearances written on systems that remain in service or are only partially removed from service must ensure that there are no adverse effects on the whole system as a result of the clearance.

6. Clearance development shall consider Safety and ALARA principles.

   a. Consider changes to area dose rates when radioactive system draining will be performed.

   b. Consider alternate methods of isolation of clearance boundaries to minimize entries into high radiation areas to minimize personnel exposure.

7. All components manipulated during clearance activities shall be tracked to ensure configuration control by one of the following methods:

   - Tagged with a Clearance Tag
   - Listed as a 'No Tag' step
   - Tracked by a procedure that governs the manipulation
   - Per the guidance of AD-OP-ALL-0204, Plant Status Control

8. When a procedure exists to secure or restore equipment to service, then the procedure shall be used to perform the task. The clearance may be performed in conjunction with the activity as appropriate.

9. Procedures used as part of clearance performance shall be listed in the Details Tab, or as a comment step and properly sequenced with the clearance steps.

10. Clearances, that require installation of Temporary Power, shall be reviewed and evaluated to ensure that the Temporary Power will not introduce an external energy source within the Clearance boundaries. If temporary power will introduce energy into a clearance boundary then it should be performed per the External Energy Injection section of this procedure.

11. If needed, ensure a Work Order or Work Request has been created to facilitate venting of instrumentation that is not covered by procedure upon returning a system to service following work that may have drained the instruments.

12. Perform system fill and vents according to site procedures as applicable.

    a. When establishing a clearance boundary, the Clearance Preparer should ensure that the piping within the boundary can be adequately filled and vented via station fill and vent procedures during clearance removal.

5.5 Clearance Preparation (continued)

b. If the proposed clearance boundary on an ECCS system will result in a fill and vent configuration different from that assumed in station fill and vent procedures, contact the appropriate system engineer and request an assessment to ensure a complete fill and vent can be accomplished.

(1) The assessment should ensure that voids introduced into the piping during maintenance can be eliminated or reduced to an acceptable size during fill and vent activities.

(2) This may include performing a UT to ensure systems are adequately filled and vented. {7.1.16}

13. Confined Space Requirements

a. If a **non-permit** required confined space requires a clearance to enter the confined space, and the confined space is such that a person could enter the confined space and be out of immediate sight of persons directly outside of the confined space, then at least one of the entry/egress points shall be tagged to prevent inadvertent closure of that confined space with Caution Tags per AD-OP-ALL-0204, Plant Status Control.

(1) The Caution Tag placement notes shall require verification of personnel have exited the confined space (e.g., signed out of entry permit) prior to closure of the confined space.

b. When isolating components or equipment that are considered a confined space, hazards associated with flowable materials (e.g., steam, gas, which could create atmospheric hazards due to leakage of a single valve) will be considered isolated only by the use of the following techniques:

(1) Blanking or blinding

(2) Misaligning or removing sections of lines, pipes or duct

(3) Double valve isolation

(a) When double valve isolation is used, a vent/bleed path must be established between the isolation valves (and routed out of the confined space) to monitor for leak-by.

(4) Notify the implementing work group so the appropriate hazard evaluation can be performed in accordance with AD-HS-ALL-0108, Confined Space Entry, prior to Workers signing onto the Clearance.

5.5 Clearance Preparation (continued)

14. Controlled drawings and references shall be used in the preparation of clearances when available.

    a. A copy of the controlled print will be used and marked up to show the required components and their desired positions.

       (1) For complex electrical circuits (e.g., control circuits, relay replacements), the isolated portions of the circuit should be highlighted to each isolation point to clearly demonstrate all paths are isolated.

    b. A detailed understanding of the system is needed by the clearance preparer to identify parallel flowpaths, remote controlling locations, electrical backfeed sources, proximity to energized sources, multiple power sources, and so on.

    c. If a controlled document is not available or there is uncertainty about the accuracy, then other means may be used as deemed appropriate. For example, performing a field walk down, using a technical manual, source voltage verification, or using the Investigatory Clearance Process. When in doubt, the clearance preparer shall seek out the appropriate technical help.

    d. All reference material, including digital photos, and hand drawings/field sketches used for clearance development may be attached to the clearance as a stored document under the 'Attachments' tab, or maintained on a fileshare that is accessible for reference.

    e. If Security equipment will be tagged, then Safeguards Information should be controlled as needed to comply with Security procedures.

15. All clearances shall be evaluated prior to approval to determine if they are Complex Clearances and mitigation strategies be put in place to ensure successful execution.

    a. Determining if a clearance is complex can be done by anyone within the clearance process, or based on management request.

    b. Mitigation strategies shall be documented in the Details Tab. (Reference Basis Document for examples)

16. If the clearance group requires assistance from a subject matter expert (in another group) to determine the necessary isolations to establish a safe boundary, then Attachment 12Attachment 12, SME Support Clearance Boundaries Request Form shall be used (e.g., where SMEs should be involved in clearance preparation):

5.5 Clearance Preparation (continued)

- Complex clearances, where prints are inadequate or not available
- Clearances that require use of elementary electrical drawings or vendor diagrams
- Clearances that will require tagging control circuits or relays
- Low Voltage electrical clearances
- When the effects of clearance are not fully or completely understood by the Preparer or Reviewer {7.1.17} {7.1.15}

17. The use of an Investigatory Clearance can be used in any of the following instances:

    - Controlled documents are inadequate or do not exist.
    - Electrical circuits that have never been tagged at the station.
    - Operations Manager support or designee discretion.

18. If an Investigatory Clearance is being used, then perform the following:

    a. Create a Clearance with the proposed boundary isolations.

    b. State in the details section of the Clearance that the Clearance is an Investigatory Clearance.

       (1) Ensure to include this is for testing isolation only and that no maintenance will be performed using an Investigatory Clearance.

    c. Ensure no Work Orders are added to an Investigatory Clearance.

    d. Cross reference the intended work clearance in the Details Tab of the Investigatory Clearance.

    e. After the Investigatory Clearance is hung, ZECs are performed to validate the tagging boundaries.

5.5 Clearance Preparation (continued)

f. If the ZECs determine the boundaries are NOT adequate, then perform the following:

(1) Any clearance which was developed to support work associated with the boundary being investigated shall have all verifications removed because the proposed boundary has been proven to be insufficient or inaccurate.

(a) This is not considered a Worker Protection error for the clearance(s) being rolled back to no verification status.

(2) Change the Investigatory Clearance boundaries using the Revision Process (refer to Section 5.23).

(a) This is NOT considered a Worker Protection Error for the investigatory clearance.

(3) Re-perform ZECs to validate the tagging boundaries.

(4) Continue to perform Section 5.5 Step 18.f(2) and Section 5.5 Step 18.f(3) until a successful Clearance boundary is determined.

(5) Once a successful Clearance boundary is confirmed revise any clearance which was initially developed to rely on the proposed boundary.

g. For Clearances relying on boundaries being tested by an Investigatory Clearance the following actions should be taken to prepare the clearance which will be used for the planned work:

(1) Prior to the Investigatory Clearance ZECs, a work clearance can be written and reviewed using the proposed boundary which includes the required work order tasks.

(2) When developing the clearance populate the "Is this associated with an investigatory clearance" attribute as "yes".

(3) The Preparer and Reviewer can sign for the proposed work Clearance(s).

(4) Place a comment in the Details tab specifying the Investigatory Clearance number being used to verify the boundary.

5.5 Clearance Preparation (continued)

(5) When the investigatory clearance is completed satisfactorily then:

(a) Update the attribute "Is the investigatory clearance completed satisfactorily" as "yes".

(b) Approve the work clearances in accordance with the guidelines of this procedure for Clearance approval.

19. After the isolation boundary is determined, a method of de energizing the system must be developed.

a. Elevation differences, temperature considerations, and so on may affect the system draining or venting; additionally, check valves or other flow restrictors may interfere with the energy release path.

b. In electrical systems, induced voltages may be a hazard, particularly around transformers or transmission and distribution equipment.

20. All clearances shall be evaluated to determine if they are exceptional per Attachment 3, Exceptional Clearances. If a clearance is designated Exceptional, then perform the following:

a. Exceptional Clearances should only be used after reasonable efforts to eliminate the need to use an Exceptional Clearance has been evaluated.

b. Document in the Details Tab of the clearance, the clearance is Exceptional.

c. Document in the Details Tab of the clearance the reason the clearance is Exceptional.

d. Exceptional clearances shall be approved by the following:

(1) A Shift Manager (SM) or higher level Operations Manager.

(a) Shift Manager approval is confirmation that the basis for being exceptional is understood and all reasonable efforts have been evaluated to make the clearance non exceptional.

(2) A Work Group Supervisor (or higher level manager of the work group).

(a) Supervisor approval is confirmation that the basis for the Exceptional Clearance is understood and mitigating actions have been determined for the Exceptional Clearance.

5.5 Clearance Preparation (continued)

e. The affected work group will signify acceptance of the Exceptional Clearance by signing on the clearance.

21. Evaluate the need to drain or depressurize both sides of a relief valve.

22. The clearance shall specify the correct sequence in which components are to be positioned and tagged.

    a. Incorporate the restoration position and sequence into the clearance during development when possible.

23. If a clearance is placed where rotation of the equipment would cause a safety hazard to employees or damage to the equipment, then flow paths that could cause rotation shall be isolated.

24. If tagging low voltage breaker systems, refer to Attachment 23, Flowchart For Low Voltage Panel Breaker Tagging.

25. Evaluate the effects of any lost or inaccurate inputs into plant processes (e.g., heat balance inputs), resulting from the clearance application.

26. When a Condition Dependent Clearance is used, then the following criteria applies:

    a. The clearance shall be designated as a Condition Dependent Clearance in the Details Tab of the clearance.

    b. The following information shall be included in the Details Tab of the clearance:

        (1) Reason for condition in the clearance

        (2) Dependent Condition to be maintained or procedure governing the condition

        (3) Contingency actions to be taken in event of loss of the condition

    c. The condition being administratively controlled should be clearly identified with a Parameter Tag or other indicating device to alert those responsible for monitoring and maintaining the condition within its required status or range.

        (1) If the condition is being controlled under the direction of a governing procedure (e.g., Reactor Head Disassembly/Reassembly), then the indicating device is not required to be identified with an Parameter Tag.

5.5 Clearance Preparation (continued)

(2) For procedure-controlled conditions, the procedure shall specify when to apply the clearance and verification that the clearance has been removed before exiting the specific condition.

d. A method to track the active parameters shall be used by the control room (e.g., Report, Turnover Sheet).

27. It is preferred to use breakers as isolation points rather than pulling fuses under load, which may cause damage to fuse holders.

28. When a lead will be lifted where multiple leads are landed on the same terminal point, then the effects of lifting any leads shall be evaluated in case more than the intended lead are lifted due to the existing configuration.

29. Safety related clearance processes shall include consideration of:

- Technical Specification adherence and Limiting Conditions for Operation (LCO)
- **[CNS, MNS, ONS]** Selected License Commitments (SLCs)

30. At a minimum, one atmospheric drain or vent between the work area and sources of pressure to the work area shall be tagged in the OPEN position, with the cap or flange removed to release pressure in the system and to accommodate thermal expansion and contraction.

31. In situations where a System, Structure or Component (SSC) is de watered and could have a potential impact on Security measures or functions (e.g. de watered systems that intersect a PA boundary), Security will be contacted for evaluation of compensatory measures. If revisions are made to the clearance boundary, additional evaluation(s) will be made to ensure compensatory measures are still adequate and necessary. {7.1.10}

32. In instances where drawings or prints do not provide reasonable assurance of the energy source that needs to be isolated, a Source Voltage Verification shall be used.

a. Source Voltage Verification should be performed by Maintenance when requested by the Clearance developers and is performed with a work order or work request.

5.5 Clearance Preparation (continued)

b. The Source Voltage Verification should be performed prior to the clearance being approved to hang (e.g., in preparation), however in instances where this cannot be performed ahead of schedule due to plant or schedule constraints a Source Voltage Verification can be performed while the clearance is being hung.

(1) If an inadequate isolation is identified during the clearance hang (after clearance approval), then reference Section 5.29, Event Response and Tagging Performance Indicators.

c. The result of the Source Voltage Verification will be attached to the Clearance or outlined in the Details Tab. The attachment shall provide enough information for the Clearance Reviewer to understand how the isolation device will remove source energy.

(1) If an inadequate isolation is identified during the clearance development (before clearance approval), then reference Section 5.29, Event Response and Tagging Performance Indicators.

d. When the Source Voltage Verification is complete, then the appropriate Action Request (AR) type will be generated to update the original document in question.

e. In all instances, Source Voltage Verification is performed before the Clearance is turned over to maintenance.

33. The Clearance Preparer(s) shall perform the clearance preparation in accordance with the requirements of this procedure using a copy of Attachment 5, Clearance Hang Preparation Checklist.

34. When clearance development is complete, then status the clearance as 'Tag Hang Prepared By' in the 'Verification' tab.

5.6 <u>Clearance Reviewer</u>

1. For Active Clearances being reviewed from a Model Clearance, use the guidance in Section 1.0 of Attachment 5, Clearance Hang Preparation Checklist. For all other Clearances or new Model Clearance generation continue in this section.

a. If the Active Clearance is being reviewed from a Model and does not meet any of the reviewer criteria in Section 1.0 of Attachment 5, Clearance Hang Preparation Checklist, then the Active Clearance shall be deleted or prepared and reviewed using section 2.0 if Attachment 5. Additionally, action shall be taken to revise the Model.

5.6 Clearance Reviewer (continued)

2. The purpose of the clearance review is to ensure that the design of the clearance is technically correct, that good isolation practices have been used, and that appropriate procedural requirements have been met.

   a. The clearance reviewer is charged with making an informed decision about the technical accuracy and safety adequacy, in all respects, of the clearance that is presented for review.

   b. The clearance reviewer shall maintain an independent perspective on the clearance.

   c. For all clearances (except Keowee), the review shall be performed by a licensed operator or a previously licensed operator at that station.

      (1) For Keowee Operations clearances, the review shall be performed by a Keowee Operations Tech 3 or exempt Keowee personnel.

3. A detailed understanding of the system is needed by the clearance reviewer to identify parallel flowpaths, remote controlling locations, electrical backfeed sources, proximity to energized sources, multiple power sources, and so on. When in doubt, the appropriate technical help should be sought. In making an informed decision about the clearance, the following techniques are ways to ensure an adequate technical review by improving the independence of the clearance reviewer's perspective:

   a. Do not discuss the clearance with the clearance preparer until the clearance reviewer has developed his or her own idea of the clearance boundary.

   b. References used by the clearance preparer may be used, but no marked up items are addressed until after a review of the task and the creation of an independent boundary has been completed. Previously marked up prints may be used for review of outage block/master clearances.

   c. Independently assess and understand the hazards.

   d. Independently assess and understand the plant impacts.

   e. Separately walkdown the work area if needed.

4. The Clearance Reviewer shall perform Attachment 5 to ensure:

   a. The clearance adequately addresses personnel safety and equipment protection.

   b. The clearance adequately supports the scope of work.

5.6 Clearance Reviewer (continued)

c. The guidance in Notes, Cautions, and the Details Tab is proper for implementing the clearance.

d. The clearance was prepared per Attachment 5.

5. Substantive differences between the reviewer and preparer, which require resolution prior to signing the Review Verification, include:

a. Different final tag lists (either components selected or component positions).

b. Sequence differences that would alter the flow of energy during the hanging of the tags (e.g., clearing a pressurized tank may require both venting and draining, and opening the vent after opening the drain will cause different energy flows than opening the vent before opening the drain).

c. Different methods of complying with operational or other requirements.

d. If revision is required, then return the clearance to the Clearance Preparer for resolution.

6. Minor differences, which do not affect the effectiveness of the clearance and tagging process, include:

- Different wording for CITs
- Sequence differences for components that will not affect the flow of energy (e.g., if a procedure is used to isolate and de-energize a system before any tags are hung, then the sequence of hanging the tags at the boundary will not matter if the procedure has prepositioned the components to the required position.)
- Equipment nomenclature differences, especially where such nomenclature differences exist in station documents (equipment labels, databases, and design documents should all agree for long-term station success).

7. When Clearance Review is complete, then status the clearance as Tag Hang Reviewed.

5.7 Clearance Hang Approval

1. Clearance approval shall be completed using Attachment 5, Clearance Hang Preparation Checklist.

2. The Clearance Approver performs many of the tie-ins from the clearance and tagging process to all operational programs through which the station is operated in accordance with company policy and regulations.

3. Approval is the responsibility of a qualified licensed senior reactor operator.

4. The Clearance Approver must be satisfied with the overall outcome, and has in fact trusted that the critical process steps up to this point have been performed by skilled people with the time and talent to provide a quality product.

   a. It is neither required nor desired that the Clearance Approver duplicate the activities of the other people in the process. However, the Clearance Approver has the right and responsibility to question any detail that in their judgment is potentially flawed.

5. Since hanging the clearance constitutes a plant status change, the Clearance Approver should initiate any additional considerations associated with the plant status change that are also required. These additional considerations include, but are not limited to, the following:

   a. Ensure Tag hanger(s) and Verifiers participate in a Pre-Job Brief per Attachment 6, Clearance Hang/Remove Pre-Job Brief Checklist {7.1.6} .

   b. Assigning a qualified independent verifier on those systems requiring independent verification

   c. Nuclear safety, industrial safety, environmental safety, and generation risk considered for conditions established by the clearance and are addressed.

6. Approve tagging application and equipment removal from service by completing the 'Tag Hang Approved' in the clearance.

7. Ensure 'Official' Tag Hang Lists are printed during implementation of the clearance. 'Unofficial' copies may be printed for second checks or walkdowns. {7.1.8}

5.8 Clearance Isolation Standards

5.8.1 General Guidance

1. Clearance isolation points may be arranged to reduce unnecessary travel as long as nuclear safety, personnel safety, and equipment reliability is not compromised.

    a. Sequence steps with the same number can be performed in any order.

    b. Steps in sequential order must be performed in order.

2. The order of tagging application should be arranged as follows:

    a. General cautions, notes or other associated clearance (i.e., specific cautions, notes, and other associated clearance information may be placed just prior to the applicable sequence step or in the placement notes for that component).

    b. Control switches

    c. Power supplies (e.g., breakers, disconnects, fuses)

    d. Lifted leads

    e. Mechanical isolation points (e.g., discharge and suction valves)

        (1) Isolate high pressure energy source prior to low pressure energy source.

        (2) Isolate discharge valves prior to suction valves.

    f. Support systems (e.g., cooling water, air supplies)

    g. Drains and Vents

        (1) Open drains prior to vents, unless directed by a system operating procedure to open a vent before a drain.

        (2) Hard piped vents may be opened first to depressurize an isolated Boundary.

3. To prevent moisture buildup on motor windings, motor heaters should remain energized unless actual motor work is to be performed. If the motor heaters are placed under clearance, prompt restoration of the heaters is desired to minimize the effect on the motor.

4. The tagging methods listed below are guidance only and each component must be tagged in a manner that is appropriate for that component.

5.8.1 General Guidance (continued)

5. Before de-energizing the main or control power to a crane or hoist to place a clearance, the Clearance Hanger shall perform a visual verification of the crane to ensure the crane is not in use. If the crane is in containment and it is known to be unoccupied then this visual verification is not required.

6. If a crane or hoist safety switch is used as a clearance isolation point instead of the MCC breaker, then verify that the safety switch completely de-energizes the equipment.

5.8.2 Mechanical And Electrical Isolation General Standards

1. Systems and components should be isolated, vented, and, if necessary, drained to an energy potential that would not create a concern for the worker before the clearance is statused as 'Ready to Work'.

2. If work on specific equipment requires tagging in such a manner that associated equipment could be damaged if operated, then ensure the associated equipment is tagged as part of the original equipment clearance. Examples of this situation include, but are not limited to the following:

   a. When a pump suction or discharge is isolated, then ensure the pump is also tagged to prevent starting.

   b. When the lubricating or cooling water system to equipment is isolated, then ensure the equipment is also tagged to prevent operation prior to the lubricating or cooling water isolation.

3. If a rotating mechanical component (e.g., a pump, a fan) is tagged out for motor or coupling work, then ensure the discharge or suction valves/dampers are tagged closed, as appropriate, to prevent motor/component rotation.

4. Valve and actuator maintenance shall be evaluated for stem ejection and addressed.

5. Potential transformer primary or secondary fuses shall be removed or racked out when working on the potential transformer or on associated ungrounded primary conductors.

6. If system has greater than 500 psid across boundary valves or fluids above 200 °F (93 °C), then double valve isolation shall be provided when available.

   a. When double isolation boundaries are used, a method of protecting the isolated piping from thermal expansion or contraction should be used where thermal expansion/contraction potential exists. Such methods could include existing relief valves or open vents or drains.

5.8.3 Pump/Fan Standards

1. For systems where a pump or fan is affected by a clearance, the clearance should be installed and removed in the sequence listed below to prevent damage to equipment. Deviations from the sequence and specific instructions below are allowed for safety, ALARA, or if the deviation would not impact personnel or equipment safety.

2. Clearance Hang:

    a. Secure Pump/Fan and hang tag on its control switch.

    b. Remove the power source for the pump/fan prime mover (i.e., open breaker, remove fuse, shut steam supply) and tag the power source.

    c. Reposition required valves from control switches and tag control switches (including alternate locations as applicable)

    d. Remove power source from valves and tag the power source.

    e. Reposition manual valves as required. Discharge should be shut before suction. Drains should be tagged before vents. Hard piped vents should be opened first to depressurize an isolated boundary.

3. Clearance Removal:

    a. Remove tags and reposition manual valves including vents and drains as required. Pump suction should be opened before pump discharge.

    b. Remove tags and restore power to valves.

    c. Remove tags from valve control switches and reposition as required.

    d. Remove tags from the pump/fan and restore power as required.

    e. Remove tags on the pump/fan control switch and reposition as required.

5.8.4 Valve Standards

1. Clearance boundary valves shall be tagged to prevent inadvertent operation or removal from the system.

    a. If the valve does not have an operator that can be manipulated, then the operator shall still be tagged (e.g., a solenoid).

    b. If a boundary isolation is not accessible (e.g., submersed), then a means to prevent access can be used (e.g., tagging an access hatch).

5.8.4 Valve Standards (continued)

c. Exceptions to this requirements are allowed for ALARA or safety concerns if approved by the Shift Manager.

2. For devices having a remote operator, such as a valve reach rod, where both valve and reach rod have a hand wheel and are accessible, the clearance should be written such that both mechanical devices are tagged.

   a. Reposition the valve with the remote operator and tag the remote operator.

   b. Verify the valve locally and tag the valve hand wheel at the valve body.

   c. Tags for the valve hand wheel may be excluded if radiation levels make entry into the area undesirable (as a guideline, anticipated dose greater than 10 mrem or Locked High Rad Area).

   d. If the valve hand wheel at the valve body is not tagged, then it shall be noted in the Details Tab and the Clearance should be marked as Exceptional.

3. Motor operated valves may be used as an isolation boundary point provided, after the valve has been positioned for the clearance, its power supply is isolated and tagged and the hand wheel is tagged to indicate the valve position.

   a. The valve should not be manually engaged to check position. This will prevent inadvertent damage to the torque switch or valve seat, and prevents the drifting problem associated with some Limitorque operated valves.

   b. Since the valve position may not be available after the motor breaker is turned off, concurrent verification may be used to determine valve position before isolating the power supply.

   c. If the valve is determined to have seat leakage, then it is permissible to manually engage the hand wheel and torque the valve shut.

   d. Refer to applicable site procedures for positioning and position verification associated with motor operated valves.

4. Manual valves should be used as clearance Boundary isolation points. When this is not practical, then the standards for gags, AOV's, MOV's, solenoid valves, check valves, relief valves, control valves, line/plug stops and freeze seals should be applied.

5.8.4 Valve Standards (continued)

5. Using a valve backseat for isolation (i.e., to isolate packing leakage for repair/replacement):

   a. Verify the valve is designed with a backseat for use as isolation.

   b. The valve will be opened and tightened on the backseat, as per applicable procedures.

   c. Contact the System Engineer as applicable if proper guidance cannot be found in applicable procedures.

   d. The hand wheel will be Danger Tagged in the backseated position.

6. Check valves and rupture discs should not be used as Boundary isolation points unless no other isolation is practical.

7. A pressure relief type valve should not be used as a clearance isolation point unless the valve is restrained in the required position with an appropriate gag or jacking device.

   a. When gagging a relief valve, then ensure an Engineering evaluation has been performed to evaluate the system effect and verify ASME code compliance prior to clearance approval.

8. Hydraulically operated valves used as isolation points should have hydraulic pressure removed or blocked in the isolated position and clearance tag attached.

9. Valves normally used for flow control are prone to have seat leakage. Ensure any leakage is evaluated and monitored.

10. Manual Throttle Valve standards: {7.1.4}

   a. Throttled valves should not normally be used as isolation points. When a throttle valve is used as a clearance isolation point, then the person applying the clearance shall perform the following:

      (1) Record the 'As-Found' position (number of turns) on the applicable section of the clearance.

      (2) Verify the 'As-Found' position is the same as the valve lineup checklist position for restoration, as applicable.

      (3) If a discrepancy exists between the 'As-Found' and valve lineup position, then consult Operations for determining restoration position.

5.8.4 Valve Standards (continued)

(4) If a valve lineup position is not available, then use the 'As-Found' position for clearance restoration.

(5) If a test (flow balance) is required to restore valve position, then evaluate if the test can be performed during anticipated plant conditions prior to using valve as a boundary.

b. Tagging Method

(1) Tags should be placed on the handwheel.

(2) If the valve has a remote operator such as a reach rod, then it should be tagged.

11. Manually Operated Valve standards: {7.1.4}

a. Butterfly valves and plug valves are prone to leak by seat. Monitor for seat leakage.

b. Tagging Method

(1) Place tag on handwheel.

(2) If the valve has a remote operator such as a reach rod, then it should be tagged.

(3) For underground valves (curb boxes) the tag should be placed in a method that would prevent inadvertent operation with the valve operating device. This could be by securing and tagging a cover to prevent access or placing the tag securely over the access area for the operating mechanism.

12. Solenoid Operated Valve standards: {7.1.4}

a. Target Rock Solenoid Operated valves should not be used.

b. Solenoid valves which fail open shall not be used as a clearance isolation point where failure would allow process flow.

c. Use only if valve fails closed.

d. Evaluate for other components that are powered from same circuit.

5.8.4 Valve Standards (continued)

e. Tagging Method.

(1) Place tag on power supply.

(2) A tag should be placed on the valve to prevent inadvertent violation of the boundary.

13. Hydraulic Operated Valve (Fails As Is) standards: {7.1.4}

a. Normally not used as a boundary device.

b. Either a manual positioning device or a mechanical gag is required.

c. Evaluate on a case by case basis to determine if valve can perform adequately as a boundary device.

d. Tagging Method

(1) Position valve from control switch.

(2) Place a CIT on control switch as required.

(3) Place tag on power supply to hydraulic pump.

(4) If the operator has a hand wheel or other manual positioning device it should be tagged.

(5) If a mechanical gag is installed, then it should be tagged.

(6) If the operator does not have a handwheel or other manual positioning device, then tag the operator to prevent inadvertent violation of the boundary.

14. Pneumatic/Air Operated Valve (Fails Open) standards:

a. Normally not be used as a boundary device.

b. Either a manual positioning device or a mechanical gag is required.

c. If a valve fails open on loss of air, then isolation of the air supply will cause the valve actuator to work against the gag (gagged closed). If possible, then do not isolate air to the valve.

5.8.4 Valve Standards (continued)

d. Tagging Method

(1) Position valve from control switch.

(2) Place a CIT on control switch as required.

(3) If work is to be performed on valve pneumatic system, then place tag on pneumatic supply.

(4) If work is to be performed on valve pneumatic system, then ensure that the pneumatics are vented from the operator and leave vent path open.

(5) If work is to be performed on valve pneumatic system, if a solenoid is to be de-energized to vent the pneumatics from the operator, then the solenoid may be de-energized and tagged.

(6) If the operator has a hand wheel or other manual positioning device, then it should be tagged.

(7) If a mechanical gag is installed, then it should be tagged.

(8) If the operator does not have a hand wheel or other manual positioning device, then tag the operator to prevent inadvertent violation of the boundary.

15. Pneumatic/Air Operated Valve (Fails Closed) standards: {7.1.4}

a. A 'fails closed' valve is a valve that closes by spring pressure when the air is vented off the valve. No air pressure remains present to keep the valve closed. If a valve uses air pressure to keep it closed a manual positioning device or mechanical gag is required.

b. If the valve is a diaphragm style valve where system d/p could open the valve, then a manual positioning device or mechanical gag is required.

5.8.4 Valve Standards (continued)

CAUTION

Bleeding off air regulator may not ensure air is bled off the pneumatic/air operated valve, unless indicated by regulator pressure gauge or by loosening fittings downstream of the regulator.

c. Ensure air is completely bled off downstream of regulator by observing regulator pressure gauge bleeds to zero as petcock valve opened. If regulator pressure gauge is not observed to move from pressurized to zero, or there is no regulator gauge then request maintenance assistance to relieve air pressure by loosening tubing or fittings. Maintenance assistance should be requested as required.

d. Tagging Method

(1) Position valve from control switch.

(2) Place a CIT on control switch as required.

(3) Place tag on pneumatic supply to valve.

(4) Ensure that the pneumatics are vented from the operator and leave vent path open.

(5) If a solenoid must be de-energized to vent the pneumatics from the operator, then the solenoid should be de-energized and tagged.

(6) If the operator has a hand wheel or other manual positioning device that could open the valve, then it should also be tagged.

(7) If the operator does not have a hand wheel or other manual positioning device, then tag the operator to prevent inadvertent violation of the boundary.

16. Pneumatic/Air Operated Valve (Fails As Is or Pressure Balanced) standards:

a. Normally not used as a boundary device.

b. Either a manual positioning device or a mechanical gag is required.

5.8.4 Valve Standards (continued)

CAUTION

Bleeding off air regulator may not ensure air is bled off the pneumatic/air operated valve, unless indicated by regulator pressure gauge or by loosening fittings downstream of the regulator.

c. Ensure air is completely bled off downstream of regulator by observing regulator pressure gauge bleeds to zero as petcock valve opened. If regulator pressure gauge is not observed to move from pressurized to zero, or there is no regulator gauge then request maintenance assistance to relieve air pressure by loosening tubing or fittings. Maintenance assistance should be requested as required.

d. Tagging Method

(1) Position valve from control switch.

(2) Place a CIT on control switch as required.

(3) Place tag on pneumatic supply to valve.

(4) Ensure that the pneumatics are vented from the operator and leave vent path open.

(5) If a solenoid must be de-energized to vent the pneumatics from the operator, then the solenoid may be de-energized and tagged.

(6) If the operator has a hand wheel or other manual positioning device, then it should be tagged.

(7) If a mechanical gag is installed, then it should be tagged.

(8) If the operator does not have a hand wheel or other manual positioning device, then tag the operator to prevent inadvertent violation of the boundary.

5.8.5 Control Switch Standards

1. Control switches should not be tagged out as energy isolation points for a Boundary, unless no other means to isolate are practical.

2. When control switches must be used as a clearance isolation point, then ensure the following requirement shall be met:

a. The control switch shall be tagged with a Danger Tag.

5.8.5 Control Switch Standards (continued)

3. When Main Control Board switches are tagged to indicate a component is affected by a clearance they should normally be tagged with Clearance Information Tags.

4. When gang operated components (e.g., four valves operated by one control switch) are to be tagged out individually, then detailed instructions shall be included on the clearance to assure the components that are not being removed from service remain in the desired state.

   a. Such instructions are not required if the entire group of components is tagged out simultaneously.

5. Remote or alternate shutdown panel controls are not required to be tagged unless they are in use as the controlling station.

6. If a component is computer controlled (i.e., by a touch screen or computer program), then the buttons or controls on the computer shall be treated as a control switch.

7. If an annunciator that is related to a system that remains operable or is in operation is made inoperable because of a clearance, then consideration should be given to flagging the annunciator window to explain the conditions.

5.8.6 Logic Circuits, Leads and Instrumentation Standards

1. If at all possible, then breakers should be used for isolation in lieu of lead lifts or sliding link use.

2. When leads are lifted or sliding links opened under the clearance, then all circuits affected will have to be evaluated.

3. When leads are lifted under the clearance, then the leads shall be clearly described.

   a. The termination point identifier, cable number, wire number, or wire color should be used to identify the correct lead, as applicable.

   b. If multiple leads exist on a terminal point, then ensure a note for the step is used to describe which lead is to be lifted.

   c. The Details Tab should identify the additional leads and the expected plant response upon lifting/disturbing the additional leads.

4. When leads must be lifted to isolate work from an electrical hazard, then tags shall be used on the leads lifted unless covered by the criteria in Attachment 1, When a Clearance is Not Required.

5.8.6 Logic Circuits, Leads and Instrumentation Standards (continued)

5. Wires that are disconnected for clearance isolation shall have tags attached. Isolating logic or relay circuits should be accomplished using devices such as isolation switches, breakers, or fuses. When isolating equipment in this manner is impractical (e.g. Clearance affects unrelated equipment), then the following devices may be used to isolate equipment:

   a. Lifted leads

   b. Boots

   c. Mechanical/electrical jumpers

   d. Gags

6. The Clearance Preparer(s) and Clearance Reviewer must fully understand relay operation and relay contact status anytime fuses are removed, leads are lifted; or boots, gags or jumpers are installed.

   a. If there is any question regarding logic system response, then the Clearance Preparer(s) or Clearance Reviewer shall request SME support using Attachment 12, SME Support Clearance Boundaries Request Form.

7. The Clearance Preparer(s) and Clearance Reviewer must fully understand all plant effects anytime that instrumentation valve manipulation is required for a clearance.

   a. If there is any question regarding instrumentation response, then the Clearance Preparer(s) or Clearance Reviewer shall request SME support using Attachment 12, SME Support Clearance Boundaries Request Form.

8. When isolating logic circuits, then sequence the tagging to prevent any undesired response from the logic.

9. When neutral jumpers are required, then steps shall be added to the clearance detailing the application (including the points of connection) of the neutral jumper, prior to the lifting of the affected lead(s).

   a. The clearance should provide steps to install the jumper on the neutral bus first.

10. If instrumentation related manipulations are required for a clearance and the components to be manipulated are normally controlled by non-operations personnel (e.g., I&C Technician, Chemistry Technician, Electrician), then the non-operations personnel should be contacted, if necessary, to determine the effects of the manipulations and should perform the manipulations for the clearance.

5.8.6 Logic Circuits, Leads and Instrumentation Standards (continued)

a. Tagger qualified personnel from other work groups may hang and verify tags on a clearance with approval from the Tagging Authority.

11. Links that slide vertically, where gravity could cause the link to reclose, should not be used as an isolation point unless a positive method to block the link is established.

12. Tagging Method

a. If lifted/opened at component, then document with Fleet/Site configuration control methods.

b. If lifted/opened at a location other than the component, then hang a tag on each lifted lead/sliding link.

c. If component is a boundary device, then tag each lifted lead/sliding link.

(1) Sliding links should be tightened when open.

(2) Use a cover or other device to attach tag to link post.

d. Tag lifted leads directly.

5.8.7 Gagging And Blocking Device Standards

1. If a device fails to a position different from the required position on a loss of control power or air supply, then it shall be held in its tagged position by a gagging/blocking device.

a. When the gagging or blocking device has been installed, then the motive force of that valve shall be removed to ensure the gagging or blocking device is performing its intended function.

b. Once tested, the motive force should be restored.

2. Gagging and blocking of isolation points shall be done using clearance steps, work packages, or approved procedures that include any pre-approved engineering solutions.

3. No work may be performed on blocked or gagged equipment that may affect the block/gag’s ability to maintain isolation capabilities of the component.

4. When a gagging or blocking device is used to maintain a boundary, then a danger tag shall be applied to the gagging or blocking device.

5.8.7 Gagging And Blocking Device Standards (continued)

5. If pneumatic operated or motor operated valves are used as an isolation boundary with the operator removed, then an appropriate gagging device should be used to maintain the isolation boundary.

5.8.8 Plug, Line Stop, And Freeze Seal Standards

1. When plugs/line stops are used as an isolation point to perform work, then the following are required:

    a. Plugs/line stops shall be installed under approved procedures or work instructions in a work order.

    b. Plugs/line stops shall be determined to be seated and one of the following shall apply:

        (1) The plug is provided with a constant gas/water supply to remain inflated and either the supply or the plug/line stop is tagged.

        (2) A physical locking/jacking device is installed and the device is tagged.

        (3) Plug installation/removal tool shall be tagged to prevent usage.

    c. Plugs that do not meet the steps above can be used if approved by an Engineering Change (EC).

2. When a freeze seal is used as an isolation point to perform work, then the following are required:

    a. Freeze seals shall be performed by approved procedures and controlled by work instructions in a work order.

    b. A clearance shall be placed to control the other isolation boundaries associated with the freeze seal.

    c. Freeze seals shall be tagged on the freeze seal control injection station as determined by operations to maintain the seal established and prevent unintended manipulation.

    d. The Tag Hanger shall be notified by Maintenance that the freeze seal is in place.

5.8.9 Venting And Draining Standards

1. When a pressure boundary is tagged for internal work, and an energy potential exists that would create a concern for the employee, then the boundary must be depressurized and drained by the use of vents and drains that are included on the clearance.

2. If no valves are available to drain/depressurize an isolated system, then the working department must be informed that other measures (e.g., breaking flanges/fittings or loosening connections) are required to drain/depressurize the system after the clearance is placed.

   a. These activities will be controlled by a work package.

   b. The applicable maintenance group should be notified as early as possible if draining/depressurizing activities will require a work package, preferably during the work week review meetings.

3. The Tag Hanger should notify cognizant Radwaste personnel prior to draining significant amounts of fluids from systems that could affect waste processing.

4. If a clearance involves venting or draining, then the locations of the vents and drains should be evaluated to ensure that no Ventilation or Containment Boundaries will be violated (i.e., RABEES, Control Room Ventilation, Containment Closure).

   a. If violation of the boundaries cannot be avoided, ensure compensatory measures are taken as required by plant procedures.

5.8.10 Breaker Standards

1. If using an MCC Breaker as an isolation point, and that model breaker (e.g., certain types of molded case breakers) has been proven unreliable to open, or if in doubt for any 480v molded case breaker, then include comment steps to ensure that 'Contact Open' checks are performed by a qualified person to ensure that the breaker is open, prior to making the clearance ready to work.

   a. Contact Open checks shall be done prior to installing the tag on the locking mechanism.

   b. Contact Open checks do not require verification.

2. The tag shall be placed on the breaker handle/switch in the required position, unless the Clearance Request identifies that the scope of work will require the tag to be placed on the cubicle door to facilitate work such as bucket or breaker removal.

5.8.10 Breaker Standards (continued)

3. For rackable breakers with multiple positions, 'Racked to Disconnect' (or equivalent position) and 'Removed' (or equivalent position) can be treated as the same position. A position of 'Racked to Disconnect/Removed' is also allowable.

4. If a clearance specifies that a rackable breaker be tagged in the 'Racked Out' position and the breaker will be removed (for breaker or cubicle maintenance only), the tag placed on the breaker can be moved from the breaker to the cubical door provided:

   a. Two qualified Tag Hangers concurrently verify the tag movement at the time the breaker will be removed.

5. A tag hung on a breaker handle or compartment door does not prevent opening the cubicle door by qualified individuals.

6. If a clearance specifies that a rackable breaker is to be 'Racked Out' and breaker will be removed (for breaker or cubicle maintenance only), then the breaker can be removed provided the tag is hung on the cubical door.

7. If a rackable breaker that has mechanical stops between its 'removed' and 'connected' positions (e.g., disconnect or test) is to be placed back into the cubical and the cubical door is tagged, the following requirements shall be met:

   a. A temp lift or clearance revision can be used to perform this activity

      OR

   b. The tagging authority shall authorize the re-installation of the breaker

      (1) A qualified individual will install the breaker with a concurrent verifier.

      (2) Two qualified Tag Hangers concurrently verify the tag movement back to the breaker at the time the breaker will be installed.

      (3) Documentation of the breaker install shall be tracked in the clearance details (as left breaker position, persons involved with installing the breaker, tagging authority, individuals that moved the tag).

8. If a rackable breaker that does not have mechanical stops between its 'removed' and 'connected' positions (e.g.; disconnect or test) to be placed back into the cubical and the cubical door is tagged, then a temp lift or revision must be performed to re-install the breaker.

5.8.10 Breaker Standards (continued)

9. For non-rackable breaker/disconnect positions, OFF allows all breaker positions except ON.

10. If a clearance specifies that a non-rackable breaker be tagged in the in 'Off' position and the breaker will be removed for maintenance, then the tag placed on the breaker can be moved from the breaker to the enclosure door provided:

    a. Two qualified Tag Hangers concurrently verify the tag movement at the time the breaker will be removed.

11. If a non-rackable breaker is to be placed back into the enclosure and the enclosure door is tagged, then a temp lift or clearance revision must be performed to re-install the breaker.

12. A ground device, ground test device or a breaker test device may be racked into the compartment if required by the work scope.

13. Rackable Breaker standards

    a. The breaker control circuit should not be tagged-out unless the specific work allowed by the clearance requires trip circuit isolation or station specific procedures require trip circuit isolation.

    b. Placement of the tag shall be on the cubicle door handle, or latch device used to prevent breaker racking or as specified in station-specific procedure.

    c. De-energizing the control circuit for a stored energy type breaker shall not be considered adequate for worker protection to prevent breaker operation.

    d. When the clearance does require trip circuit isolation, then the breaker shall be racked out in accordance with station-specific procedures.

    e. Tagging Method

        (1) Secure component/Open breaker.

        (2) Place a CIT on control switch when required by tagging sequence.

        (3) Tag control power if required.

        (4) If the breaker is equipped with a locking device, then the tag shall be hung on the locking device.

5.8.10 Breaker Standards (continued)

14. MCC Breaker Standards

    a. Tagging Method

        (1) Secure component/Open breaker.

        (2) Place a CIT on control switch when required by tagging sequence.

        (3) Place tag on breaker at the lockout device, if equipped.

        (4) An evaluation of the appropriate tagging methods, such as tagging overloads removed or leads lifted and control switches, is required for concurrent downstream and cubicle work.

        (5) When opening MCC breakers, the Tag Hanger should verify a change of state. This can be done by feel, sound or other positive means of indication that the breaker opened.

        (6) When valve MCC breakers are restored in the clearance process, a comment should be included to describe the expected MCC indication (red when the breaker is turned on and the valve is expected to be open, or green when the breaker is turned on and the valve is expected to remain shut) to be checked when the breaker is energized.

15. Distribution Panel Breaker Standards

    a. If a permanent lockout device does not exist use of a portable or removable lockout device is required

    b. Tagging Method

        (1) When distribution panel breakers are tagged out as an isolation point, then the tag shall be attached to the breaker switch using a station approved method that will securely attach the tag to the breaker.

16. Control Power Standards

    a. Tagging only the Control Power is acceptable for equipment protection ONLY, unless maintenance is limited to only the Control Power Circuit.

5.8.10 Breaker Standards (continued)

b. Tagging Method (any of the following)

- Tag Control Power
- Tag fuses
- Knife switches

17. Lighting Panel Breaker Standards

a. If a permanent lockout device does not exist use of a portable or removable lockout device is recommended

b. Use of other tag attachment may be used

c. Tagging Method

(1) Place tag on breaker

5.8.11 Grounding Standards

NOTE

The requirements contained in this procedure for grounding apply regardless of which work group (i.e., Operations or Maintenance) performs the safety grounding.

1. Grounds are used to provide additional protection for personnel when working on electrical equipment and are not part of the clearance boundary.

2. Grounds are to be installed using station specific guidance.

3. All grounds installation and removal shall be tracked to prevent re-energizing a component with grounds installed except as noted in Step 4 below. The tracking mechanism shall be one of the following two methods:

a. Approved technical procedures that documents the physical location of the grounding device in addition to signing and dating for the installation and removal.

(1) If an approved technical procedure is used, then the clearance that provides the boundary will contain a Comment or Step tag to notify the tag removers that grounds are used. This will be sequenced (on the removal) prior to re-energizing components.

5.8.11 Grounding Standards (continued)

b. Tagging the grounds with Ground tags within a clearance structured such that ground removal will have to be verified prior to re-energizing the component(s).

(1) Each grounding component will have its own tag (e.g., each independent lead or cable installed will be Ground Tagged separately).

(2) Consider tagging each end of ground cables if long runs of ground cables are used.

4. The following are exempt of the requirements of Ground Tags:

- Grounding of scaffolding
- Grounding of vehicles/lifting devices
- Mousing/test leads
- Other ground devices not in the electrical circuit bounded by the Boundary for attached work orders

5. If the hazard to the worker is being controlled by the clearance boundary (e.g., buss bar, buss supply breakers), then installation and Removal of Grounds requires being signed onto the Clearance that de-energized the component being grounded.

6. For racking in a ground truck device for a single motor, the worker is not required to be signed into the Clearance.

7. If a bus or power source is to be grounded, then prior to grounding, ensure all electrical feeds and potential backfeeds to that bus or power source are tagged out.

8. Closed circuit breakers shall not be used to complete a ground circuit.

9. Disconnect switches which are tagged closed with a Ground Tag may be used to complete a ground.

5.8.12 Fuse Standards

1. It is preferred to use breakers as isolation points rather than pulling fuses under load that may cause damage to fuse holders. The clearance step should include the following when available:

   - Panel number
   - Terminal board number
   - Fuse number
   - A description of the fuse which should include current rating as a minimum.

2. If the fuse is not easily identifiable, then provide the physical location of the fuse in the tag placement and removal notes.

3. Breaker control power fuses should only be tagged when they are included as part of the Boundary.

   a. Control power fuses are separate from the breaker and should be tagged with separate tags when required to be used as part of the boundary.

4. When a fuse is removed to provide clearance isolation, then the fuse should be replaced with a non-conductive fuse clearance device that prevents insertion of a fuse when clearance is hanging.

   a. The Danger Tag should be placed on the fuse holder and not the removed fuse.

   b. Store or attach the removed fuse in or to the non-conductive fuse clearance device, if available.

      (1) If the fuse cannot be stored within the non-conduction fuse clearance devices, then the fuse shall be stored in a location required by site procedures and identified with a CIT.

   c. Use a device that does not exceed the size of the removed fuse to prevent damaging the fuse clips.

5.8.12 Fuse Standards (continued)

d. When a non-conductive fuse clearance device will not fit within a fuse clip, then the Danger Tag applied for the removed fuse should be hung on or as close to the fuse clips as practical and in a location that is obvious to anyone intending to manipulate the fuse. A temporary attachment device can be used to allow attaching the tag directly to the fuse clip.

(1) The fuse shall be stored in a location required by site procedures and identified with a CIT.

e. If physically unable to tag the fuse holder, the Danger Tag should be hung on the door to the fuse compartment.

5. When tagging a fuse block (or multiple fuses controlled by one holder) to provide isolation, the following controls shall apply:

a. The fuse block will be tagged such that personnel would understand that the block and block holder is associated with a clearance.

(1) If the fuse block removed, then the empty receptacle is restricted in a way that prevents inadvertent placement of fuses or a fuse block in that receptacle.

5.8.12 Fuse Standards (continued)

EXAMPLES

- A secure cover placed over the block receptacle in a manner that will prevent a fuse block from being re-installed, affixed with a Danger Tag.
- A Danger Tag placed over the vacant block.
- A dummy fuse block re-installed and affixed with a Danger Tag
- Other methods can be used provided they are approved by the Operations Manager, maintain the integrity of the isolation and do not create additional hazard or FME concerns.

(2) If the fuse block/holder was removed, it will be tagged with a CIT or Danger Tag (as appropriate) and either restrained within the compartment or removed and placed in a secure location.

(3) Certain fuse blocks have the option of rotating the removable portion of the fuse block 180 degrees to the 'OFF' position and reinsert into the stationary portion of the block. This is an acceptable method with the Danger Tag placed on the handle of the fuse block.

6. When restoring a clearance requiring installation of a fuse, then the fuse restoration shall be in accordance with station procedure.

   a. Fuses and fuse holder shall be inspected for integrity prior to reinstallation to ensure the fuse is not damaged and the fuse holder will adequately hold the fuse.

7. Ensure the size and rating of fuse removed during clearance activities is the same as the fuse that is reinstalled during restoration.

8. Clearance Format for Fuses

   a. Write clearances requiring individual fuse removal where the fuse clip can accept a non-conductive fuse clearance device as follows:

      (1) A step that removes the fuse and installs the Danger Tagged non-conductive fuse clearance device into the fuse clip.

      (2) A second step which identifies the removed fuse with an CIT and places the removed fuse in a suitable container.

5.8.12 Fuse Standards (continued)

b. Write clearances requiring individual fuse removal where the fuse clip cannot accept a non-conductive fuse clearance device as follows:

(1) A step that removes the fuse, lists the fuse number, indicates Danger Tag and position of Fuse Removed.

(2) A second step which identifies the removed fuse with an CIT and places the removed fuse in a suitable container.

5.9 External Energy Injection (EEI) Standards

1. External Energy Injection is the function of introducing a source of energy into a clearance boundary. The energy source must be considered hazardous, by definition, for an evolution to be considered 'EEI'. The determination of the source energy presenting a hazard to the clearance boundary should be determined by the workgroup performing the EEI and Operations. If it is determined that the EEI is not Hazardous Energy, then the remainder of this section is not required.

   a. The decision for EEI not being hazardous shall be documented on the Details Tab of the Clearance in eSOMS.

   b. The evaluation of the EEI not being hazardous shall re-performed if work scope is added (or changed) to the clearance.

   c. If the External Energy Injection is determined to be hazardous, the remainder of this section applies.

2. EEI standards must still be followed when the Danger Release process is used.

3. Examples of energy injection:

   - Hydro Testing
   - Local Leak Rate Testing (LLRT)
   - Megger Tests
   - Doble Tests
   - Hi-pot Tests
   - Protective Relay Testing or Electrical Panel Meter Testing

5.9 External Energy Injection (EEI) Standards (continued)

4. When EEI will be performed on equipment within a clearance boundary, then the activity shall be performed under the requirements of the governing approved procedure or work instructions to ensure the proper safety precautions are taken.

NOTE

The purpose of Step 5 and 6 is to allow certain EEI activities to be performed when technical procedures and safety standards outside of the clearance and tagging process provide the necessary barriers to perform such work safely. The Tagging Authority for the station can choose to enforce the use of Attachment 8, External Energy Injection (EEI), even when the below conditions are met.

5. If all of the following conditions are met, then the remaining EEI Standards in this section are not required during Main Turbine, Turbine Driven feed pumps, and Diesel Engine Rotation evolutions:

   a. The rotation is directly controlled by the procedure/work order and does not exceed 5 RPM.

   b. The procedure/work order used by the work group to perform the task shall control the access during rotation to all exposed rotating components, including (but not limited to):

      (1) The Main Generator, diesel generator, crankcase components, Low/High Pressure Turbines and Condenser areas within 5 feet of exposed rotating turbine blading.

NOTE

The work group is still required to sign onto the clearance being used for protection even if the remainder of this section is not required.

6. If **all** of the following conditions are met, then the remaining EEI Standards in this section are not required for all other External Energy Injections:

   a. The component is physically removed from the clearance boundary.

5.9 External Energy Injection (EEI) Standards (continued)

(1) Physically removed means the component is not connected to the circuit that the boundary encompasses, meaning energy injected is only put on the component being tested and not internally to any part of the 'safe' boundary. Some examples are as follows:

- Component is being tested within a remote maintenance shop
- Cables, leads or bus bars have been disconnected
- Electrical connections have been disconnected
- Piping sections are blank flanged so they are not connected to the system.

b. The area where EEI is performed is roped off, line of sight of the boundary is maintained, and entry/exit controlled by the work group performing EEI, preventing any other work from being performed in that area.

c. The 'physical' disconnect points of the component being tested are encompassed within the roped off and controlled boundary to prevent reinstallation.

7. If EEI will be performed on a component within a clearance boundary, then perform Attachment 8, External Energy Injection (EEI).

5.10 <u>Hanging Tags</u>

1. All personnel performing the clearance hang activities shall participate in a Pre-Job Brief per Attachment 6, Clearance Hang/Remove Pre-Job Brief Checklist {7.1.6} .

2. Establishing a safe working boundary is the primary function of individuals hanging a clearance. This is performed by aligning systems, positioning components, removing energy from systems and hanging tags. The boundary is not considered established until energy has been removed (e.g., drain/depressurize complete).

3. Tagger Qualified personnel from other work groups may hang and verify tags on a clearance with approval from the Tagging Authority.

   a. For example Maintenance personnel could open sliding links and then hang the required tags.

5.10 Hanging Tags (continued)

4. If Operations is to tag a component they do not frequently manipulate (e.g., leads, fuses, links), then Maintenance should be present in a support function when the component needs manipulated.

5. General Requirements for Hanging Tags

   a. Danger Tags shall not be attached to components (breakers, disconnects, valves) that are to be removed from their associated systems.

   b. Tags shall be located in highly visible location as close as possible to the component when unable to attach directly to the component to avoid confusion as to what point the tag is controlling.

   c. Tags shall be securely fastened to all points of isolation with a non-reusable nylon cable tie with minimum unlocking strength of 50 pounds for regular size tags (standard tie wraps have been approved to have minimum 50 pounds break strength).

   d. Tag hanging devices (tie wraps) are to be placed through a component locking mechanism that will preclude the operation of that component, when possible.

   e. Tags can be attached with manufactured Additional Measures restraining devices that are used to secure components in position. .

   f. Tags shall be placed in a manner such that operating indications are not obscured by the tagging device.

   g. Tags shall clearly identify the equipment to which they apply.

   h. Tags shall be suitably protected when exposed to the weather or harsh environments.

   i. Component positions may be verified by utilizing the position on tags currently hung (if a position is provided).

6. A field copy of the clearance paperwork may be used when conditions require, as determined by management. Information recorded on the field copy shall be transferred to the original clearance sheet or electronically in eSOMS as soon as possible.

7. All components manipulated during clearance application/removal activities shall be either tagged with a tag or included as a No Tag in the clearance removal to ensure configuration control. This may include referring to a procedure to perform the manipulations.

5.10 Hanging Tags (continued)

8. If changes in the tag hang sequence are required, then refer to Section 5.22, Clearance Modifications/Changes.

9. The Tag Hanger shall perform the following:

   a. Component positioning and tag placement shall be performed in the specified sequence on the Tag Hang list.

   b. Identify the component to be manipulated by matching the component label with the equipment ID provided on the tag list.

      (1) Discrepancies in labeling between tags, clearance checklists and labels (soft match vs. hard match) should be resolved per the guidance of AD-HU-ALL-0004, Procedure and Work instruction Use and Adherence. In all cases, if in doubt, stop and contact supervision.

   c. Review all Placement Notes, Clearance Notes and Annotations for the component to be manipulated prior to positioning the component.

   d. As Found positions of components may be documented to aid in the Tag Removal process.

   e. Position the component per the Tag Hang list.

      (1) Verify correct component and system response using redundant indication when available.

      (2) If redundant indication is NOT available, then ensure the lack of redundant indication is discussed during the brief and additional error prevention tools used as required.

   f. Hang the required tag per the General Requirements of this section.

   g. Additional Measures shall be installed by the hanger when they must be installed with the clearance hang (e.g., breakers), Additional Measures that can be installed after the tag hang should be done by the Verifier.

5.10 Hanging Tags (continued)

h. When draining or venting is required, then verifications can be signed as complete for the following reasons:

(1) The clearance Boundary has been completely drained or vented.

(2) The clearance Boundary has not been completely drained or vented but the Work Group's Supervision has agreed to accept the clearance with draining not fully complete, then document the acceptance on the Clearance Details Tab.

i. When Tag Hang is complete, the Tag Hanger documents the Clearance Hang in eSOMS.

5.11 <u>Verification of Tag Placement</u>

1. All personnel performing the clearance verification actions shall participate in a Pre Job Brief per Attachment 6, Clearance Hang/Remove Pre-Job Brief Checklist {7.1.6} .

2. All Danger Tags and Danger Release Tags (DRT) require Independent Verification (IV) to be performed unless:

   a. CV is required as directed by AD-HU-ALL-0005, Human Performance Tools.

   b. Waived by Supervision

      (1) If verification is waived, then document the reason in the Details Tab.

3. The Tag Verifiers function is to check that the Tag Hanger has established a boundary of safe working conditions for other workers. They must strictly adhere to the concept of independence so that their focus is not simply on completing the mechanical function of looking at tags and components, but also validating that the clearance has been implemented as designed, thus making the equipment safe to work on. This is an engaged, thinking approach to the Tag Verifier function.

4. Independent boundary verification may be started by a second qualified individual using a duplicate of the original clearance prior to completion of the clearance.

   a. The person performing the boundary verification shall maintain an adequate separation from the original clearance manipulator to maintain the integrity of the verification.

5.11 Verification of Tag Placement (continued)

5. Independent Verification and Concurrent Verification shall be performed per AD-HU-ALL-0005, Human Performance Tools.

6. The Tag Verifier shall perform the following:

   a. Identify the component to be verified by matching the component label with the equipment ID provided on the tag list.

   b. Verify that the component is in the position required.

   c. Observe that the tag is properly attached.

   d. Any discrepancies shall be communicated to the Clearance Approver or supervision and actions shall be initiated to correct the deficiencies.

   e. Ensure Additional Measures are installed, if required.

   f. When Verification is complete, then the verifier documents the Clearance Verification in eSOMS.

5.12 <u>Clearance Approval/Ready To Work Verification</u>

1. When the clearance boundary has been established and energy removal is complete (e.g., drained, depressurized), then a Clearance Approver shall complete the 'Tags Verified Hung' verification in eSOMS.

2. The SM Work Control can implement the following actions to validate or improve Clearance Holder knowledge:

   a. Designates one or more scheduled Clearances for an online work week(s) as a Clearance Holder challenge.

   b. Ensures a holder lock is applied after the Clearance is set to 'Tags Verified Hung'

   c. Ensures a Clearance Holder challenge is performed.

      (1) A Clearance Holder challenge ensures the Clearance Holder understands the roles and responsibilities of a Clearance Holder and ensures proficiency in performing the Clearance Holder function.

5.13 Clearance Holder Sign On

1. The Clearance Holder is a key interface between Operations and Maintenance, and bears complete responsibility for communication of the status of work to all parties. Both the Clearance Holder and the clearance preparation/execution group are completely responsible to the downstream people for correct execution of the clearance and tagging process at this interface.

2. The Clearance Holder is typically a supervisor level person (but not in all cases). It is crucial that the clearance holder understand the responsibility they have to protect the clearance from change or release until all of the work they are holding for is complete and in a safe condition.

3. In the absence of the original Clearance Holder, another Clearance Holder from the same work group may be considered the Clearance Holder if in control of the work for which the Clearance was accepted.

   a. If workers from a different work group desire to perform work under a Clearance when the Holder is not their respective work group or discipline, then the Holder must accept responsibility for the additional Workers and perform the required Holder functions.

   b. If the Holder is not comfortable with Holding the Clearance for the additional Workers, then the Workers need to have a Holder from their work group or discipline hold the clearance.

4. If the Clearance Holder will require protection from the Clearance, then they shall meet the requirements of a Worker per this procedure.

5. If Clearance Holder has questions or concerns about the Clearance, then ensure all concerns are addressed prior to holding the clearance.

6. Clearance Holders should never assume the equipment is de-energized, depressurized or drained merely because the clearance is hanging. Unless there is diverse demonstration of safe working conditions, approach the equipment as still being energized/pressurized.

7. The Clearance Holder who originally accepted the clearance need not be the person who releases the clearance and the Clearance Holder who originally accepted the clearance need not be the person who is the current Clearance Holder. However, each Clearance Holder shall ensure they are aware of the status of the clearance and work before assuming the duties of Clearance Holder.

5.13 Clearance Holder Sign On (continued)

8. When a job is not being continuously worked (a Clearance Holder has not remained signed in), then the Clearance Holder shall perform the following prior to returning to work under the work order task:

   a. Review the Clearance Coversheet.

   b. Verify required isolation points to ensure tag placement has not changed.

   c. Recheck the equipment and ensure it is de-energized/depressurized.

   d. Verify workers have individually signed-on to the work order associated with the clearance (in eSOMS or on Attachment 9, Worker Tracking List).

   e. Restart work.

9. The checklist provided in Attachment 7, Clearance Holder Checklist shall be used in accepting, performing work under and releasing a clearance.

10. The Clearance Holder shall ensure a Holder's Safety Verification is performed as follows:

    a. Prior to commencing work, verify the clearance boundary is adequate for their assigned work order tasks. Methods of verification include:

       - Reviewing applicable drawings
       - Reviewing procedures
       - Reviewing the Clearance boundary
       - Discussing with the Clearance Approver or designee

    b. Brief the workers under his or her responsibility. The brief shall cover the following:

       - The work to be performed
       - The basis for the Clearance being Exceptional, as applicable
       - The basis for safe conduct of the work (given all the hazards that would exist if the clearance were not used)
       - The exact clearance boundary
       - What components are approved to be worked on

5.13 Clearance Holder Sign On (continued)

- A discussion of the Details Tab including Exceptional Clearance details.
- Identify who is the Clearance Holder(s)
- The potential for unreleased energy, and the means to release it (break a fitting, discharge a capacitor, apply grounds, and so on)
- Special precautions, if any
- Personal protective equipment to be used, if more than the expectations for general workers (e.g., work may require placement of electrical mats or personal grounds; these should be noted for all parties' awareness during the brief)
- If any doubt or questions exist about a clearance, then Contact the Tagging Authority for assistance

c. Sign into eSOMS as a Clearance Holder for the required clearance(s).

d. If workers sign onto the Clearance on Attachment 9, Worker Tracking List, then the Holder shall also sign into eSOMS as a Clearance Worker for each task.

11. The Clearance Holder shall ensure that, prior to commencing work, the following is complete (Section 5.13 Step 11.a through Section 5.13 Step 11.c can be performed in any order):

a. Tagged boundaries for assigned work scope have been walked down

(1) The Clearance Holder may appoint a qualified (at a minimum shall be Clearance Worker qualified) designee to walkdown the clearance.

(2) The walkdown shall be performed with an active copy of the clearance or an Approved to Hang copy may be used if the walkdown is done in conjunction with the Clearance Hang.

(3) Component position can be verified by visual observation and checking multiple indications such as water no longer draining from drains, pressure indictors reading zero, or pipes no longer warm for example. It does not mean manipulate the component.

(4) When a Temp Lift or Revision is processed, then boundary walkdown shall be performed prior to accepting the clearance or re-accepting the Temp Lift.

5.13 Clearance Holder Sign On (continued)

b. Zero Energy Checks are performed prior to the start of work and after any of the following:

- Initial tag placement
- Revisions
- Shift change

c. Workers have individually signed into eSOMS or on Attachment 9 for the Work Order Tasks the workers are assigned to.

5.14 Worker Sign On

1. The method described here and directed in the process steps satisfy OSHA regulations to ensure hazards from the unexpected release of energy will not cause injury to personnel. Workers have the right and obligation to ensure that the work they are about to do can be accomplished in a safe manner.

2. Each individual performing work or testing that require the protection provided by a clearance shall personally sign-on the 'Work Order Task' tab in eSOMS or Attachment 9, Worker Tracking List, if used. This is the personal control over the boundaries that provide safe working conditions. Allowing another worker to sign someone in is not allowed.

3. Any individuals not entered into the eSOMS database shall use Attachment 9 to sign-on the clearance.

4. If the Worker is signing into the Clearance using eSOMS then:

   a. Ensure an eSOMS qualified Clearance Holder responsible for the work activities has signed onto the clearance.

   b. Sign-on shall be from a Kiosk or the 'Work Order Task' tab of the clearance.

5. If the Worker is signed into the Clearance using a Worker Tracking list then:

   a. The Clearance Holder shall sign into eSOMS as a clearance worker for every WOT within the Worker Tracking List.

      (1) The Clearance Holder shall note the reason why they are signing in as a worker in the Clearance Worker Sign-On Notes.

   b. If specific points are listed on Attachment 9, Worker Tracking List, then workers acknowledge this as their required Boundary when signing on.

5.14 Worker Sign On (continued)

c. Each work order shall have its own Worker Tracking List per associated clearance.

d. If a vendor is brought on site and will not be badged or have electronic access to NLMS/eSOMS, then training is not required provided they are only performing functions as a Clearance Worker. The Clearance Holder is responsible for those persons safety, performing the necessary Holder Safety Verifications and ensuring the workers understand how the clearance is protecting them.

6. If a worker believes that a clearance is not required for their safety but a clearance is in place for their job, then this should be resolved between the worker, the Work Group supervisor, and the Operations Work Control Center prior to commencing work (Work Order may need revised).

   a. If either group decides a clearance is needed, then a clearance will be required.

7. Every worker being protected by a clearance (and thus signing onto a clearance) is responsible for understanding the basis of their safety as provided by the clearance. The tags used to define the safe boundary are a part of that understanding, as are the Zero Energy Checks that prove that energy is removed from the work area.

8. Every worker signing onto a clearance shall have participated in a briefing with a Clearance Holder or designee.

9. Workers shall sign on the clearance for the applicable work order task at the beginning of the job (or when assigned to work on) or at the beginning of the workday, prior to performing work.

10. All workers signing onto a clearance under a given work order task shall be aware that signing onto a clearance denotes the following:

    a. They are personally responsible for understanding the basis for their safety as provided by the tags applied by the clearance and tagging process.

    b. The worker has been briefed on the work scope and safe work boundary of the clearance.

    c. The acceptance of the clearance as an appropriate boundary for the work activity.

5.14 Worker Sign On (continued)

d. They accept responsibility to ensure Zero Energy Checks or adequate de-energization for any work that requires the protection of tags is performed prior to the start of work and after any of the following:

- Initial tag placement
- Revisions
- Shift change

e. Zero Energy Check examples include but are not limited to, any or all of the following as applicable:

(1) Electrical Work

- When work requires direct contact with electrical circuits, then voltage testing or indicating devices shall be used to verify de-energized in conjunction with functional testing of the meter or testing device (e.g., Live-Dead-Live check)
- Electrical grounds installed as appropriate to discharge static electricity or induced voltage
- Observations of gauges or meters as energy is removed

(2) Mechanical Work

- Verifying system is drained or depressurized where work is to be done by checking vents and drains which were opened by the clearance
- Observations of gauges as energy is removed
- If using a flange to check for drained/depressurized, then leave an appropriate number of bolts engaged when breaking flanges
- Ensure piping and component temperatures reflect system isolation for existing conditions
- When working on isolated portions of charged systems, then check piping and components for vibration or flow noise

5.14 Worker Sign On (continued)

- When working on rotating equipment that does not include electrical work, verification of Zero Energy must include the rotational energy source (e.g., breaker open, leads lifted, steam supply isolated)

f. That signing into a clearance provides a positive step that identifies them and accounts for them as being protected by this clearance.

11. Workers are to notify the WCC as soon as possible when a clearance problem is identified.

a. Problems shall be resolved prior to work start.

b. If problems arise during work activities, which introduce a personnel or equipment risk, the work shall be halted and equipment placed in a safe condition until the problems are resolved.

12. When alternate or diverse indications are available, then they should be checked (e.g., control lights, pressure gages).

13. Each worker shall sign off the clearance:

a. At the end of each shift.

AND

b. When they no longer require the protection provided by the clearance.

5.15 Clearance Release

1. When the clearance is no longer required to be held, then the Clearance Holder shall:

a. Verify their workers have individually signed-off the clearance in eSOMS or on Attachment 9, Worker Tracking List.

5.15 Clearance Release (continued)

(1) If a worker is not onsite and the clearance must be released, then the Holder releasing the clearance shall perform the following:

(a) Complete Attachment 10, Releasing Another Worker's Clearance Protection.

(b) Write a condition report documenting the circumstances as to why the worker could not personally release the clearance.

(c) Forward the completed Attachment 10 to the site Tagging Authority in Operations to be transmitted as a QA record.

b. The condition of your work area for your Work Order Tasks is intact and tooling and other materials have been removed (unless required to remain).

c. Document any special conditions in the 'Clearance Holder' tab note section (e.g., incomplete work, degraded equipment condition).

d. The Clearance Holder shall mark the 'Work Complete' checkbox for their completed work order tasks.

e. Sign out of the clearance.

NOTE

The Tagging Authority may delegate actions in the following step to the Work Group Supervisor if available.

2. When site needs dictate removal of a clearance and the Clearance Holder is not on-site, then release may be made by phone.

a. The Tagging Authority shall contact the Clearance Holder.

b. The Clearance Holder shall clearly communicate job status and Worker status (in eSOMS or Attachment 9, Worker Tracking List) to the Tagging Authority.

c. The Tagging Authority shall verify a walkdown of the work area/boundary is performed and verify that all workers have signed off the clearance.

d. The Tagging Authority shall sign-off the Clearance Holder from the Clearance and document 'per telecom'.

5.15 Clearance Release (continued)

3. If site needs dictate removal of a clearance and the Clearance Holder is not available by telecom, then release may be made by the Clearance Holder's Manager or designee.

   a. The clearance shall not be released until a thorough review of the work performed is completed and the job site is walked down.

   b. The Clearance Holder's Manager or designee shall assume all responsibility for clearance release and notify the Clearance Holder prior to or upon return to the site.

   c. Clearance Workers under that Clearance Holder shall personally sign off or Complete Attachment 10, Releasing Another Worker's Clearance Protection.

   d. Write a condition report documenting the circumstances as to why the Clearance Holder could not personally release the clearance.

5.16 <u>Clearance Removal Preparation</u>

1. Removal Preparation shall be performed in accordance with Attachment 14, Clearance Removal Preparation Checklist.

2. The preparer shall verify the restoration positions and restoration sequences are correct. The restoration position should be based on current plant status/conditions. This may include reviewing applicable procedure steps and/or valve lineups to determine plant status. If relying on a system alignment for restoration, then the procedure and section or valve lineup being relied on should be specified in the Details Tab. {7.1.18} {7.1.19} {7.1.20}

3. Restoring plant status to normal following work takes place in stages.

   a. An initial alignment of all components in the clearance boundary can be conducted to create a known starting point.

   b. Next, fluids are introduced in a controlled manner and electrical sources aligned.

   c. Finally, the system is operated as required to perform necessary functional tests, post maintenance testing, and operational surveillances.

4. A tag removal list is not a replacement for procedures.

5.16 Clearance Removal Preparation (continued)

5. If using a procedure to restore the system or component, then consider the following:

   a. When a procedure section exists for the applicable system, determine the components on the clearance that are not captured within this procedural guidance.

      (1) The clearance removal should align these components to their normal configuration.

      (2) The remaining component positions should be aligned to a status compatible with expected plant conditions assumed by the procedure to be performed.

   b. After the clearance removal is complete, the appropriate procedure steps are performed to place the system or component in service. This will properly configure the remaining components that were part of the clearance.

6. Any restoration positions that will not be tracked and controlled within the bounds of an approved plant procedure will require administrative controls to be established.

7. Determine if the component that was drained has a heater associated with the drained portion, then a fill and vent shall be performed prior to energizing the heater.

8. When large portions of systems are removed from service and a complete system alignment is to be performed, it is permissible to remove a released clearance and leave the components position as is and rely on the required valve lineup to align and return the system to operation.

   a. Add a note to clearance Details Tab when this is the method of clearance removal.

   b. The procedure and section or valve lineup being relied on should be specified in the Details Tab.

9. When removal preparation is complete, then sign the 'Removal Prepared By' Verification in eSOMS.

5.17 Clearance Removal Review

1. Removal Review shall be performed in accordance with Attachment 14, Clearance Removal Preparation Checklist.

2. In making an informed decision about the clearance removal, the following techniques are ways to ensure an adequate technical review by improving the independence of the reviewer's perspective:

   a. Use appropriate, most current, and approved references (e.g., procedures, drawings, manuals, planning documents).

   b. Separately assess and understand the work that was performed.

   c. Separately assess and understand the hazards, both of the conditions established by the clearance and the act of restoring equipment from the clearance.

   d. Separately walk down the work area if needed.

3. When removal review is complete, sign the 'Removal Reviewed By' verification in eSOMS.

5.18 Clearance Removal Approval

1. Removal Approval shall be performed in accordance with Attachment 14, Clearance Removal Preparation Checklist.

2. Since removal of the clearance constitutes a plant status change, the Clearance Approver should initiate any additional considerations associated with the plant status change that are also required. These additional considerations include, but are not limited to, assigning resources, establishing priorities, and, if necessary, supervising the evolution.

3. When the clearance removal is ready to be authorized, then sign the 'Clearance Removal Approved By' Verification in eSOMS.

5.19 Tag Removal

1. All personnel performing the clearance removal activities shall participate in a Pre-Job Brief per Attachment 6, Clearance Hang/Remove Pre-Job Brief Checklist {7.1.6} .

2. The tag remover may be directed to coordinate the removal of tags and the positioning of components with procedural steps necessary to complete the evolution and restore functionality.

5.19 Tag Removal (continued)

3. When all tags are removed, the tag remover reports completion of the evolution to supervision and returns the tag list to the tag authority or designee, except when radiological controls prohibit this. Tag Remover accounts for all the tags that have been removed and ensures the number of tags removed matches the expected total number of tags to be removed.

4. If Operations is to remove a tag from a component they do not frequently manipulate (e.g., leads, fuses, links), then Maintenance should be present in a support function when the component needs manipulated.

5. If it becomes apparent that a system is not responding in the manner expected or is being placed in an unstable or unsafe condition, then immediately place the system in a stable condition and contact the Control Room or WCC for resolution.

6. The Tag Remover shall perform the following:

   a. Inform the affected Control Room Supervisor of the planned removal prior to start of the removal.

   b. Prior to removal of Clearance Tags, visually inspect the work area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

   c. Review the Tag Removal List for applicable directions prior to positioning components.

      (1) Minor discrepancies such as typos and functionally equivalent terms (e.g., valve vice vlv) may be clarified per the guidance in procedure AD-HU-ALL-0004, Procedure and Work Instruction Use and Adherence. In all cases if in doubt, stop and contact supervision.

   d. Follow the specified sequence when removing tags and positioning components.

   e. Verify the control stations are in the required position prior to the restoration of the energy source (e.g., power supply, instrument air, fuse).

   f. Remove Additional Measures and tags as appropriate.

5.19 Tag Removal (continued)

g. Align components in the required position and sequence specified by the 'Clearance Removal' sheet.

(1) If a tag is missing or found on the wrong component, then stop the restoration and consult Operations for resolution prior to continuing with Clearance removal.

h. Observe the physical result of each alignment action and ensure the desired conditions are being met.

(1) If the position cannot be changed, then stop and notify Operations for direction.

(2) If any temporary plant equipment is found to be installed during Clearance Removal, then stop and notify Operations for direction.

i. Enter component positions as follows:

(1) On the paper copy of the Clearance, placekeep in the '1st Verifier' column. If 'As-Left' configuration is different than the specified restoration configuration, document the 'As-Left' configuration.

(2) Review comment steps on clearances and enter component removal positions and placekeep in the '1st Verifier' column, as appropriate, on the clearance.

(3) Account for all tags and dispose of the tags in accordance with station radiological control procedures.

j. When Tag Removal is complete, then the Tag Remover documents the Clearance removal in eSOMS.

(1) An SRO can document in eSOMS for the Tag Hangers when appropriate.

5.20 <u>Verification of Tag Removal</u>

1. All personnel performing the clearance verification activities shall participate in a Pre-Job Brief per Attachment 6, Clearance Hang/Remove Pre-Job Brief Checklist {7.1.6} .

2. Clearance removal verification requirements shall be in accordance with site specific procedures for IV/CV.

3. The Tag Removal Verifier needs to understand that the function they are performing is to check that the plant alignment has been properly restored.

5.20 Verification of Tag Removal (continued)

4. If independent verification is required, this may be started by a second qualified individual using a duplicate of the original clearance removal sheet prior to completion of the clearance.

   a. The person performing the independent verification shall maintain an adequate separation from the original clearance manipulator to maintain the integrity of the verification.

5. Independent Verification or Concurrent Verification shall be used as determined by supervision per AD-HU-ALL-0005, Human Performance Tools.

6. Verification for tag removal (if required) may be waived by the Clearance Approver based on ALARA concerns as directed by AD-HU-ALL-0005, Human Performance Tools.

   a. If verification is waived due to ALARA concerns, then document in the Details Tab of the clearance.

7. The Tag Verifier shall perform the following:

   a. Check that the proper component was selected by comparing the information placed on the clearance and in-plant label. Any discrepancies shall be communicated to the supervision.

   b. Check the tag was removed from the component for the clearance being released.

   c. Check the components are in the position required by the checklist.

   d. Ensure Additional Measures are removed, if required.

   e. If a tagged point cannot be verified, then document on the Tag Removal list.

   f. When Verification is complete, then the verifier documents the Clearance Verification in eSOMS.

      (1) An SRO can document in eSOMS for the Tag Hangers when appropriate.

5.21 Clearance Closure

1. A qualified Clearance Approver shall perform the following when clearance removal and boundary verification are complete in order to close out the Clearance:

   a. Review the Clearance to ensure all documentation is filled out completely.

   b. Ensure all relevant comments written on the Clearance hardcopy are entered electronically.

   c. Ensure any unresolved issues documented in the Clearance are resolved and document the resolution in the Clearance.

   d. When verification is complete, then status the Clearance as 'Tags Removed' in the 'Clearance Verification' tab.

   e. eSOMS will automatically archive the clearance and send it to document management. Any additional paperwork that needs attached to the clearance electronic copy should be transmitted with the corresponding clearance number. Paper copies do not need to be retained.

2. Operations shall perform the following, as required:

   a. Follow up on any issues identified during the Clearance manipulation.

   b. Complete any Tech Spec related actions or compensatory actions as required.

   c. Complete any Fire Protection or Barrier Breach related actions as required.

   d. Ensure that the Clearance activity is logged in the main control room narrative log.

3. There may be notifications to make, other compensatory actions to remove or cancel, or other activities tracked by the clearance that need to be closed out.

4. A review of the closed paperwork for lessons learned and a review of any post-job brief is an engaged, thinking approach to the close-out function.

5.22 Clearance Modifications/Changes

1. All modifications to clearances need to be evaluated on a case by case basis. Should a clearance not be able to be hung or removed in the sequence and position specified understanding the impacts of continuing shall be known before proceeding.

NOTE

Steps 5.22.2 through 5.22.6 are for reference use and variations to the process for clearance modifications can be used on a case by case basis.

2. For clearances that are Approved for Hanging but not yet set to Tags Verified Hung.

    a. If the clearance cannot be completed (and some tags have been hung) due to equipment failure or incorrect position on the tag, then perform the following:

        (1) On the original clearance, perform verifications on all of the tags that have been hung.

        (2) On the original clearance, status the tags that cannot be placed as 'Unable to Hang' in eSOMS, which will render that clearance useless (no holders or workers will be able to sign on)

        (3) On the original clearance, remove all work order tasks.

        (4) Create a clearance revision and remove any tagged components that are marked as 'unable to hang', this will 'hold' the tags that have been already hung in the field.

        (5) Create a revision of the revision created in Step 2.a.(4).

        (6) Add all required work order tasks to the 2nd revision created in Step 2.a.(5).

        (7) Process the 1st revision created in Step 2.a.(4) to Verification Level 4 (Tag Hang Verified By).

        (8) Process the original clearance to 'Verification Level 8 (Tag Removal Verified By).

        (9) Modify the 2nd clearance revision as required to support the work.

        (10) Status the 2nd revision to the desired verification level and perform verifications per the requirements of this procedure.

5.22 Clearance Modifications/Changes (continued)

(11) When ready, process the 1st Revision to 'Verification Level 8 (Tag Removal Verified By)

b. If tags cannot be hung because current plant alignment does not support hanging the clearance and no tags have been hung, then perform the following:

(1) Status all tags as 'Unable to Hang' in eSOMS.

(2) Revise the clearance and copy the work order tasks as appropriate.

(3) If required, on the original clearance remove all work order tasks.

(4) Process the original clearance to 'Tags Verified Removed'.

(5) If required, modify the revised clearance (e.g., WOT's, tagged points)

(6) When appropriate, status the revision to the desired verification level.

3. For changes to the Removal Configuration of clearances that are Approved for Removal but not yet set to Tags Verified Removed, then perform the following:

a. If the As-Left position is changed from the Removal Configuration a method of maintaining Plant Status Control must be in place.

b. A Clearance Approver can modify the 'As-Left' configuration if the 'Removal Configuration' is not going to be the required position when removing a clearance.

c. If the As-Left configuration is modified, a second Clearance Approver shall agree.

d. Prior to clearance closure, document in the clearance details the configuration change and the approving Clearance Approver's names.

4. For Clearances that are approved for removal but Tag removal is not desired:

a. Once the Clearance has been approved for removal, the tags are no longer valid. The clearance shall be removed. The 'As-Left' positions can be the previously tagged positions to assist in placement of a new clearance.

b. Copy the clearance being removed to Active and process the clearance through the require verifications per this procedure.

5.22 Clearance Modifications/Changes (continued)

c. Re-hang all new tags per the requirements of this procedure.

5. If changes in the tag sequence or verifications are required, then perform the following:

   a. Return the clearance to the Clearance Approver.

   b. The Clearance Approver will pen and ink change the Tag Hang/Remove list and initial by each change.

   c. A second Clearance Approver will review and if they concur with the change, initial the Tag Hang/Remove list by each change.

   d. Prior to clearance closure, document in the clearance details the change and the approving Clearance Approver's names.

6. Evaluate clearance modifications for a clearance event.

5.23 <u>Revision Process</u>

1. General Rules for Clearance Revisions {7.1.11}

   a. Revisions in eSOMS are performed by creating a new Clearance and sharing tags as needed with the original clearance needing revision.

   b. Using the Revision process in eSOMS allows for Work Order Tasks to be copied from the original clearance to the Revision.

   c. The Revision is prepared using the normal Clearance process ensuring that any Work Order tasks associated to the Revision have an adequate boundary for the work.

   d. The revision is then hung and Clearance Holders and Clearance Workers sign on to the Revision for their work tasks. The Clearance Holders and Clearance Workers then sign off the original Clearance (if required) and it is dispositioned as needed. eSOMS will not allow any Tag Removal activities with any Clearance Holders or Clearance Workers signed on to that Clearance.

5.23 Revision Process (continued)

e. If a Holder or Worker is offsite and cannot be located, then contact a Maintenance Supervisor or Operations Supervisor to release the clearance per Attachment 10, Releasing Another Worker's Clearance Protection.

f. When revising a clearance and work orders need to be copied from the original clearance, then the 'Copy Work Orders' function can be used in eSOMS; however, deleting the work orders off the original clearance must be done if the original clearance is going to be deleted or voided.

2. If the Revision involves Hanging Tag(s) (Boundary Expansion) then:

a. Verify the original clearance with the original scope of work is in eSOMS in any status.

b. The clearance preparer will 'Copy to Active' via 'right click', do not copy work order tasks if the expected boundary is not for the original work order tasks.

c. When the new clearance is created, then it will initially share all of the tags with the original clearance.

(1) The preparer can add tags to facilitate a safe work boundary for the associated or new Work Order Tasks.

d. When the new clearance revision is approved, then hang the necessary tags.

e. Procedural requirements of the Clearance Holder/Workers must be met for the clearance revision.

3. If the Revision involves Lifting Tag(s) (Boundary Collapse) then:

a. Verify the original clearance with the original scope of work is in eSOMS in any status.

b. The clearance preparer will 'Copy to Active' via 'right click'.

5.23 Revision Process (continued)

NOTE

A Work Order Task cannot be removed from a clearance once a Worker has signed on.

c. If desired, then copy the work order tasks from the original clearance to the revision.

(1) As required, remove the Work Order Tasks that are not required on the clearance revision.

d. When the new clearance revision is created, then it will share all of the tags with the original clearance.

(1) The preparer can remove tags from the new clearance that are not needed.

e. Execute the Clearance Revision to establish the new work boundary.

f. When the new clearance is set to the Ready to Work verification level, notify the work groups.

(1) Procedural requirements of the Clearance Holder/Workers must be met for the clearance revision.

g. The original clearance can be processed for removal.

5.24 <u>Work Order Tasks and Clearance Association</u>

1. Adding Work Orders Tasks to an Approved (hanging) Clearance

a. If the following are true, Work Order tasks may be added to existing Clearances:

(1) The Clearance boundary is adequate to safely perform the work.

(2) The qualified Clearance Preparer(s) and Reviewer(s) have completed all applicable items on Attachment 5, Clearance Hang Preparation Checklist, for the new task(s) being added.

b. The qualified Clearance Preparer(s) and Reviewer(s) shall ensure the clearance Boundary is appropriate for the Work order by completing Attachment 5, Clearance Hang Preparation Checklist

c. Verify the work order is not in a status that allows work to begin.

5.24 Work Order Tasks and Clearance Association (continued)

d. A qualified Clearance Preparer will add the work order and document the review in the '1st Verified By Date/Time' field in the 'Work Order Tasks' tab for the work order.

e. If the clearance Boundary is appropriate for the work order, then a qualified Clearance Reviewer will document approval by competing the '2nd Verified By Date/Time' field in the 'Work Order Tasks' tab for the work order.

f. Verify the permit holds have been released in CAS (may need to be done manually).

g. Evaluate for an SL 4 clearance precursor.

2. Modified Work Scope of a Work Order attached to an Clearance that has been approved to Hang:

a. The Work Planner or Work Supervisor will notify the Tagging authority that changes are required to an existing work order.

b. The reason for the changes will be discussed in detail to determine if the associated Clearance requires modification.

(1) If no Workers have signed on to the affected Work Order Task, then delete the Work Order Task from the clearance.

(a) The Work Order Task shall be modified as required and re-associated to the Clearance provided the boundary is adequate.

(b) Verify the permit holds have been released in CAS (may need to be done manually).

(c) If the Clearance Boundary is not adequate for the change in Scope then a Clearance Revision or new Clearance shall be used.

(2) If Workers are signed on the to Work Order Task, then all Workers must sign off and the Clearance Approver must remove the 1st and 2nd verifications for the Work Order Task.

(a) Modifications to the Work Order Task shall be made and when complete, if the Clearance Boundary is still adequate then 1st and 2nd verifications can be performed and Workers can sign back on to the Task.

5.24 Work Order Tasks and Clearance Association (continued)

(b) If the Clearance Boundary is not adequate for the change in Scope then a Clearance Revision or new Clearance shall be used.

(c) The Work Order Task shall be marked as 'Work Complete' on the original clearance by the Clearance Approver.

(d) The Work Order Task shall then be associated to the new Clearance or Revision for work to continue.

3. Removing a Work Order from an Existing Clearance:

a. The Work Week Manager, Outage Coordinators, or Work Group Lead should contact the Clearance Coordinator or Operations Supervisor to have the work order removed from the Clearance.

b. If Workers are or have ever signed on the to Work Order Task, then all Workers must sign off and the Clearance Approver must remove the 1st and 2nd verifications for the Work Order Task.

(1) The Work Order Task shall be marked as 'Work Complete' on the original clearance by the Clearance Approver.

5.25 <u>Temp Lifts</u>

1. General Rules for Temp Lifts

a. A Temporary Lift is used to remove tags of an active Hanging Clearance without adding, deleting or altering the tag type of any Clearance point.

NOTE
The Temporary Lift cannot be statused to 'Tag Removal Approved' unless all the affected Clearance Holders have accepted the Temporary Lift (or signed off) and Clearance Workers have signed off the Clearance.

b. Work being performed under a Clearance must stop during the temporary lift.

(1) Clearance workers shall sign off of the Work Order Task(s).

(2) Clearance Holders shall Accept the Temp Lift or sign off the clearance(s).

5.25 Temp Lifts (continued)

2. Temporary Lift Process

a. Prepare the Temp Lift per Attachment 13, Temp Lift Checklist.

b. The person requesting the temporary lift shall notify all Clearance Holders signed-on to the affected clearance(s) the component impacts.

(1) Discuss the precise temporary lift details with the person generating the temporary lift (i.e., reason for the temporary lift and the exact component changes required).

(2) Ensure all Clearance Holders and Workers are notified of the following:

(a) Proposed temporary lifts and any potential conflicts with work that is underway.

(b) Once the Clearance has the temporary lift implemented, crafts will not be able to sign-on to any Clearance that has any Tags that are affected by the Temporary lift.

(3) Each applicable Clearance Holder and Worker shall review and status the temporary lift as required.

(a) Clearance Holders shall acknowledge the temporary lift by accepting the temporary lift from the temporary lift module.

(b) 'TEMPORARY LIFT Accepted By' signifies that the Holder has accepted the Temp Lift.

c. The Tagging Authority shall:

(1) Ensure all Holders entered in eSOMS have signed electronically in the 'TEMPORARY LIFT Accepted By' field of the temporary lift.

(2) Verify that all Holders / Workers who were notified to stop work have signed-off.

(3) Ensure Temp Lift is adequate per Attachment 13, Temp Lift Checklist.

(4) Status the temporary lift as 'Tag Removal Approved'.

5.25 Temp Lifts (continued)

3. Temporary Lift Release

   a. Following the completion of the activity that required the temporary lift, Tagging Authority shall review the activity to determine if the original clearance should be reapplied or remain removed.

   b. Tagging Authority shall:

      (1) Brief the Clearance Preparer on the method of removal as required.

      (2) If the Clearance Temp Lift is to be re-applied,

         (a) Reapply the Clearance boundary points temporary lifted.

         (b) Reinstall Additional Measures as appropriate.

         (c) Status the Temp Lift as 'Tags Verified Re-Hung'.

         (d) Notify the Clearance Holders and direct them re-accept the Clearance and to have Workers sign-on the Clearance, if required.

         (e) Re-verification of Safe Working Conditions shall be performed.

      (3) If the Temp List is to remain removed, then perform the following:

         (a) Status the affected clearances as verified 'Tag Removal Approved'.

         (b) Once complete the temp lift should be processed to completion.

5.26 <u>Emergency Clearance Removal</u>

1. If tags must be removed during an operational emergency, then attempt to determine the status of the work and obtain approval to remove tags by contacting one of the following:

   - The Worker
   - The Clearance Holder
   - The Clearance Holder’s Supervisor
   - The Clearance Holder’s Superintendent/Manager

5.26 Emergency Clearance Removal (continued)

2. The individual approving the release of the clearance assumes the Clearance Holder responsibility.

> **NOTE**
>
> The Clearance Approver responsibility to notify the Clearance Holder of clearance removal may only be delegated to a relieving Clearance Approver or the Clearance Holder's Supervisor/Manager.

3. The Shift Manager may approve removal of the tags after having:

   a. Verified that personnel safety is assured.

   b. Verified that removal will not jeopardize equipment protection.

4. Document clearance removal in the plant narrative log and on the Details Tab of the clearance.

5. The Clearance Approver shall ensure the clearance database is updated and a Condition Report is written.

6. Workers that cannot be notified shall have their plant access suspended by contacting Security until notification is complete.

7. Refer to Attachment 10, Releasing Another Worker's Clearance Protection.

5.27 <u>Audits, Self Assessments and Admin Requirements</u>

> **NOTE**
>
> The assessment team shall not be engaged in tagging activities while the assessment is in progress.

1. At least once per 12 Months, each site shall perform an assessment of the Clearance Process required by 29 CFR 1910.147 and 29 CFR 1910.269. The assessment team shall include an Operator or Clearance Holder qualified in accordance with fleet procedures, and shall consist of the following elements:

   a. A review of a representative sample of open clearances with placed tags for compliance with fleet procedures.

      (1) If a large number of deficiencies are found, extent of the audit will be increased to provide assurance that remaining clearances are correct.

5.27 Audits, Self Assessments and Admin Requirements (continued)

b. Interview (or equivalent method) a representative number of employees that implement the Clearance Program to determine their knowledge of the program personnel responsibilities under the clearance process. Group meetings between the assessment team and clearance qualified personnel constitutes compliance with this requirement.

c. Review of field observations to determine compliance with applicable personnel safety related work practices.

d. Program Performance at the station by trending clearance events.

e. Documentation of the annual assessment and disposition of all corrective actions shall be entered and retained in the Corrective Action Program.

(1) The documentation of the annual audit shall include the following:

- Date of assessment
- Names of assessment team members
- Clearance numbers of clearances reviewed
- Names or positions of employees observed and interviewed
- Deficiencies identified and action plan for correcting the deficiencies with responsible persons and due dates

2. At least once per 12 months the Fleet Clearance and Tagging Working Group will perform an assessment of the of the Clearance Process required by 29 CFR 1910.147 and 29 CFR 1910.269. This shall consist of the following elements:

a. An independent review will be conducted of fleet tagging procedures to verify compliance with 29 CFR 1910.269(d)(8)(ii) and 29 CFR 1910.147(f)(3)(i). This review will be performed by the Corporate Clearance and Tagging Program Owner, which satisfies the OSHA requirement to have a person not directly involved with the C&T process perform this review. {7.1.1}

b. A review of aggregate fleet performance over the past 12 months to determine performance gaps.

5.27 Audits, Self Assessments and Admin Requirements (continued)

> **NOTE**
>
> Quarterly and Monthly audits may be suspended during Outages providing that an audit is completed within thirty days of the completion of the Outage. The SM over the tagging group's approval is required to suspend the audits.

3. Quarterly Audit, the SM over the tagging group should ensure an audit of active Clearances is performed. The audit should consist of the following:

   a. The audit should include physical verification that the tags for clearances in effect greater than 30 days are in place and undamaged and that components are in the position listed on the Tag List.

      (1) Clearances in High Radiation Areas or Locked High Radiation Areas are excluded from this audit.

      (2) Damaged, illegible or missing tags shall be reprinted and replaced and documented on the details tab.

      (3) Physical verification of component position does not need performed if additional measures are in place.

4. Monthly the SM over the tagging group shall ensure an audit of active Clearances is performed.

   a. The audit shall review clearances that meet all of the following criteria:

      - Does not already have an Applicability Determination (AD) assignment written.

      - Clearance is hanging for greater than 60 days, or the Clearance is expected to remain hanging for greater than 90 days.

      - Clearance contains positionable components as defined by AD-OP-ALL-0204, Plant Status Control.

   b. If a clearance meets the criteria described in Section 5.27 Step 4, then complete an Applicability Determination in accordance with AD-LS-ALL-0007, Applicability Determination Process.

   c. Document the AD Assignment Number in the Clearance Details Tab.

5.27 Audits, Self Assessments and Admin Requirements (continued)

5. Working Group Guidance

   a. Each station will hold a Site Level Working Group meeting at a frequency not to exceed quarterly, per the agenda listed on the Fleet Clearance and Tagging SharePoint.

   b. A Fleet level working group meeting shall be held at a frequency not to exceed quarterly, per the agenda listed on the Fleet Clearance and Tagging SharePoint.

5.28 Site Clearance and Tagging Weekly Meeting

1. Each site will conduct a weekly meeting to discuss the Clearances to be executed for each on-line work week.

2. The focus of the meeting should be to review the following for the week:

   - Complex Clearances

     ◊ Any challenges or difficulties developing the clearance which warrants additional review or challenge.

   - Exceptional Clearances

   - External Energy Injection (EEI) Activities

     ◊ During External Energy Injection Activities review, ensure the details tab correctly identifies the EEI activity and that the EEI activity is NOT in parallel with other activities requiring worker protection under that Clearance.

3. If the boundary cannot be altered to make it non-Exceptional, then the team shall identify mitigation strategies to compensate for the Clearance being Exceptional (e.g., verifying pressure is relieved by viewing a pressure gauge or verifying temperature is acceptable by use of a contact probe).

4. A list of EEI activities for the week that get published in the Plan of the Day document should be a product of the Site Clearance and Tagging Weekly Meeting.

5.28 Site Clearance and Tagging Weekly Meeting (continued)

5. No quorum is specified, but typical attendees should include:

- Shift Manager On-line/Work Control or designee
- Maintenance Planning
- Mod Planning
- Maintenance
- Work Week Coordinator
- Operations Work Week Manager or designee for the T-week being reviewed

5.29 Event Response and Tagging Performance Indicators

1. Clearance Severity Level details and definitions are listed in the Severity Level Determination document.

2. Final Severity Level Determination for SL-1, SL-2, and SL-3 events must be approved by the Operations CFAM.

3. If an SL-1or SL-2 Event were to occur, then Attachment 2, SL-1 and SL-2 Event Response Guidelines, is required to be used.

5.30 Processing Clearance When eSOMS is Not Available

1. When eSOMS is not available, then clearances currently hanging and new clearances required can be processed utilizing the following guidance.

2. Existing clearance may be utilized/modified provided the original hardcopy of the clearance is used. Depending on the unavailability of eSOMS, the electronic tool may not be reliable until fully restored.

   a. Clearance Holders and Workers requiring the need to use a clearance that is already hanging shall use Attachment 9, Worker Tracking List to document sign on and sign off of the clearance.

   b. eSOMS clearances that need to be approved or removed shall use the following guidance:

      (1) Any changes to the Details of the clearance shall be initiated with the date and time, for each change made.

5.30 Processing Clearance When eSOMS is Not Available (continued)

(2) Verifications shall be handwritten onto the original hardcopy clearance, along with time/date and signature.

(3) Hang/Remove positions shall be handwritten onto the original hardcopy clearance, along with time/date and signature.

c. All clearance changes shall be entered into eSOMS upon return.

3. New clearances can be generated using Attachment 22, Clearance Form Template, when eSOMS is off-line. The following items shall be performed for handwritten clearance:

a. Operations shall maintain a manual clearance log for these handwritten clearances, refer to Attachment 11, Manual Clearance Log.

b. Clearance numbers should be issued consecutively with the year followed by the next sequential number (e.g., 14-001).

c. Clearances shall be prepared and approved in accordance with this procedure.

d. Tags shall be handwritten in sequential order when the computer is down.

e. When eSOMS is returned to service:

(1) The clearance shall be entered into eSOMS (The computer is used for clearance status update purposes only).

(2) A reference to the manual log number shall be entered into the Details Section of the clearance.

(3) Attachment 22 and Attachment 11 are not required to be retained provided all details have been entered into eSOMS.

5.31 <u>Danger Release Tags</u>

1. In situations where a component within the applied clearance boundary may need to be manipulated several times to facilitate testing, Danger Release Tags can be used. Danger Release Tags grant operational release to a single Clearance Holder from the Tagging Authority for the purposes of testing.

2. Multiple Work Order Tasks can be assigned to a Clearance using Danger Release Tags.

a. The signed on Clearance Holder is responsible for all Work Order Tasks on a Clearance that contains a Danger Release Tag(s).

5.31 Danger Release Tags (continued)

b. When the Danger Release Tag is lifted per this section, then no Work Order Tasks assigned to that Clearance are protected.

3. If Danger Release Tags are used, then the following applies:

- Danger Release Tags shall not be used as shared tags.
- Danger Release Tags can only be used with work activities that are simple in nature.
- Components can never be manipulated with a Danger Release Tag hanging. Danger Release Tags provide personal protection when applied to a component.
- Only one Clearance Holder will hold the clearance containing the Danger Release Tag at a time.
- Only qualified Clearance Taggers can Hang/Remove Danger Release Tags.
- Workers signed onto the clearance containing the Danger Release Tag shall be briefed by the Clearance Holder with operational authority of the component. Designee is not allowed.
- Testing shall be scheduled such that the tested components do not create issues with other work groups within any shared boundaries (e.g., water movement from valve strokes).
- Based on the scope of testing, a clearance lock can be used when using Attachment 15, Danger Release Tag Remove/Re-Hang Form, to prevent workers from electronically signing on.

4. When a Danger Release Tag is to be lifted, then perform the following:

a. The Clearance Holder shall ensure they are signed onto the Clearance in eSOMS.

b. Before tag lift, all Workers must personally sign themselves off of the Clearance in either eSOMS or on Attachment 15, Danger Release Tag Remove/Re-Hang Form

c. The Clearance Holder with Operational Release (or designee) will:

(1) Sign the DRT, if a signature is already on the tag from another Holder, then note on Attachment 15 and continue.

5.31 Danger Release Tags (continued)

(2) Remove the DRT and document on Attachment 15, Danger Release Tag Remove/Re-Hang Form.

(3) Once the area has been verified safe, reposition the component and perform testing.

5. When re-hanging DRT's is required to continue work, then perform the following:

a. Re-position the component to the required position on the original Tag Hang List.

b. Re-hang the DRT and document on Attachment 15, Danger Release Tag Remove/Re-Hang Form

c. Install Additional Measures, as required.

d. Perform Tag Placement verification.

e. Perform Zero Energy Checks.

f. Ensure all workers personally sign themselves onto the clearance in eSOMS or on Attachment 15, Danger Release Tag Remove/Re-Hang Form.

g. Repeat Section 5.30 steps 4 and 5 as required.

6. When testing is complete, then perform the following:

a. If tag-rehang does **NOT** need to be performed, **AND** no additional work will be performed or added to the Clearance boundary, then perform the following:

(1) 'N/A' the final Tag Re-Hang section of Attachment 15, Danger Release Tag Remove/Re-Hang Form

(2) Return the removed tag and Attachment 15 to Operations.

(3) Operations shall lock the Clearance, and place a note on the lock that DRT's have been removed and by who

(4) Verify no other Clearances share the DRT.

5.31 Danger Release Tags (continued)

(a) If other clearances are found to share the DRT, then those clearances shall be locked and an NCR generated for having two active Clearances with a shared DRT.

(b) Until the issue is resolved, lock all identified Clearances that share a common DRT(s) and do **NOT** proceed.

(5) When the clearance has been locked, the Clearance Holder can release the clearance.

(6) Only when ready to process the clearance to 'Tag Removal Approved' can the clearance be unlocked.

(7) On the 'Tag Remove Tab in eSOMS, an SRO shall document the 1st and 2nd verifier in eSOMS for the persons that lifted the tag. Operations will not need to re-verify or sign for in eSOMS.

b. If tag-rehang will be performed, then perform the following:

(1) Re-position the component to the required position on the original Tag Hang List.

(2) Re-hang the DRT and document on Attachment 15, Danger Release Tag Remove/Re-Hang Form.

(3) Install Additional Measures, as required.

(4) Perform Tag Placement verification.

(5) Clearance Workers and Clearance Holder sign out of the clearance in eSOMS as appropriate.

5.32 eSOMS Clearance Training and Qualifications

1. The following references the required training and qualifications that are to be met per the guidance of this procedure. Contact your site training department for specific information on completing these courses. For guidance on what courses to take as well as qualification cards, refer to the 'Training and Qual Cards' section of the Clearance and Tagging SharePoint Page.

2. Requalification (requal) training must be completed once every calendar year.

Qualification	Required Training /Qual Card
Clearance Worker CO-FLT-CLEARANCE WORKER	(Initial) TTC1406-N (Clearance Worker) and TTC1707-N (Clearance Worker Initial Training) **AND** (Requal) TTC1707-N **OR** TTC1703-N
Clearance Holder CO-FLT-CLEARANCE HOLDER	(Initial) CO-FLT-Clearance-Holder (Qual Card) **AND** (Requal) TTC1708-N (C&T Holder) **OR** TTC1703-N (CT Holder Refresher)
Maintenance Tagger CO-FLT-TAGGER	(Initial) CO-FLT-MNT-TAGGER (Qual Card) **AND** (Requal) TTC1709-N (Clearance Tagger Initial Training) **OR** TTC1703-N (Clearance and Tagging Refresher)
Operations Tagger CO-FLT-TAGGER	(Initial) CO-FLT-OPS-TAGGER (Qual Card) **AND** (Requal) TTC1709-N **OR** TTC1703-N
Operations Clearance Preparer CO-FLT-TAGPREP	(Initial) CO-FLT-OPS-TAGPREP (Qual Card) **AND** (Requal) TTC1710-N (eSOMS Clearance Tagging) **OR** TTC1703-N
Operations Clearance Reviewer CO-FLT-TAGREVIEWER	(Initial) CO-FLT-OPS-TAGREVIEWER (Qual Card) **AND** (Requal) TTC1710-N **OR** TTC1703-N
Operations Clearance Approver CO-FLT-TAGAPPROVER	(Initial) CO-FLT-OPS-TAGAPPROVER (Qual Card) **AND** (Requal) TTC1710-N **OR** TTC1703-N

6.0 RECORDS

6.1 QA Records

1. Clearances on equipment are vital non-permanent records. The following clearance related documents are vital records and should be transmitted to Document Management.

   - Automatically generated eSOMS Clearances via eSOMS Autoprint
   - Attachment 8, External Energy Injection (EEI) is a vital record. The attachment and all approval sheets shall be maintained with the Work Order Package.
   - Attachment 9, Worker Tracking List
   - Attachment 10, Releasing Another Worker's Clearance Protection
   - Attachment 12, SME Support Clearance Boundaries Request Form
   - Attachment 15, Danger Release Tag Remove/Re-Hang Form

6.2 Business Records

None

7.0 REFERENCES

7.1 Commitments

1. 29 CFR 1910.269, Electric Power Generation, Transmission, and Distribution
2. CAPR 19038-09, Loss of Level In Spent Fuel Pools
3. CAPR 43929-04, Clearance Tag Hanging Error
4. CAPR 76491-03, Personal Clearance Error
5. CAPR 79007-13, Problem Hanging Clearance for C CSIP
6. CAPR 141473-03, Leak on Valve 1CS-243 Following a CSIP Start
7. CAPR 160702-09, 10, and 11, Clearance Boundary not Adequate for Work on FE-10830
8. CAPR 280320-26, CO 146180, Incorrect Checklist Hung
9. CAPR 1480983-08, 1A CA Pump Auto Start Due To OPs Tagout

7.1 Commitments (continued)

10. CAPR 01634672-10, Two NI Pumps and NV Pump Were Capable of injection During LTOP
11. CAPR 1644350-04, Approximately 270 Gallons Drained From Reactor Coolant System
12. CAPR 1760104-11, Near Miss During Scheduled Work on DW-18
13. CAPR 1782967-01 and 02, Zero Energy Check Not Performed Prior to Beginning Work
14. CAPR 1799849-11, U2 Containment Not Isolated as Expect To Perform EC
15. CAPR 1901267-26, Inadequate Comp. Measures for Dewatered RC Piping
16. GL 2008-01 Managing Gas Accumulation in Emergency Core Cooling, Decay Heat removal, and Containment Spray Systems
17. IER L2-11-2, 2009-2010 Scream Anlysis, Reccomendation 7e
18. LER 88-029, Reactor Core Isolation Cooling System Isolation Due to Equipment Failure
19. Response to NRC, i.e. Report R11; 500-400/87-31 Violation A (SHF/10-13510E)
20. SOER 07-1, Reactivity Management, Recommendation 5

7.2 Procedures

1. AD-EG-ALL-1132, Preparation and Control of Design Change Engineering Changes
2. AD-HU-ALL-0004, Procedure and Work instruction Use and Adherence
3. AD-HU-ALL-0005, Human Performance Tools
4. AD-HS-ALL-0108, Confined Space Entry
5. AD-HS-ALL-0110, Electrical Safety
6. AD-LS-ALL-0007, Applicability Determination Process
7. AD-MN-ALL-0005, Nuclear Planning
8. AD-OP-ALL-0204, Plant Status Control
9. AD-OP-ALL-0211, Facilities Clearance and Tagging

7.2 Procedures (continued)

10. AD-PI-ALL-0106, Cause Investigation Checklists
11. AD-WC-ALL-0410, Work Activity Integrated Risk Management
12. OMM-001, Operations Administrative Requirements

7.3 <u>Miscellaneous Documents</u>

1. [RNP] ACR 91-237, Sequence for Hanging and Removing Tags
2. Clearance and Tagging Basis Document
3. [BNP] CR 98-00015-6
4. [BNP] CR 98-01220-2
5. [RNP] CR 80320, AFW-39 Misposition, Non-cited Violation
6. [HNP] CR 1971603, Drawing Error Caused Clearance Error
7. EPRI Nuclear Maintenance Applications Center: Clearance and Tagging Guideline for Nuclear Electric Generating Stations, Revision 1 (EPRI Guide)
8. [BNP] ER 87-39
9. [BNP] ER 97-13-01
10. Information Notice No. 82-41, Failure of Safety/Relief Valves to Open at a BWR Information Notice No. 83-39, Failure of Safety/Relief Valves to Open at a BWR - Interim Report
11. Information Notice No. 83-82, Failure of Safety/Relief Valves to Open at a BWR - Final Report
12. Information Notice No. 86-12, Target Rock Two-Stage SRV Setpoint Drift & Information Notice No. 88-30, Target Rock Two-Stage SRV Setpoint Drift Update
13. INPO 01-002, Guidelines for the Conduct of Operations at Nuclear Power Stations
14. INPO 2015-006, Equipment Clearances
15. NCR 479306, Unexpected Voltage Found During Clearance
16. NCR 01402290, WC Aeration Blower C Running After Red Tag Isolation
17. NCR 01498979, Discharge Valve Found Closed During Maintenance

7.3 Miscellaneous Documents (continued)

18. NCR 01572245, U-2 Reactor Coolant Leak To BAT Thru Relief Valve 1NV-488
19. NCR 01633487, U1 Turbine Driven CA Pump Auto Started
20. NCR 01716101, Boron Accumulation on Valv
21. NCR 01755914, EC supply pump A Wind Milling
22. NCR 01807884, 3CC-1 Will Not Operate And Has No Control Board Indication
23. NCR 01902866, Maintenance In Close Proximity To Pump Shaft
24. NCR 01906606, 2008 INPO E&A - July 28 - August 8, 2008 AFI
25. NCR 01910532, Voltage Discovered During Zero Energy Check
26. [HNP] NCR 02068664, Voltage Found during Holder Safety Verification
27. [BNP] NCR 02101978, HWWV Modification Valves Under Clearance in Incorrect Position
28. OSHA 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout)
29. OSHA 29 CFR 1910.269, Electric Power Generation, Transmission, and Distribution

<< When a Clearance is Not Required >>

NOTE

- This Attachment provides guidance to allow specific activities to be performed without a clearance providing the work supervisor, the employee associated with the activity, and Operations agree that adequate safety will be maintained.
- Clearances are not required when no Hazardous Energy is present.
- Long-standing practice in the nuclear electric generating industry has shown that many routine work activities are safely and properly performed on equipment where the individual conducting the work is certainly in a position to prevent the unexpected release of energy to that worker. It is precisely because the risk of unexpected release of energy is essentially precluded that OSHA does not require lockout/tagout in these cases. However, clear criteria are needed to define and limit the work activities that are conducted without a clearance.
- The Basis Document has clarifying information and should be referred to if Section 1.0 will be used.

1.0 STEPS TO DETERMINE IF A CLEARANCE IS NOT REQUIRED:

1. A clearance may not be required when an activity has been specifically approved as having met <u>all</u> the following criteria:

    - Only one individual will perform hands-on work (or a two person team functioning in a reader-doer format)
    - The individual worker clearly understands that he/she has sole responsibility for his/her personal safety during the work activity
    - The individual performing hands-on work has direct line-of-sight of the isolation boundaries and is close enough to intervene should someone attempt to manipulate an isolation boundary
    - The activity involves <u>routine/periodic minor servicing</u> of operational equipment (e.g., Minor Maintenance/Tool Pouch Maintenance)
    - The safety hazard is not complex (e.g., multiple types of hazards present)
    - Installed personnel safety guards and personnel safety interlocks remain intact and/or are properly used.
    - The work is a normal part of the worker's craft or assignment

<< When a Clearance is Not Required >>

1.0 STEPS TO DETERMINE IF A CLEARANCE IS NOT REQUIRED: (continued)

- The work does not extend beyond the worker's shift, unless there is a procedure-directed turnover and the activity will be worked continuously
- The work is controlled by approved plant procedures or work instructions that identify the protective measures required and specific steps for preventing an unexpected energy release. This is not meant to supersede procedural guidance, for example if a station specific procedure states that 'no packing adjustments shall be made on Hydrogen valves' then the guidance of that procedure must still be followed.
- Operations concurs that the work can be performed without clearance.

2. For **ALL** activities that have been determined to not require a clearance that are not **explicitly** listed below, a communication shall be sent to the SM- Work Control over the clearance group documenting the decision.

2.0 PRE-APPROVED ACTIVITIES NOT REQUIRING CLEARANCE:

Below are examples of routine work activities that could be performed without an equipment clearance, assuming all appropriate safety precautions are followed.

2.1 General Work

- No energy source present or possible
- Non-power block equipment that less than 480VAC and is not hard wired, provided the power source is disconnected/unplugged and within sight of the worker
- Changing light bulbs
- Cleaning/replacing ventilation filters where the worker is not exposed to rotating machinery
- Portable equipment repairs
- Changing fuses in systems less than 600 volts, using properly rated fuse pullers (when there is not impact to power-block equipment)
- Opening electrical panels in accordance with standard electrical safety precautions (with control room permission)

<< When a Clearance is Not Required >>

2.2 Electrical/I&C Work

> **NOTE**
>
> Any electrical work must follow the governance of AD-HS-ALL-0110, Electrical Safety

- Troubleshooting electrical equipment.
- Working I&C controlled instrument valves under control of approved procedures or work plans
- Instrument work in which the process flowstream is isolated by a thermo-well
- Calibrating pressure, level, flow and temperature instruments
- Work involving process sensor filling, venting, draining, and blowing down sensing lines
- Lifting/landing leads for calibration and troubleshooting.
- Annunciator replacement, troubleshooting and testing
- Radiation monitoring system voltage checks and troubleshooting
- Radiation measuring instrument repairs
- Limit and torque switch adjustments conducted using approved procedures.
- Stroking a valve and actuator to determine proper operation
- Breaker maintenance while breakers are removed from the cubicle with no possibility of inadvertent reconnection.
- Circuit breaker replacement using standard electrical safety precautions
- Calibration, surveillance, and troubleshooting of instrument loops (pneumatic/ electronic), including AC power and high voltage power supplies to the instruments
- System dynamic adjustments on plant instruments/equipment that require normal lineups

<< When a Clearance is Not Required >>

2.3 Mechanical Maintenance Work

- Online packing gland adjustments on pumps and valves
- Greasing rotating equipment provided machine guards are not removed or opened.
- Handwheel replacement on manual valves (case-by-case on power-operated valves)
- Cleaning/replacing/rotating duplex and inline strainers in cooling water systems (case-by-case basis)

2.4 Chemistry Work

- Primary and secondary systems chemistry sampling

2.5 Radiation Protection Preapproved Work

- Radiation measuring instrument repairs

2.6 Operations Work

- Operations refueling tests (unless the test specifically calls for clearance tags)
- Stroking valves/actuators to determine proper operation.
- Annunciator bulb replacement; annunciator troubleshooting and testing
- Online packing gland adjustments on pumps and valves
- Greasing rotating equipment provided machine guards are not removed or opened.
- Handwheel replacement on manual valves (case-by-case on power-operated valves)

Cleaning/replacing/rotating duplex and inline strainers in cooling water systems (case-by-case basis)

ATTACHMENT 2
Page 1 of 1

<< SL-1 and SL-2 Event Response Guidelines >>

1.0 SEVERITY LEVEL 1 AND SEVERITY LEVEL 2

1.1 Standard event response guideline for a Severity Level 1 or Severity Level 2 Event:

1. Send a communication within 4 hours to the Corporate Duty Manager with the initial event information and any immediate lessons learned.
2. Initiate a PIRT per AD-PI-ALL-0106, Cause Investigation Checklists.
   a. Include at least one member of the Fleet Clearance and Tagging Working Group from another fleet site as a member of the event investigation team.
3. Perform an extent of condition review for the involved workers (consider previous 5 and 5 Clearances written but not yet performed).
4. Review event for appropriate Station, Department, and Crew clock reset
5. Disqualify the HU/Clearance & Tagging qualifications for all those involved.
   a. Consider removing the involved individuals from the appropriate duties.
6. Initiate the appropriate level of investigation.
7. Initiate a challenge call with the Fleet Clearance and Tagging Working Group and include the Operations and Working Group Senior Management as appropriate. This could be the same call as the PIRT report out, if appropriate.
   a. Discuss the event including why the event occurred and what the worker(s) actions will be to prevent a similar event.
8. Distribute a fleet wide communication discussing the event and known lessons learned.

1.2 When investigation is complete:

1. Distribute the investigation report to all sites for communication to all personnel on site.
2. Evaluate the event for training opportunities, and submit training requests to capture the event for inclusion in future training.
3. Prepare and execute a return to proficiency plan for the affected worker(s). This will include discussing the event with the Site Operations Leadership.

<< Exceptional Clearances >>

1.0 EXCEPTIONAL CLEARANCES

1. Clearances are marked as 'Exceptional' when standard methods of isolation cannot be achieved.

    a. All reasonable efforts shall be taken to preclude the use of an Exceptional Clearance.

2. Clearances that are marked as Exceptional must be accepted by a Shift Manager (or by a higher level in Operations Management) and the Work Group before the clearance is Approved.

    a. If the clearance will not be accepted as written, the clearance must be re evaluated. Efforts should be made to work with the work group to determine an acceptable boundary.

3. When a clearance is determined to be Exceptional, the following **SHALL** be performed:

    a. Mark the clearance as Exceptional in the Attributes of the clearance.

    b. Document the reason WHY the clearance is Exceptional in the Details Tab.

4. The Clearance Holder and Workers sign on signifies acceptance of the Exceptional Clearance.

5. Clearances are not required to be marked as Exceptional if no Work Order Tasks will be assigned to them.

<< Exceptional Clearances >>

2.0 EXAMPLES OF WHEN A CLEARANCE SHALL BE MARKED AS EXCEPTIONAL.

- Lack of double valve isolation when required (>500 psid or >200*F across boundary isolation).
- Use of a check valve or rupture disc to provide isolation as a primary or secondary boundary.
- Use of a control valve that has an orifice in the valve disc as an isolation point.
- Use of a hydraulically operated valve as an isolation point when the pressure cannot be removed or the valve cannot be blocked in the isolate position.
- Use of a fail close AOV as an isolation point when the air supply pressure cannot be removed.
- When a pressure boundary is tagged out for internal work, or a segment within the boundary has an energy potential that would create a concern for the worker, and the boundary and segment within the boundary is not depressurized and drained.
- No vents or drains are available to be tagged open within the boundary
- All stored energy cannot be relieved from within a Boundary or component to be worked on and the boundary cannot be expanded to remove energy. (Some components or systems may retain forms of energy (e.g., stored energy) after primary isolation, for example: Circuit breakers, Heavy duty spring-loaded valves, Lines or process equipment using hazardous chemicals , Rotating generators with field breakers open, Capacitors, batteries)
- Use of a control switch as the sole isolation point for personnel protection.
- All required isolation points cannot be isolated OR all control devices to a component cannot be tagged (e.g., Handwheel, reachrod)
- Additional Measures cannot be employed.
- Clearances using freeze seals as boundary isolations.
- Condition Dependent Clearances.
- If a boundary isolation is not tagged and access is not restricted.
- 'Abandoned In Place Equipment' as boundary isolation.
- When components isolated in a confined space do not have isolations blank/blind flanged, sections of pipe/duct removed, or 2x isolation with a vent/bleed path **AND** a hazard could be created should a single isolation leak.
- When there are KNOWN issues with methods of determining isolation (for example: bad drawings, no drawings) and Operations documents the potential for isolation challenges such that the work group is aware of the potential for energy before work start AND source voltage verification CANNOT be performed ahead of work start.

ATTACHMENT 4
Page 1 of 2

<< Model Clearance Creation / Revision Checklists >>

Model Clearance Number ____

NOTE

This section is used when developing a Model Clearance and is intended to provide additional items that are needed for a Model Clearance.

Initials: ____ ____

Model Clearance Creation	Preparer ′. / NA	Reviewer ′. / NA
Was the Model clearance developed per Attachment 5, Clearance Hang Preparation Checklist?		
Are the Model Work Order Task(s) listed on the Model WO Tasks Tab in the Approved Status?		
Has the Model Clearance been associated to a Model Work Order Task(s)?		
Is the approval date for the Model WOT(s) that were utilized to develop the Model Clearance (as listed in the CAS TIMM101 screen) listed on the detail tab?		
Is a method for defining that the clearance was created from a model clearance such that when the clearance is copied to Active, it is readily apparent to the preparer and reviewers that the clearance was created from a Model. (e.g., inclusion of the heading *****Created from Model Clearance******)		
Does the Details Tab list the document number and revision for each controlled document used in the development of the model clearance boundary.		
(If applicable) Is the Maintenance Procedure referenced in the Model Work Order Task listed in the Details Tab?		
Evaluate pending revisions, procedure holds, and engineering changes to controlled documents to determine if they impact the model clearance.		
If revisions are required to perform this task (i.e.; initial clearance hang for work and then a revision to support re-test), then are the revision(s)listed on the details tab of each corresponding clearance in the revision chain?		
Are marked-up copies of each controlled document utilized to develop the clearance boundary retained, either attached to the clearance or in a file share location (per site discretion)?		
Is a copy of the Model WOT Clearance Request attached or in a file share (per site direction)		
When Prepared /Reviewed, sign for the appropriate verification in eSOMS.		
The Reviewer shall sign the Approval verification after the Review verification is complete.		

<< Model Clearance Creation / Revision Checklists >>

NOTE

This checklist is used when revision to an Approved Model Clearance is required.

Model Clearance Revision	Preparer ′. / NA	Reviewer ′. / NA
Create the next revision of the Model Clearance by copying the approved model to a new model.		
Ensure the new Model Clearance number is the same as the old model clearance number with the next sequential revision number (e.g., O-OPS-5175-PMBKR003 becomes O-OPS-5175-PMBKR003(1)).		
Invalidate the currently approved model clearance by signing 'Model Clearance Not Available for Use' verification.		
If the revision is required for editorial changes only (i.e., improving notes or adding clarifying information) and does not impact the clearance boundary, further technical review is not required. If ONLY editorial changes are made the next 2 sections may be marked 'N/A'.		
If model clearance revision is required due to a change of the model WOT, then • Confirm the scope of the model work order and the clearance request have not been changed (review M114 Task Notification Request) • If the scope of the WOT or Clearance Request has changed then redevelop the model clearance using the section for Model Clearance Preparation and exit this checklist.		
If the revision is due to revision of any controlled document used to develop the clearance boundary, then • Evaluate the changes to determine if the clearance boundary has been affected. • If the boundary has been impacted then redevelop the model clearance using the section for Model Clearance Preparation and exit this checklist.		
Update the Model clearance with the new information • Editorial/administrative changes made (can be done in the change log) • Model WOT approval date (if changed) • Controlled document revision numbers (if changed) • Updated marked up references (if changed)		
Validate no additional changes are listed in the Change Log.		
When Prepared and/or Reviewed, sign for the appropriate verification in eSOMS.		
The Reviewer shall sign the Approval verification after the Review verification is complete.		

<< Clearance Hang Preparation Checklist >>

NOTE

The below checklist is not an all-inclusive list of requirements. It is meant to be a memory aid in clearance development and can be used in sequence or in any logical order.

Clearance Number: ___________________________________

Initials: _____ _____ _____

Section 1.0 - Active Clearances Created from Model Clearances	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Note: • This section is only used when Preparing and Reviewing an Active Clearance created from a Model Clearance that is tied to a Model Work Order. • If during the Clearance Preparation the questions below cannot be signed for, then the Active Clearance being Prepared/Reviewed shall be revised or prepared using Section 2.0 below. • If the Model Clearance requires revision (as per not being able to answer the questions below) then the Model Clearance shall be revised per Attachment 4, Model Clearance Creation / Revision Checklists.			
Does the clearance Details Tab prominently indicate that the clearance was created from a Model Clearance?			
Does the work scope listed in the Details Tab match the scope of the Work Order Task?			
Is the approval date for the Model Work Order Task listed in the eSOMS details the same as the current approval date for the Model Work Order task in the CAS TIMM101 panel? If not, then the Model Clearance shall be revised before creating the active clearance.			
Review the current WOT approval history to determine if the PM WOT has been revised since it was created from the Model WOT. If the current WOT has been revised, then has the work scope or clearance request changed?			
Are the revision numbers for each controlled document used to develop the Model Clearance the same as the current active controlled document?			
Are there pending holds, revisions, or engineering changes for any controlled document listed in the ESOMS details or attachments tabs that impact the clearance boundary?			
Change log reviewed to ensure no changes have been made to the active clearance boundary after being copied to active from the model clearance.			
Sign for the appropriate verification level in eSOMS (remaining prep/review boxes in this attachment should be marked n/a)			

<< Clearance Hang Preparation Checklist >>

Section 2.0 - Active Clearances **Initials:** _______ _______ _______

Scope Identification	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Procedures reviewed? (e.g., Maintenance Procedures, CAS field with procedures, Drawing Isometrics)			
Does the Clearance Request and Scope of Work meet the requirement of this procedure? Contact Planner/Crew/Engineering as needed. (If NOT adequate, then return to planner and initiate an NCR tracking the SL4 event.)			
If External Energy Injection (e.g., Doble, Megger, Hydro, Hi-pot) will be performed, then has a statement added to the Detail Tab?			
Clearance Development	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Piping isolated for configuration control or worker protection? Are all isolation valves (except Control Room MOVs or AOVs which may be 'No Tag' label) are tagged appropriately?			
Tech Spec/SLC/Equipment Important to Emergency Response (EITER)/Containment Integrity impacted? If so, then has a statement been added to Details Tab?			
If developing Clearance for equipment protection only, are Work Order Task(s) and scope added to the Details Tab and NOT to the Clearance?			
Verify confined space tagging requirements met per Section 5.5 Step 13.a and Section 5.5 Step 13.b.			
Correct Unit/Train/Tag Type/Components included on the Tag Lists?			
Have you reviewed your site specific attachment in this procedure?			
If controlled drawings do not exist, have Field Walk downs been performed or SME Review obtained? (Consider Sketches or Pictures clarifying isolation points attached to clearance, if required)			
IF components will be positioned per procedure, than has a Comment or Step Tag been added that refers to correct procedure and enclosure/attachment to control sequence of events? {7.1.10}			
Is the warning (below) added to the details page prior to removing component that has alternate train or component when practical? Consider adding "Conduct a visual inspection of the alternate train(s) or component(s)" to the placement notes of the affected component. {7.1.17} *Conduct a visual inspection of the alternate train(s) or component(s). This is a basic check for leaks, high temperatures, high vibrations, or any other observable operational challenge. Any operational challenges noted will need to be evaluated before removing redundant equipment from service.*			

<< Clearance Hang Preparation Checklist >>

Impacted drawings, flow diagrams, or I&C diagrams reviewed and marked up? **NOTE:** EE, CWD, LL drawing review required for control circuit work. **NOTE:** Reviewer should evaluate drawing revisions used compared to the preparer			
Attachment 12, SME Support Clearance Boundaries Request Form evaluated with any of the following conditions: • Infrequently used drawings • Drawing NOT understood • Work scope determination required multiple Planners or Engineering • WO returned to Planning and scope remains unclear • Isolation NOT previously requested for same work scope			
Impact of EC (or EC Pend, 'MOD in progress') understood relative to the work scope requiring tags? Ensure placeholders for comment steps and procedure steps are placed on the Hang checklist for use on the lift checklist as necessary.			
Previous Clearances reviewed?			
Outstanding WOs that could affect Clearance or boundary components reviewed?			
Component verification technique determined?			
Clearance in proper sequence (minimizing any applicable action times)?			
Appropriate number of blank procedures steps inserted to support Clearance Removal?			
Is configuration control for components being worked under the clearance addressed to ensure they are restored to the required position during clearance removal (e.g., WOT's, PSC, NO Tags, Procedures)?			
For components with multiple control devices, are all control devices tagged? Remote locations not tagged documented in Clearance details with reason and marked as Exceptional?			
If system conditions are used as a boundary (Parameter Tag), then are contingency and communication methods included in details section of clearance?			
Are support systems required to be secured and isolated?			
Are Danger Release Tags used for any evolutions within this clearance boundary? If so follow the guidance of Section 5.31, Danger Release Tags.			
Clearance evaluated against criteria contained in Attachment 3, Exceptional Clearances.			

<< Clearance Hang Preparation Checklist >>

Have impacts been evaluated to ensure that the effects on systems and components outside of the boundary are identified and are acceptable or properly dispositioned (e.g., evaluate effect on work on fire systems such as CO2 or Halon)?			
Have impacts been evaluated for clearances written on systems that remain in service or are only partially removed from service? Ensure that there are no adverse effects on the whole system as a result of the Clearance.			
Is guidance in Notes, Cautions, and the Details Tab proper for implementing the Clearance?			
Venting and Draining	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Are Vents and Drains tagged where required?			
If system piping is drained (includes the suction source, pump discharge, or interconnected piping) for the ECCS, DHR, Containment Spray, other safety-related system or system that performs a safety function, and an approved procedure for fill and vent does not exist, then has Engineering been consulted to ensure the fill and vent plan is adequate to restore piping to a water filled condition? {7.1.16}			
Will components be aligned to allow complete system draining when required? (MOV/AOV, multiple drains)			
Are comment steps or placement notes needed to ensure notifications are made prior to draining or when complete?			
Fire Protection header/mulsifyre: Are steps included to isolate and drain water from clapper/test valve?			
When available, are alternate energy release paths used? (Such as removing flanged connections, or providing a vent or drain path where energy will be diverted to a safe location)			

<< Clearance Hang Preparation Checklist >>

Mechanical Considerations	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
If this is in support of MOV testing have fluid movement or stem ejection concerns been addressed?			
NOTE: AOVs are not a preferred clearance boundary and can only be used if it can be assured that the valve will remain in the required safe position. If AOVs are used as isolation points, then refer to Section 5.8.4, Valve Standards?			
Rotating equipment: Was windmill protection evaluated for personnel and equipment protection?			
Are H2 piping and components purged?			
Is the high pressure side isolated before the low pressure side?			
If using a relief valve, pressure control valve or excess flow valve as boundary, then is an approved restraining device used to secure valve in required position? If so, verify ASME compliance before approval (ref section 5.8 Step 7.a.)			
If a machine guard is going to be removed, then has the component been evaluated for inclusion into the clearance?			
Mechanical High Energy Isolation Considerations	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
If system has greater than 500 psid across boundary valves or fluids above 200 °F (93 °C), then is double isolation provided?			
If double isolation **<u>IS NOT</u>** possible, then document on the Details Tab of Clearance so all clearance holders are informed that only single isolation is provided.			
Where double isolation **<u>IS</u>** provided, then is a method of protecting the isolated piping from thermal expansion/contraction provided? If not, then document in the Details Tab.			

<< Clearance Hang Preparation Checklist >>

Electrical Considerations	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Are loads shutdown before opening breaker?			
Was Attachment 23 evaluated for low voltage breaker(s) with no impact statement?			
Is power removed for control power, tank or motor heaters, and alternate power supplies?			
When suction, recirc or motor cooler flowpaths are removed for pumps, fans or heaters, evaluate Equipment Protection requirements (Normal/Alternate power removal).			
If insulation is being removed from piping with heat trace, then tag heat trace (including all alternate power supplies).			
If controller operates multiple components, then consider interlocks and tagging multiple components.			
Has circuit been evaluated for daisy chains/feedbacks/alternate power?			
If opening molded case breakers that have a history of being unreliable, add notes to perform 'Contact Open' checks.			
If annunciators, vibration sensors, RTDs, ground detectors, position indicators and optical insulators have alternate power supplies, then consider isolation.			
If an optical isolator is included in the circuit, then verify that is physically isolated by either a lifted lead, open knife switch or other positive means to physically isolate the circuit.			
If grounds are needed, then how are the grounds being tracked (e.g., Procedure, Ground Tags, or Danger Tags when needed for Personal Protection)?			
If a procedure is used to control grounds, has a comment step be added on the removal to notify the operator to verify ground removal before clearance removal?			
Final Prep/Review and Tagging Package Contents	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Supporting documentation (e.g., drawings, prints, procedures) as required. (only one copy of the marked up drawings are required)			
Compensatory Action documentation (e.g., Protected Equipment information, Fire Protection Comp Actions).			
Attachment 12, SME Support Clearance Boundaries Request Form			
Read/Address all ESOMS warnings before signing verification			

<< Clearance Hang Preparation Checklist >>

Clearance Approval Verifications	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Aggregate Impact Review: Evaluate the Clearance(s) to ensure that implementation of this is understood and acceptable.			
Ensure overall plant conditions support performance of the Clearance. The Approver is not required to perform a technical review of the Clearance preparation. The Approver's decision on extent of review will need to be based upon the specific circumstances and risk associated with the Clearance. {7.1.10}			
Regulatory and Administrative requirements met? (e.g., Tech Spec, SLC, Fire Protection, Reactivity Management, Environmental Management)			
If an SSC is newly installed (not turned over) or actively being modified under an EC, prior to tagging ensure a complete or partial turnover has been performed **or** turnover exceptions are approved per AD-EG-ALL-1132.			
Redundant equipment reviewed for the consequences of losing redundancy (off normal conditions reviewed)			
Redundant train operability assessed including confidence runs {7.1.17}			
Protected Equipment posted prior to Clearance execution. (eSOMS #: ____)			
In situations where a SSC is de-watered and could have a potential impact on Security measures or functions (e.g. de-watered systems that intersect a PA boundary), Security will be contacted for evaluation of compensatory measures. If revisions are made to the clearance boundary, additional evaluation(s) will be made to ensure compensatory measures are still adequate and necessary. {7.1.10}			
Resolve DRT sharing - Clearances shall not be approved with shared DRT's			
If DRT's are used, then are other boundaries affected by the potential of testing within a boundary (MOV testing)?			
If DRT's are used, then does the schedule align the testing appropriately?			
If verification requirements waived, ensure clearance is updated.			
If this is a Condition Dependent Clearance, then is the plant ready to support the desired condition?			
If this an Exceptional Clearance, is it documented why in the details?			
If this a Complex Clearance, are mitigating actions documented in the details?			
[CNS, MNS, BNP, ONS] Is there any affect to the opposite unit?			
WOT's associated to the Clearance are 1st and 2nd verified (if appropriate)			
PRA, On-line & Shutdown Risk acceptable/updated.			
Fire Protection actions/paperwork initiated.			
Barrier Breach actions/paperwork initiated.			
Mode Dependent actions initiated/performed.			
Approve Clearance - address all eSOMS Warning (acknowledge or resolve)			
Clearance application Pre-job Brief initiated and/or performed.			

ATTACHMENT 6
Page 1 of 2

<< Clearance Hang/Remove Pre-Job Brief Checklist {7.1.6} >>

Scope of Work	**(✓ - N/A)**	Will a steam system or water system with elevated temperatures be valved into a colder system? Evaluate having engineering review the clearance for water hammer impacts.	
Identify roles and responsibilities for the job and ensure quals verified.		Identify any Reactivity Management concerns.	
Review the Details Page.		Discuss any Procedure coordination including special plant conditions or system alignments.	
Identify the correct Unit, Train, Channel, Loop, and Components		Discuss sensitive equipment/Stay Clear Zones located in the area where the clearance will be hung.	
Review the job scope and discuss what success looks like		FME Concerns discussed?	
Review Verification Requirements		**Safety / Human Performance**	**(✓ - N/A)**
Have required Additional Measures devices/methods been identified?		Identify PPE/Electrical Safety Requirements for this job	
(Removal) Review the Removal List and sequence. Have DRT's been removed by Maintenance?		Discuss Operator Fundamentals	
Are there any Special Tools required? (e.g., man lift, keys, valve bar)		Ensure a 'Keys to Life' discussion is held regarding how we will ensure our work will produce a working boundary that is protecting a Human Life..	
Discuss communication requirements and any draining considerations when system draining is required including any potential environmental impacts.		Discuss any Radiological Safety or ALARA concerns. Is there any effect on other systems equipment?	
(Hang) How will energy removal be verified? Do you have redundant indications?		**S**ummarize the task with critical steps or critical attributes and error likely situations along with the Human Performance tools and barriers to be used to prevent errors on those steps.	
Have Critical Steps been identified and Appropriate HU tools applied?		**A**nticipate errors and error traps.	
Review Drawings/Prints		**F**oresee probable and worst-case consequences should an error occur. What is the worst that can happen if an error is made? What is probable or likely to happen if an error is made?	
Plant Impacts	**(✓ - N/A)**	**E**valuate controls or contingencies to prevent, catch, and recover from errors and reduce their consequences.	
Discuss Condition Dependent requirements and any contingency actions established including any stop work criteria.		**R**eview operating experience and lessons learned that are relevant to the job (Site, Fleet and/or Industry).	
Discuss any Plant Status Control challenges.		Discuss actions to be taken in case of an emergency.	
Identify Tech Spec requirements associated with the clearance.			

<< Clearance Hang/Remove Pre-Job Brief Checklist {7.1.6} >>

Clearance # ________________________________

☐ Mark or highlight Critical Step(s) in the activity that relates to Reactivity/Operational Risk

☐ Obtain approval from the Control Room directly prior to performing a critical step or series of critical steps related to Operational risk

☐ Monitor/Validate performance of each critical step related to Operational Risk by direct oversight in the field, by work group supervision unless alternate methods are specifically determined at the Pre-Job Brief.

Participants: ____ Date: ___/___/___

____

____

ATTACHMENT 7
Page 1 of 1

<< Clearance Holder Checklist >>

CAUTION

Never assume the equipment is de-energized, depressurized or drained merely because the clearance is hanging. Unless you have tested the equipment, approach it as still being energized/pressurized.

Prior to Workers Signing On	✓
Have you read all clearance 'Detail Tab' instructions in eSOMS?	
Have you verified the boundary is adequate for the assigned work?	
Did you hold a brief discussing the boundary? (Reference Section 5.13) • The work to be performed • The basis for safe conduct of the work • The exact clearance boundary • What components are approved to be worked on • A discussion of the Details Tab including Exceptional Clearance details. • Identify who is the Clearance Holder(s) • The potential for unreleased energy, and the means to release it. • Special precautions, if any • Personal protective equipment to be used.	
Have you signed onto eSOMS to hold the clearance (the Clearance Holder is required to sign into eSOMS as a Clearance Holder and a Clearance Worker for each task which the workers are signed on to Attachment 9, Worker Tracking List)?	
Has the Work Order Task been statused appropriately to allow work start? (All holds released)	
Prior to Commencing Work	✓
Have the tagged isolation points required for your Work Order Tasks been walked down and verified adequate?	
Has each worker individually signed-on the Work Order Task in eSOMS or on Attachment 9, Worker Tracking List, acknowledging their understanding of the boundary and accepting the clearance?	
Has a Zero Energy Check been performed PRIOR to commencing work?	
Has a Peer Check been performed in the field to verify the correct component is being worked on?	
Prior to Releasing (Signing Off as Holder)	✓
Did you document in the clearance any special conditions such as incomplete work?	
Did you verify each worker individually signed-off the worker document in eSOMS and on Attachment 9, Worker Tracking List?	
Did you release the clearance by entering 'Work Complete' in the Work Order Tasks tab of the clearance for the appropriate Work Order Task? (If applicable)	

ATTACHMENT 8
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<< External Energy Injection (EEI) >>

NOTE

- This attachment shall be maintained with the work package and transmitted as a QA document with the work package.
- Section 2.0 and 3.0 can be performed concurrently, following completion of Section 1.0.

1.0 EEI IMPACT DETERMINATION - THE WORK GROUP AND OPERATIONS SHALL:

1. Determine EEI Scope and System Impact:

   a. Review the applicable sections of the maintenance procedure controlling the injection of energy.

   b. Coordinate to mark up print(s) that identify the External Energy Injection Scope.

      (1) Ensure, based on current system configuration, concerns with downstream impacts (e.g., water movement) are resolved prior to proceeding.

   c. Review point at which energy will be injected. If energy injection point is a boundary isolation, then is a Temp Lift/Revision required?

Clearance # ____________________

Description of EEI: ____________________

EEI Requestor (name) ____________ Phone # ____________

Work Group (name) ____________ Operations (name) ____________

<< External Energy Injection (EEI) >>

2.0 OPERATIONS SHALL DETERMINE AFFECTED CLEARANCE/WOT AND PERSONNEL:

1. A Clearance Reviewer or Approver shall review the clearance and associated WOT's where External Energy is being injected and determine if any other work is affected by the EEI.

   a. List affected Clearance(s) and corresponding WOT's in Attachment 8 Section 6.0.

   b. Lock and Unlock Affected Clearances as needed to control access to clearances and to ensure no additional WOT's are added.

   Name: ______________________

2. A Clearance Approver shall provide a peer check of the clearance and associated WOT evaluation.

   Name: ______________________

3.0 THE WORK GROUP SHALL:

1. Walk down the EEI area to ensure no safety concerns exist with performing EEI.

2. Work with Operations to obtain a list of Workers signed on to affected WOT's and have the EEI Affected Employees sign the External Energy Injection Affected Employee Acceptance form or sign off their clearances.

3. If the task requires personnel protection, then ensure all personnel directly involved with EEI have signed onto the clearance in eSOMS.

4.0 CLEARANCE APPROVER:

NOTE
If at any time personnel changes are required (e.g., shift change, additional resources required), then Attachment 8 Section 2.0 through Attachment 8 Section 4.0 shall be re-performed and the EEI shall be re-evaluated.

1. When Attachment 8 Section 1.0 through Attachment 8 Section 3.0 are complete, then the Clearance Approver can approve EEI.

2. Ensure all clearances listed in Attachment 8 Section 6.0 are locked.

<< External Energy Injection (EEI) >>

4.0 CLEARANCE APPROVER: (continued)

3. Ensure the External Energy Injection Affected Employee Acceptance Form reflects who is signed into the clearance(s) in eSOMS and correct any discrepancies before proceeding.

   EEI Approver (Name/Sign): ______________________________________

5.0 WHEN EEI IS COMPLETE:

1. The work group shall notify Operations to unlock the appropriate clearances.

   Who was notified (Name): __________________ Date/Time: ______________

2. Operations shall notify affected Work Groups that work can recommence.

6.0 AFFECTED CLEARANCE AND WOT LIST:

Affected Clearances	Affected WOT's	Locked (initials)
Make copies of this page if additional space is needed	pg. ____/____	

<< External Energy Injection (EEI) >>

6.0 AFFECTED CLEARANCE AND WOT LIST: (continued)

External Energy Injection Affected Employee Acceptance Form (For additional forms, print this attachment and attach to the original)			Page ___/___
WO & Task #	**Worker Name (Print)**	**Worker Signature**	**Date**

QA Record

ATTACHMENT 9
Page 1 of 2

<< Worker Tracking List >>

Work order #:	**Clearance #:**	**Supervisor (Print):** **Phone #:**	**Clearance Holder (Print):**

Description of Boundary: (identify specific isolation points if applicable)

____
____
____
____
____

- **Note** - Signing this Worker Tracking List acknowledges that you have been briefed on the Clearance, understand the Boundary, and agree that you are protected for your scope of work.
- **Note** - The Clearance Holder is required to sign-in on eSOMS as a Clearance Holder and a Clearance Worker for each task

Worker Sign-On				**Worker Sign-Off**		
Print Name	**Sign Name**	**Date**	**Time**	**Sign Name**	**Date**	**Time**

ATTACHMENT 9
Page 2 of 2

<< Worker Tracking List >>

Worker Sign-On				**Worker Sign-Off**		
Print Name	**Sign Name**	**Date**	**Time**	**Sign Name**	**Date**	**Time**

Clearance Holder will verify 'Worker Sign-Off' column is completed for all Workers.

Clearance Holder Sign and Date:____ / __________

QA Record

ATTACHMENT 10
Page 1 of 1

<< Releasing Another Worker's Clearance Protection >>

CAUTION

Releasing another worker's clearance protection can cause injury or death. Strict compliance with this attachment is required. NO exceptions are permitted.

Clearance Number: ______________________________________ Date: ____/___/____

Name of Worker: ____

Work Group or Department of Worker: _______________________________

Supervisor completing release: (Printed Name/Signature)

________________________________/_______________________________

Sign-off ALL Steps: Signature

1.	Contact security and verify worker is not in the Protected Area.	
2.	Verify job assignment is not outside the Protected Area, If this job is outside the Protected Area make all attempts to contact the Worker and prevent worker from recommencing work.	
3.	Request security place an admin hold on worker's badge.	
4.	If on Attachment 9, Worker Tracking List, then record worker absence and sign-off from Worker Tracking List.	
5.	If on eSOMS, then request Tagging Authority sign-off worker from the clearance.	
6.	Keep this attachment on file until notified that the worker has returned.	
7.	When worker returns to site notify them that the clearance was released.	
8.	Worker acknowledgement of notification: Name____ Signature/Date _____________________________ ___/___/___	
9.	Remove administrative hold on worker’s badge.	
10.	Record condition report written by work group. NCR #__________	
11.	Submit completed attachment to Tagging Authority.	

QA Record

ATTACHMENT 11
Page 1 of 1

<< Manual Clearance Log >>

Yr - Seq. # (99-0001)	Component ID & Description	Clearance Holder Name/Workgroup/Contact #

<< SME Support Clearance Boundaries Request Form >>

1. The purpose of SME support is to not only assist with determining boundary isolation points for a clearance, but to also without a doubt, convince the qualified clearance preparer that the suggested isolation points will provide a safe working boundary.

2. If multiple SME's are required based on knowledge or size of the isolation, then note next to the component which person is responsible and all parties will sign the preparer or verifier line (as appropriate).

3. The SME 'preparer' will generally work with the Clearance Preparer and the SME 'verifier' will generally work with the Clearance Reviewer, however these are recommendations. The SME's will in all cases, however, maintain independence.

4. Some examples of when SME support should be used are: Complex Clearances where prints are inadequate or not available, Clearances that require use of elementary electrical drawings, Clearances that will require tagging control circuit diagrams or relay diagrams and Low Voltage electrical clearances. This is not an all-inclusive list.

Section 1 - Requestor Complete: (Please print.)

Name		**Ext. No.**	
Work Group		**Date**	
Unit No.		**Requested Scope of Support:**	
System No.			
Work Order Task			

<< SME Support Clearance Boundaries Request Form >>

Section 2 - Subject Matter Expert (SME) complete the following:

Tagging Requirements for Task (attach list if necessary)**:**

Component	Description	Position

List reference drawings and procedures (attach list if necessary)**:**

ATTACHMENT 12
Page 3 of 3

<< SME Support Clearance Boundaries Request Form >>

Identify Plant Impacts:

Identify special requests, precautions, tagging sequence information, and prerequisites:

Preparer:		**Verifier:**	
Print Name		**Print Name**	
Sign		**Sign**	
Date		**Date**	

Note - Verification must be completed independent of the performer.
Note - Consider attaching electronically to eSOMS for future use.
QA Record

ATTACHMENT 13
Page 1 of 1

<< Temp Lift Checklist >>

Temp Lift #: ____________________ **Clearance #:** ____________________________

Initials: ______ ______ ______

Preparation, Review, and Approval	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
If components will be positioned by a procedure, has the detail been added to the removal/rehang notes that refers to the applicable procedure and controls sequence of events? {7.1.10}			
Is the Tag Lift and Re-Hang Sequence correct?			
Have all active WOs been reviewed for the component whose tag will be temporary lifted?			
Have all active Clearances been reviewed for this component (and its support system(s), if applicable), to determine if other work exists that hold this component?			
Are any other tags are hanging on this component?			
If other work holds this clearance, then has a determination been made on whether the status of that work will support allowing the component to be safely energized?			
Are the following listed in the Description section of the Temporary Lift? • Name of individual requesting lift • Reason for temporary lift			
Are all Clearance Holders, who are currently signed into a WO Task for the tag(s) to be lifted, in agreement with proceeding with the tag lift (accepted the Temporary Lift or have signed off the Clearance), and have all Clearance Holders signed electronically in the 'TEMPORARY LIFT Accepted By' field of the temporary lift?			
Have all Clearance Holders been notified that work must stop and have the Clearance Holders been directed to have workers sign off?			
Verify all Holders accepted the temp lift or signed off.			
Verify all workers have signed off.			
Is the Lift verified to be compatible with overall plant Conditions (Tech Spec, SLC, Reactivity Management, Fire Impairment, Control Room Notification)? {7.1.10}			

ATTACHMENT 14
Page 1 of 2

<< Clearance Removal Preparation Checklist >>

Clearance #: ______________________________

Initials: _______ _______ _______

Removal Development	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Procedures in progress reviewed?			
Return positions established governed by operating procedures based on plant conditions and system alignments or [CNS, MNS, ONS] The Operational Control Group (OCG) direction, or to support PMT's?			
Components arranged as follows? • Lowest energy and support components restored first • Highest energy and primary components are restored last			
Verification type properly designated.			
If this clearance returns systems or components to service following implementation of an EC (including partial implementation of the EC), then ensure the required procedure step to evaluate has been included.			
Ensure sequence is correct (e.g., drain paths closed prior to filling and minimize SSU/LCO times, maximize DID).			
Does restoration support Post Maintenance Testing (if required)?			
Mechanical Considerations	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Does a procedure step crack the supply valve to fill the system slowly?			
If the clearance involves a freeze seal, then are steps in place to ensure the vents and drains are closed before freeze seal thaws?			
Have the consequences of lifting safety/relief valves due to miss-calibration, thermal or hydraulic effects been evaluated? add notes to Details Tab			
If system piping is drained (includes the suction source, pump discharge, or interconnected piping) for the ECCS, DHR, Containment Spray, or other safety-related system or system that performs a safety function AND an approved procedure for fill and vent does not exist, then has Engineering been consulted to ensure fill and vent plan is adequate to restore the piping to a water filled condition? {7.1.16}			
[ONS] Are these systems included for fill and vent plan adequacy evaluation from Engineering if a procedure does not exist? {7.1.16} SSW, ASW, CCW (Include portion to RCW Coolers), LPSW, EFW, WC, SSF ASW, SSF DSW, SSF HVAC SW, SFC, RCW (SFC portion) [Keowee] WL and TS			
Electrical Considerations	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Are breakers for pumps racked in or closed after piping is filled and vented?			
Are breakers for heaters in hydraulic systems closed after piping filled and vented?			

<< Clearance Removal Preparation Checklist >>

Final Position Considerations	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
CAUTION Be aware that using As-Found position or flow diagrams as the sole determination for restoration position may not provide an accurate determination of current plant configuration requirements.			
Have any differences between desired Tag Removal Position and 'As-Found' positions been resolved prior to proceeding?			
Have impacted flow diagrams been reviewed?			
Have pump suction, recirc and discharge flowpaths been verified to be available as required OR have remarks been included to describe how the flowpath will be established?			
Have 'EC Revision' or 'EC Pend' associated to drawings been investigated?			
Have appropriate procedures/checklists been determined to determine final restoration position (Nuclear Fusion or similar search tool may be used)?			
Have plant conditions at the time that the component is to be restored to service been evaluated?			
Are all components that could have been manipulated during maintenance restored via Procedure or a tagged step (e.g., NO Tag, Comment Tag, Step Tags)?			

Final Verifications	Preparer √ / NA	Reviewer √ / NA	Approver √ / NA
Are all WOT's marked 'Work Complete' (have WOT's not in the 'Complete' or 'FIN/Admin' status been evaluated for removal of the clearance, if needed)? Ensure WOTs listed in the details tab are in a condition for the clearance removal.			
Are all Clearance Holders and Workers signed off?			
Have work groups required to support clearance removal been notified?			
Have DRT's already been removed by Maintenance? If so, then ensure Tag Removal verifications are updated following removal approval.			
Do procedures need to be implemented to support clearance removal?			
Do plant conditions support the removal of the clearance in all respects? {7.1.14}			
Can compensatory measures be cancelled? (Fire Protection)			
Have you evaluated Tech Spec's, if applicable?			
Can Probabilistic Risk Assessment be updated?			
Are PMT’s being coordinated with clearance removal as applicable?			
Can Protected Equipment barriers be removed (if applicable)?			
Barrier Breach actions/paperwork closed (if applicable)?			
Ensure a Clearance removal Pre-Job Brief initiated/performed.			
Approve the Clearance Removal - acknowledge/accept eSOMS warnings.			

ATTACHMENT 15
Page 1 of 2

<< Danger Release Tag Remove/Re-Hang Form >>

Clearance #:	Supervisor Name:	Clearance Holder:
WOT #:	Supervisor Phone:	

Description of Testing:

____

____

____

____

Tag #/ Component ID	Tag Removal Section					Tag Re-Hang Section			
	Workers Verified Off? (Initials/Date/Time)	**Rem. Seq.**	**Removal Config.**	**1st Verif.** (Initials/Date/Time)	**2nd Verif. IV** (Initials/Date/Time)	**Hang Seq.**	**Tagged Config.**	**1st Verif.** (Initials/Date/Time)	**2nd Verif. IV** (Initials/Date/Time)

<< Danger Release Tag Remove/Re-Hang Form >>

By signing the 'Worker Sign-Off' column, you are declaring you no longer require protection of the clearance. By signing the 'Worker Sign-On' column, you are acknowledging that you have complied with the requirements of this procedure.

Worker Sign-Off				Worker Sign-On		
Print Name	**Sign Name**	**Date**	**Time**	**Sign Name**	**Date**	**Time**

Clearance Holder will Verify Worker Sign-Off column completed for all Workers.

Clearance Holder Sign and Date:_________________________________ / __________ **Sheet ____ of ____

(**Copy this attachment as needed and attach copies to original)
QA Record

ATTACHMENT 16
Page 1 of 1

<< Brunswick Nuclear Plant Specific >>

1. Valves with Ball Screw Stem Actuators should not be manually torqued.

   The following valves have Ball Screw Stem Actuators:

   BNP:

1-E41-F001	1-E41-F002	1-E41-F003
1-E41-F006	1-E41-F011	1-E11-F068A
1-E11-F068B	1-E11-F024A	1-E11-F024B

2-E41-F001	2-E41-F002	2-E41-F003
2-E41-F006	2-E41-F011	2-E11-F068A
2-E11-F068B	2-E11-F024A	2-E11-F024B

2. Only a licensed operator may perform fuse removal/installation evolutions on the 49’ elevation of the Control Building. This is primarily due to the responsibilities and awareness that licensed operators possess concerning the consequences of improper fuse manipulations generic to the “Back-panel” area of the Control Room. I&C can assist in the fuse handling evolutions under the direction of a licensed operator.

3. The Independent Verification requirement for establishing a clearance on motor operated valves contained in 0AP-013, Plant Equipment Control for BNP has been replaced with the Concurrent Verification requirements of this procedure, which are considered more stringent and protective.

ATTACHMENT 17
Page 1 of 1

<< Catawba Nuclear Station Specific >>

1. This procedure applies to all departments and personnel with the exception of vendor work performed at CNS (BLDG 7752) for outsourced water treatment:

   - The boundary valves for this work at CNS are 1RL-A028, 1YM-781, and 1WB-32.
   - This procedure is applicable when tagging the boundary valves.

2. If a maintenance activity involves hydraulic isolation on a system or component that will be open during the maintenance activity and it is not on this list, Danger Tags are required.

   - Operational activities listed in the following table:

Operational Activity
Reset Fire Protection System Mulsifyre during routine testing and operations
Add or remove balls to the Amertap system as part of normal system operations.
Routine chemical additions performed by approved station procedure.
Routine system sampling performed by approved station procedure.
Routine feed and bleed of closed cooling systems involving no biological hazards.
Filter and media replacement involving exposure only to hydraulic systems at static head pressure and ambient temperature with no biological hazards
Demineralizer sluice and load interfaces for sluice, reference volume, and resin reload activities.

<< Harris Nuclear Plant Specific >>

1. The following area drawings should be considered unreliable. Source Voltage Verification and the Low Voltage Panel Breaker Tagging flowchart should be used if clearances development requires the use of these drawings.
   - Operations Building (Blue Heaven)
   - Paint shop/storage building
   - Chemical storage building
   - Service building
   - Administrative building
   - CRDF (Central Receiving and Dedication Facility)
   - Turbine storage building
   - Mobile equipment shop
   - Any warehouse
   - K building
   - M building
   - TTF (Technical Training Facility)
   - HEEC (Energy Center)
2. The clearance Tag Hanger and the clearance Tag Verifier will not be dispatched to perform their functions at the same time except under unusual circumstances as directed by the SM or as allowed by procedure. {7.1.3}
3. The Key Safety Function Configuration requirements checklist must be reviewed prior to Operations Clearance issuing for any forced and all refueling outages (anytime plant enters Mode 5). This checklist will be provided to Operations by the Outage Management Unit during outages.
4. Fuses removed during Operations Clearances process should be verified against the EDB fuse data for fuse ampere, type and manufacturer.

<< Harris Nuclear Plant Specific >>

5. System configuration control is normally maintained by the Operations Clearance Process. If a component, within the boundary of an Operations Clearance, that is not tagged, is manipulated or has maintenance performed on it, then one of the following shall be performed:

    a. If configuration control is to be maintained by the Clearance, then perform the following:

        (1) List the components on the Clearance Checklist.

        (2) The components shall be restored to proper position when the Clearance is removed.

    b. If configuration control will not be maintained by the Clearance, then perform the following:

        (1) The Shift Manager shall approve not maintaining configuration control by the clearance. This approval should be noted in the Details Tab.

        (2) The OP electrical/valve lineup should be used to document the restoration of all components within the Clearance boundary. This should be completed prior to restoring the Clearance.

6. Clearance boundary isolation valves for work on acid (excluding boric acid) or caustic systems should be capable of performing adequate isolation. A review of Work Management System (WMS) is required to check that no outstanding deficiencies exist that affect a boundary valve's ability to adequately isolate the system. {7.1.2}

7. When evaluating potential problems which could arise with the clearance process, then consider if any post clearance inspection such as component integrity monitoring or PMT required.

<< Harris Nuclear Plant Specific >>

8. Motor operated valves using Limitorque Operators, under the following conditions, have experienced problems with the valves drifting open:

- Operator is in manual
- Valve is shut
- Valve is a globe valve
- A high pressure is present beneath the disc
- Valve has a fast operating time (less than 10 sec)

9. The anomaly occurs because the drive gear train is disengaged when in the manual mode. With the high pressure under the seat and the fast operating time with no stem locking feature, the valve operator has insufficient resistance to prevent valves from drifting. An alternative clearance valve or a means for holding valves with these conditions should be used when using such valves for isolation. The following valves have been identified as susceptible to valve drift:

HNP:

1CS-182	1CS-240	1CS-382	1CS-472	1CS-752
1CS-196	1CS-278	1CS-423	1CS-745	1CS-753
1CS-210	1CS-341	1CS-470	1CS-746	

NOTE

Electrical checks to verify breaker position may require a work order to allow access to the MCC, Power Panel, or component.

10. Breaker tagging:

a. When tagging 480 Volt Molded Case Circuit breakers in Motor Control Centers or in 480 Volt Power Panels, include clearance steps/positions to ensure that electrical checks are performed to ensure that the breaker is open, prior to making the clearance ready for acceptance. If the breaker is verified to be removed from its cubicle, then these checks are not required.

<< Harris Nuclear Plant Specific >>

b. EC 84170 installs new MCC buckets that include voltage indicating LEDs to provide breaker indication for each phase. These LEDs allow for verification that a phase is open by checking that the associated LED is lit before opening the breaker and then verifying that the associated LED is NOT lit following opening of the breaker. These new breaker open indications do not eliminate maintenance from performing their own test to verify that voltage does not exist prior to performing work on the breaker.

11. When a system is breached, if a significant increase in pressure occurs in the system (such as a pump start or system heat-up), the system should be periodically checked for an increase in leakage.

12. During clearance development an evaluation of the Temp Power Log should be performed.

13. The following is a list of EPT-250 and EPT-251 throttle valves. If these valves must be used for Equipment Clearance boundary isolations their positions must be recorded to the nearest tenth of a turn and repositioning these valves will require the performance of EPT- 250 or EPT-251 unless all of the following conditions are met:

    a. An approved procedure required the documentation of the as-found position and ensures the valve is returned to its original position.

    b. The valve position markings are aligned when manipulation is complete.

    c. System operability is controlled during valve manipulation.

    d. System Engineer is notified to perform EPT-250 or EPT-251 if any discrepancy exists.

    - EPT-250

        ◊ 1SW-58, CCW Hx 1A SW Inlet Isol

        ◊ 1SW-70, CCW Hx 1A SW Outlet

        ◊ 1SW-73, WC2-1A SW Outlet Isol

        ◊ 1SW-119, AH-2 & 3 SW Return Header Isol

        ◊ 1SW-1492, ESW Strainer 1A Back flush Outlet

<< Harris Nuclear Plant Specific >>

- EPT-251
  - ◊ 1SW-256, CCW Hx 1B SW Inlet Isol
  - ◊ 1SW-266, CCW Hx 1B SW Outlet
  - ◊ 1SW-136, WC2-1B SW Outlet Isol
  - ◊ 1SW-120, AH-1 & 4 SW Return Header Isol
  - ◊ 1SW-1493, ESW Strainer 1B Back flush Outlet

14. When verifying the physical location of fuses, use the EMDRAC (1364 series) drawings. CWD'S refer to the location of the termination locations only.

15. All Limitorque SMB-00/SB-00 motor operated valves, if manually operated, are required to be stroked electrically from the control switch to be declared operable. All of the applicable SMB-00/SB-00 valves are listed in OMM-014, Operation of the Work Coordination Center.

16. When draining non-contaminated systems inside the RAB, measures must be taken to prevent these systems from being drained to the Radioactive Floor Drain or Equipment Drains Systems. The Details Tab of the clearance should specify the required drain routing, including any special equipment requirements, to ensure that non-contaminated systems are drained to the Secondary Waste System, or the HVAC Condensate Drains System. These non-contaminated systems include, but are not limited to NSW, ESW, CCW, ESCW, NESCW, FP, PW, FW, AFW, and DW.

17. High pressure systems (greater than 500 psig) with single isolation shall include a plan for leaving a recirculation path/drain path open prior to isolating both the suction and discharge valves so that a determination can be made if components on the high pressure side are holding prior to completing the clearance. Clearance boundary isolation valves for work on high pressure systems with single isolation valves should be capable of performing adequate isolation. A review of Work Management System (WMS) is required to verify that no outstanding deficiencies exist that affect a boundary valve's ability to adequately isolate the system. {7.1.5}

<< Harris Nuclear Plant Specific >>

18. When circuit breakers as listed in PLP-400, Post Maintenance Testing, are racked out and then racked back in (for example, clearances) then the breaker must be cycled to start the component to verify the breakers are properly racked in. If the component cannot be started at that time due to plant conditions, then verify an EIR exists for the breaker that lists OP-156.02, AC Electrical Distribution, Attachment 12, 52S/MOC Device testing, as the PMT.

19. If clearance involves draining a tank with continuous influent (such as the RAB Floor Drain Tank), the tank level should be periodically monitored to verify the influent is not exceeding the capacity of the drain. A comment should be placed in the Details Tab of the clearance to alert the holder that the tank has continuous input. This is to guard against the influent rate increasing or clogging of the drain maintaining the tank level.

20. If a clearance involves venting or draining, the locations of the vents and drains should be evaluated to ensure that no Ventilation or Containment Boundaries have been violated (i.e., RABEES, Control Room Ventilation, Containment Closure). If violation of the boundaries cannot be avoided, ensure compensatory measures are taken as required by plant procedures.

21. If a clearance involves isolating an electrical supply to a component, the Clearance Preparer must review both the EM-005, Temporary Power for Bus Outages, and AP-401, Installation and Control of Temporary Power and Equipment, logs for potential additional power sources.

22. If a clearance involves the Diesel Driven Fire Pump, placing the selector switch to OFF and tagging the electrical control circuit is not adequate to prevent a potential start/rotation from the DC powered starting circuit. The DC power should be removed from this pump by lifting and tagging the motor starter negative (–) lead to prevent inadvertent start/rotation.

23. If an approved clearance is revised such that additional components are added to the boundary, then the Work Week Manager should be notified. The potential exist that the proposed change could affect plant risk level.

24. Installation or removal of clearance tags from the Main Control Board and AEP-1 will be performed by licensed operators.

ATTACHMENT 19
Page 1 of 3

<< McGuire Nuclear Station Specific >>

1. This procedure applies to all departments and personnel with the exception of vendor work performed at MNS in the Water Treatment Building (BLDG 7490) for outsourced water treatment:

   - The boundary valves for this work at MNS are 1RL-340 and 1YM-950

   - This procedure is applicable when tagging the boundary valves.

2. If a maintenance activity involves hydraulic isolation on a system or component that will be open during the maintenance activity and it is not on this list, Danger Tags are required.

   - Operational activities listed in the following table:

Operational Activity
Clean RC pump strainer during routine operations
Feedwater pump seal injection strainer cleaning during routine operations
Reset Fire Protection System Mulsifyre during routine testing and operations
Add or remove balls to the Amertap system as part of normal system operations.
Routine chemical additions performed by approved station procedure.
Routine system sampling performed by approved station procedure.
Routine feed and bleed of closed cooling systems involving no biological hazards.
Filter and media replacement involving exposure only to hydraulic systems at static head pressure and ambient temperature with no biological hazards
Demineralizer sluice and load interfaces for sluice, reference volume, and resin reload activities.

3. Clearances requiring draining or venting that can affect the Control Room will contain a "Comment Tag" or "Step Tag" in Tagging clearances to Contact Control Room prior to draining.

4. Clearances requiring danger tags on sliding links or lifted leads SHALL be walked down prior to preparing the clearance. The SM or SM-Work Control can exempt these walk downs if the area is inaccessible or there will be inappropriate LCO entries for Environmentally Qualified (EQ) sealed terminal cabinets.

5. Clearances associated with an EC should have the following statements or similar statements to ensure the associated system and components will NOT be placed in service without the required OPS Procedure(s), Flow Drawings, Electrical Drawings, being issued and in place. The statement (Section 5.3 Step 1.c(1)) should be added to the "Detail Tab" of the Clearance and a "Comment or Step Tag" in the "Clearance Removal" prior to restoring components:

<< McGuire Nuclear Station Specific >>

a. Add to the "Detail Tab" of the Clearance:

b. PRIOR TO REMOVING THIS CLEARANCE, evaluate the OPS Turnover Acceptance requirements listed in the associated "EC Turnover Milestone" in the associated EC. The required changes listed in the "Notes Section" of that Milestone must be completed prior to "Clearance Removal". Contact OPS ECC with any questions.

c. Add a "Comment or Step Tag" in the "Clearance Removal" prior to restoring components:

d. Evaluate the OPS Turnover Acceptance requirements. Contact OPS ECC with any questions.

6. Electrical components from the following have a known history of induced voltage being present. Clearances for work associated with the following systems or components shall be made Exceptional due to this induced voltage:

- Condensate Polisher system
- Heat Detectors on the Main Transformer Deluge circuits
- Feedwater Heater Emergency High Level Switches
- Slave Relay Contacts in SSPS

7. Red cable ties shall only be used for attaching the following and shall NOT be used for any other purpose:

- Danger Tags
- Danger Release Tags
- Additional Measures

8. Prior to Emergent Clearance Approval, the MNS standard for Emergent Clearances are for Maintenance to review the Clearance.

- Document the completion of the Maintenance review in the 'Details' tab of the Clearance
- The Maintenance review should be completed by a SME for the particular job area or a Maintenance Supervisor.

<< McGuire Nuclear Station Specific >>

◊ Complete the review in accordance with the requirements of Attachment 7, Clearance Holder Checklist

ATTACHMENT 20
Page 1 of 1

<< Oconee Nuclear Station Specific >>

1. If a maintenance activity involves hydraulic isolation on a system or component that will be open during the maintenance activity and it is not on this list, Danger Tags are required.

   - Operational activities listed in the following table

Operational Activity
Reset Fire Protection System Mulsifyre during routine testing and operations
Add or remove balls to the Amertap system as part of normal system operations.
Routine chemical additions performed by approved station procedure.
Routine system sampling performed by approved station procedure.
Routine feed and bleed of closed cooling systems involving no biological hazards.
Filter and media replacement involving exposure only to hydraulic systems at static head pressure and ambient temperature with no biological hazards
Demineralizer sluice and load interfaces for sluice, reference volume, and resin reload activities.

<< Robinson Nuclear Plant Specific >>

1. Motor operated valves using Limitorque Operators, under the following conditions, have experienced problems with the valves drifting open:

   - Operator is in manual
   - Valve is shut
   - Valve is a globe valve
   - A high pressure is present beneath the disc
   - Valve has a fast operating time.(less than 10 sec)

2. The anomaly occurs because the drive gear train is disengaged when in the manual mode. With the high pressure under the seat and the fast operating time with no stem locking feature, the valve operator has insufficient resistance to prevent valves from drifting. An alternative clearance valve or a means for holding valves with these conditions should be used when using such valves for isolation. The following valves have been identified as susceptible to valve drift:

SI-866A	SI-866B

3. During outages, the WCC front counter should not be used for preparation or development of clearances. {7.1.12}

4. Unless a walk down is waived by the SM due to inaccessibility or to minimize dose, the clearance preparer shall perform a work area walk down during the development of a mechanical clearance in which either of the following conditions apply: {7.1.7}

   a. The clearance is original in scope (i.e., no successful historical data)

   b. There are drawing deficiencies or a lack of drawing detail (e.g., pipe unions).

5. Clearances for Out-Buildings (ISFSI, RCP Motor, & O&M) should be Facilities Tagging whenever possible. If unable to utilize Facilities Tagging, then Operations will not develop the clearance based solely on existing drawings, and the following actions shall be taken:

   a. The circuit shall be de-energized and verified 'dead' by the requesting group.

   b. Initiate NCR for Severity Level 4 (Trend Only) issues and take action as appropriate.

<< Robinson Nuclear Plant Specific >>

6. When preparing a Clearance Checklist involving any active component that has a 'fail open', 'fail intermediate', OR 'fail closed' position, then perform the following:

   a. Make every effort to locate a controlled source of information to determine the failed position of any active component associated with the clearance boundary or work activities. (This may require Engineering or Maintenance assistance.)

   b. If a controlled source cannot be located, then perform the following:

      (1) Initiate an CR to capture and resolve the lack of configuration control documentation on the associated component.

      (2) Apply the following additional clearance checklist requirements:

         (a) Document the unavailability of a controlled information source in the Details Tab.

         (b) If possible, then implement steps to manually isolate the component before placing it in its failed position.

         (c) Implement steps to keep the component manually isolated until restored from the failed position.

NOTE

The following verification step is to be performed immediately following the action that places the active component in its checklist-required position. The check must provide positive indication that the desired change of state has actually occurred, such as a local visual verification, remote position indication.

         (d) Add a verification (initial and second check) of the clearance required position of the active component to every hang and lift checklist.

<< Robinson Nuclear Plant Specific >>

7. Use the following instructions when developing clearances:

   a. For Unit-1 or Freeze Protection

      (1) Source voltage verifications shall be performed as necessary to provide assurance that all energy sources have been identified.

         (a) Source voltage verification is not required for components that have a documented history of successful energy isolation.

      (2) Ensure the Clearance is designated as Exceptional.

8. The following RNP fan units have been evaluated by Robinson Nuclear Unit #2 - RES, Maintenance, and Operations for rotation of equipment where a safety hazard to employees or damage to equipment could occur.

   - HVE-3, Iodine Removal Unit
   - HVE-4, Iodine Removal Unit
   - HVH-1, HVAC CV Air Recirculation Cooling Unit
   - HVH-2, HVAC CV Air Recirculation Cooling Unit
   - HVH-3, HVAC CV Air Recirculation Cooling Unit
   - HVH-4, HVAC CV Air Recirculation Cooling Unit
   - HVE-2A, Aux Building Exhaust Unit
   - HVE-2B, Aux Building Exhaust Unit
   - HVS-1, Aux Building Supply Fan
   - HVA-1A, Air Handler for Control Room Heat and Cooling
   - HVA-1B, Air Handler for Control Room Heat and Cooling
   - HVE-19A, Control Room Emergency Air Handler
   - HVE-19B, Control Room Emergency Air Handler
   - HVE-15, Spent Fuel Building Exhaust Air Handler Unit

<< Robinson Nuclear Plant Specific >>

- HVE-15A, Spent Fuel Building Exhaust Air Handler Unit
- HVE-50, Radwaste Facility Exhaust Fan

9. If work scope requires entry into a fan unit listed in Attachment 21 Step 8, then a blocking device or rotational restraint will be used to prevent rotational energy.

   a. If work scope has been reviewed and deemed acceptable by both RNP Maintenance and RNP Operations to NOT block or install a restraint, then the Clearance will be considered Exceptional due to "All stored energy cannot be relieved from within a Boundary or Component to be worked on".

   b. All fans at RNP NOT listed in Attachment 21 Step 8 have been evaluated and use of blocking or restraints are not required to be used during Clearances due to system design.

<< Clearance Form Template >>

Clearance Number:	
Component to be Worked: Location:	
Scope of Work:	
Hazards:	
Operational Impact:	
Special Instructions:	
Attribute Description	Attribute Value
Is this a Clearance with Exceptions?	Yes No
Fire Systems Impact	Yes No
Operations Walkdown Completed by:	Yes No
Maintenance Rule	Yes No

Work Order Tasks	Work Order Task Description
1.	
2.	
3.	

Verification	Name/Signature	Date/Time
Hang Prepared		
Hang Reviewed		
Approved to Hang		
Tags Verified Hung		
Removal Prepared		
Removal Reviewed		
Approved to Remove		
Tags Verified Removed		

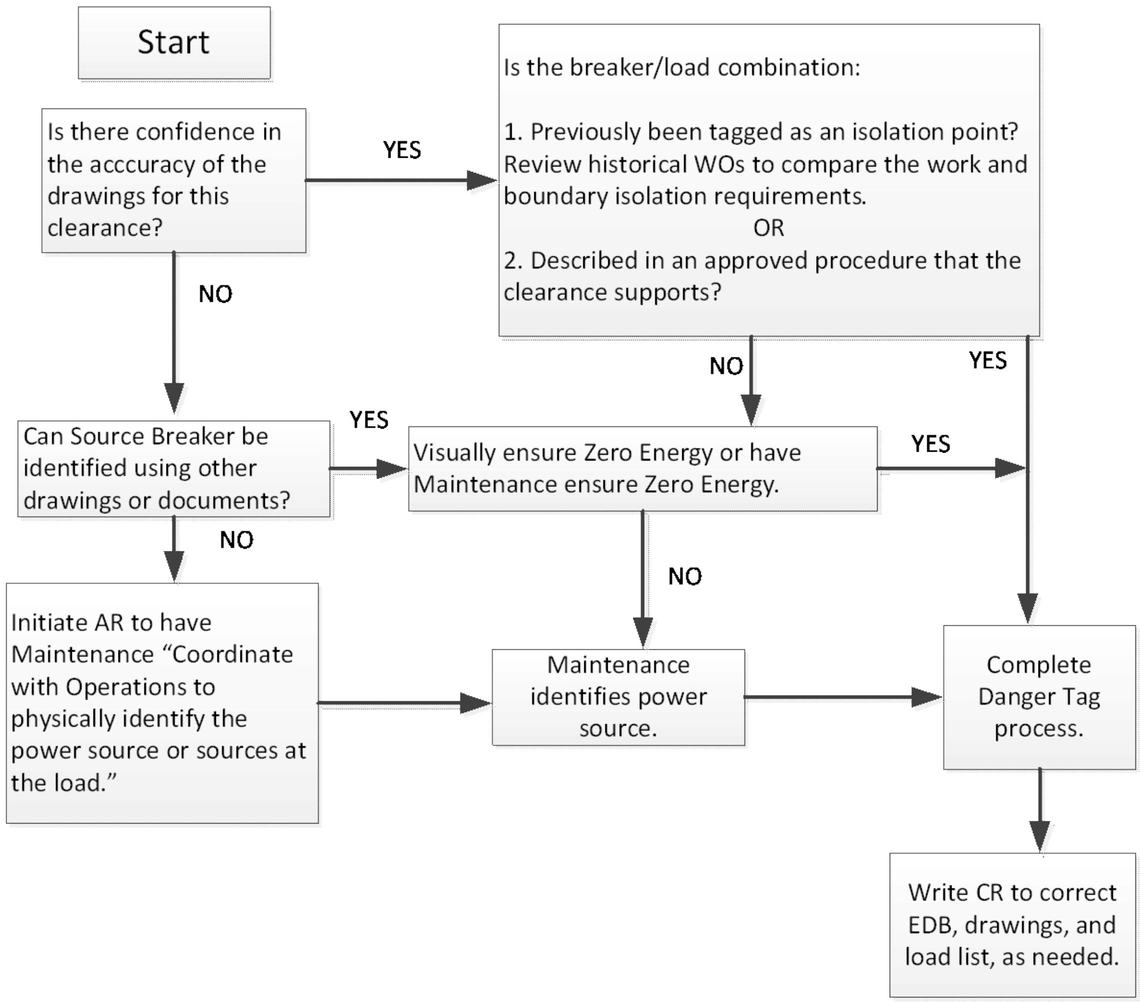
<< Clearance Form Template >>

Clearance:____ Page __ of __ (copy as needed)

Tag Type	Equipment ID	Ver Req	Hang Seq	Placement Configuration	Hang 1st Verf Date/Time	Hang 2nd Verf Date/Time	Ver Req	Rem. Seq	Removal Config.	Rem. 1st Verf Date/Time	Rem. 2nd Verf Date/Time
Serial No	**Description/Location**			**Placement Notes**					**Removal Notes**		

ATTACHMENT 23
Page 1 of 1

<< Flowchart For Low Voltage Panel Breaker Tagging >>



DUKE ENERGY

Reference Use

MCGUIRE UNIT 0

TECHNICAL PROCEDURE (OPERATING)

RP/0/A/5700/004

GENERAL EMERGENCY

REVISION 034

Special Considerations:

EOP-Protected procedure – Any revision to this procedure should be reviewed by an EOP writer.

Q98 References

<< Request For Emergency Exposure >>

Request For Emergency Exposure [Note 1]

Activity	Total Effective Dose Equivalent (TEDE)	Lens of Eye	Other Organs [Note 2]
All	5 rem	15 rem	50 rem
Protecting Valuable Property	10 rem	30 rem	100 rem
Lifesaving or Protection of Large Populations	25 rem	75 rem	250 rem
Lifesaving or Protection of Large Populations [Note 3]	> 25 rem	> 75 rem	> 250 rem

Notes:
1. Excludes declared pregnant women.
2. Includes skin and body extremities.
3. Only on a volunteer basis to persons fully aware of the risks involved. All factors being equal, select volunteers above the age of 45 and those who normally encounter little exposure.

RP Badge No.	Name	Age	Employer	Signature of Individual

My signature indicates my acknowledgment that I have been informed that I may be exposed to the levels of radiation indicated above. I have been fully briefed on the task to be accomplished and on the risks of this exposure.

I, ________________________ acknowledge this planned Emergency Exposure ______________
(RPM or designee, signature or note of verbal authorization) Date/Time

I, ________________________ approve this planned Emergency Exposure at ______________
(Emergency Coordinator or EOF Director, signature or note of verbal authorization) Date/Time

<< Request For Emergency Exposure >>

1. Subsequent Radiation Protection Action:.. ☐
   - **Determine** need for medical evaluation.. ☐
   - **Initiate** reporting requirements per 10CFR20 .... ☐
   - **Copy** to Individual's Exposure History File....................................... ☐

End of Attachment

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EXAM BANK QUESTION: 7297 MNS

C

Given the following Unit 2 conditions:

- The Unit is responding to a large LOCA with 10% failed fuel
- The SM has determined that manual alignment of 2NI-184B (ND PUMP 1B CONT SUMP SUCT) is required to protect valuable property
- RP projects that expected dose rate in the area of the valve is 120 R/hr

The MAXIMUM time limit allowed per RP/0/A/5000/018 (Emergency Worker Dose Extension) to meet the allowed Total Effective Dose Equivalent (TEDE) dose, with necessary extensions applied, for manually opening 2NI-184B is _____(1)_____ minutes. (Disregard any dose received in transit to and from 2NI-184B)

In accordance with RP/018 and considering all other administrative requirements are met, the Emergency Coordinator or _____(2)_____ is authorized to approve the Emergency Exposure.

Which ONE of the following completes the statements above?

A. 1. 12.5
   2. EOF Director

B. 1. 12.5
   2. RP Manager

C. 1. 5.0
   2. EOF Director

D. 1. 5.0
   2. RP Manager

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EXAM BANK QUESTION: 7297 MNS

C

General Discussion

Per RP/18, 10 Rem dose is allowed to protect plant equipment during an emergency following approval of the dose extension. With the given dose rate, 5 minutes is the maximum time limit to manually open 2NI-184B.

Per RP/18, the Emergency Coordinator or EOF Director will approve all emergency dose extensions.

Answer A Discussion

Part 1 is plausible because 25 Rem is allowed to save lives or protect the health and safety of the public.

Part 2 is correct.

Answer B Discussion

Part 1 is plausible because 25 Rem is allowed to save lives or protect the health and safety of the public.

Part 2 is plausible because the RP Manager is required to acknowledge the Emergency Worker Dose Extension, but does not approve it.

Answer C Discussion

CORRECT - See discussion above.

Answer D Discussion

Part 1 is correct.

Part 2 is plausible because the RP Manager is required to acknowledge the Emergency Worker Dose Extension, but does not approve it.

Basis for meeting the KA

KA is matched because candidate must have knowledge of the emergency worker dose limits for equipment saving activities and who can approve the dose limit extensions needed.

Basis for Hi Cog

The KA is of a higher coginitive level due to the applicant being required to apply knowledge of emergency worker dose limits for protecting plant equipment and using the given dose rate in the area, calculate the maximum amount of time that an emergency dose worker could take to manually open 2NI-184B.

Basis for SRO only

This is an SRO Only question linked to 10CFR55.43(b)(4), Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions. This question requires the candidate to have knowledge of emergency dose for equipment saving activities. This level of knowledge is not expected of a Reactor Operator.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	ILT-17 CNS Audit Examination

Development References	Student References Provided
OP-CN-EP-SEP2 obj. 13 (Rev 4) RP/0/A/5000/018 (Rev 2)	

KA	KA_desc
GEN2.3 2.3.14	Radiation ControlKnowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities. (CFR: 41.12 / 43.4 / 45.10)

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. **Check if "Aircraft Probable Threat" exists as follows:**	
a. Notification of the following:	__ a. **GO TO** Step 8.
__ • McGuire - IN FLIGHT PATH OF TRACK OF INTEREST.	
__ • Estimated time to site - LESS THAN 30 MINUTES.	
• Either of the following:	
__ • Large aircraft (defined as aircraft used for long distance, coast to coast flights) - IDENTIFIED AS THREAT.	
OR	
__ • Small aircraft (defined as general aviation aircraft, helicopters, ultralights, etc) - SUSPECTED OF BEING GREATER THREAT THAN SIZE WOULD INDICATE.	
__ b. **GO TO** Enclosure 2 (Aircraft Probable Threat).	

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

6. **Check if "Aircraft Imminent Threat" exists as follows:**

a. Notification of the following:

__ • McGuire - IN FLIGHT PATH OF TRACK OF INTEREST.

__ • Estimated time to site - LESS THAN OR EQUAL TO 5 MINUTES.

• Either of the following:

__ • Large aircraft (defined as aircraft used for long distance, coast to coast flights) - ADJUSTING ALTITUDE TO ALIGN AIRCRAFT WITH SITE.

OR

__ • Small aircraft (defined as general aviation aircraft, helicopters, ultralights, etc) - SUSPECTED OF BEING GREATER THREAT THAN SIZE WOULD INDICATE.

__ b. **GO TO** Enclosure 1 (Aircraft Imminent Threat).

RESPONSE NOT OBTAINED:

a. Perform the following:

__ 1) **IF** threat locally observed (at McGuire Site) **AND** from large aircraft (defined as aircraft used for long distance, coast to coast flights), **THEN GO TO** Enclosure 1 (Aircraft Imminent Threat).

__ 2) **IF** ordered by NRC senior manager to implement "Aircraft Imminent Threat" procedure, **THEN GO TO** Enclosure 1 (Aircraft Imminent Threat).

__ 3) **GO TO** Step 7.

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C

EXAM BANK QUESTION: 5995 MNS

Given the following information:

- The Control Room has been notified by the NRC Headquarters Operations Center that a 747 commercial aircraft has been hijacked
- Ground intelligence indicates a nuclear plant is the intended target
- The airplane's current flight path will intersect with McGuire in **20 minutes**

In accordance with AP-47 (SECURITY EVENTS),

1) the CRS will transition to ________.

2) all non-essential personnel on site will be directed to ________.

PROCEDURE LEGEND:

ENCLOSURE 1 (AIRCRAFT IMMINENT THREAT)
ENCLOSURE 2 (AIRCRAFT PROBABLE THREAT)

Which ONE (1) of the following completes the statements above?

A. 1. ENCLOSURE 1
2. relocate to the MOC

B. 1. ENCLOSURE 1
2. seek shelter in the nearest building

C. 1. ENCLOSURE 2
2. relocate to the MOC

D. 1. ENCLOSURE 2
2. seek shelter in the nearest building

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EXAM BANK QUESTION: 5995 MNS C

General Discussion

Since time to impact is 20 minutes, AP-47 directs the crew to implement Enclosure 2. Enclosure 2 will direct implementation of Enclosure 21 (Site Relocation During Probable Aircraft Threat). Enclosure 21 directs relocation of plant personnel to the MOC.

If impact time was less than 5 minutes, AP-47 would direct transition to Enclosure 1 (Aircraft Imminent Threat).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible because AP-47 requires transition to Enclosure 1 if time to impact is less than 5 minutes.
The second part is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible because AP-47 requires transition to Enclosure 1 if time to impact is less than 5 minutes.
The second part is plausible because if impact time is less than 5 minutes, Enclosure 1 will have the crew make an annoucement per Enclosure 16 for site personnel to seek shelter in the nearest building.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
The first part is correct.
The second part is plausible because if impact time is less than 5 minutes, Enclosure 1 will have the crew make an annoucement per Enclosure 16 for site personnel to seek shelter in the nearest building.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge of the procedure associated with a security event (i.e. AP-47 - Security Events).

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) The question can NOT be answered solely by knowing systems knowledge.
The information in the in the first part of the question is in no way related to systems knowledge.
The second part of the question is related to how a system will be operated under a specific set of conditions. This can only be answered based on detailed procedure knowledge and therefore does not constitute system level knowledge.

2) The question can NOT be answered by knowing immediate operator actions.
There are no immediate actions in AP-47.

3) The question can NOT be answered solely by knowing entry conditions for AOP or direct entry conditions for EOPs.
Neither part of this question deals with with entry conditions of AP-47.

4) The question can NOT be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of the procedure.
This is detailed knowledge of procedure steps and not the purpose, sequence of events, or overall mitigative strategy of he procedure.

5) The question requires the applicant to analyze the conditions given and based on that analysis determine the appropriate procedure transition. Therefore, it is SRO knowledge.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	ILT-31 MNS NRC Examination

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EXAM BANK QUESTION: 5995 MNS C

Development References
REFERENCES: AP-47 (Security Events) AP-47 Background Documents LEARNING OBJECTIVES:

Student References Provided

KA	KA_desc
GEN2.4 2.4.28	Emergency Procedures / PlanKnowledge of procedures relating to a security event (non-safeguards information). (CFR: 41.10 / 43.5 / 45.13)

4.0 GENERAL INFORMATION (continued)

2. Initial Notifications, [8.7.2]:

   a. Initial notifications to the State(s) **AND** counties must be made within 15 minutes of the event declaration using the ENF. .... ☐

   b. The following are designated as Initial Notifications: .... ☐

      - First declaration .... ☐
      - Any upgrade in classification .... ☐
      - Change in PAR. .... ☐

   c. For an upgrade in classification prior to **OR** while transmitting an initial message: .... ☐

      (1) The notification for the lesser emergency classification must be made within 15 minutes of the lesser classification declaration time. .... ☐

      (2) The agencies must be informed that an upgrade in classification will be coming. .... ☐

      (3) The upgraded classification message must be transmitted within 15 minutes of the upgraded classification declaration time. .... ☐

3. Follow-up notifications, Attachment 1, Completion And Transmission Of A Follow-Up Message. .... ☐

4. Event termination notifications, Attachment 2, Completion And Transmission Of A Termination Message. .... ☐

5. ORO is defined as Counties **AND** State Emergency Agencies. .... ☐

5.0 PREREQUISITES

None

CONDUCTING A SITE ASSEMBLY, SITE EVACUATION OR CONTAINMENT EVACUATION

1. Symptoms

1.1 A security event which prompts response by the Security Force, immediate action by plant personnel, and/or assistance from offsite agencies is required to apprehend intruders, mitigate event or prevent radiological sabotage.

1.2 Site Assembly warrants accountability of all personnel on site:

- Alert, Site Area Emergency or General Emergency
- Emergency Coordinator Judgment

NOTE:
- Non-essential personnel may be evacuated from plant site during Site Area Emergency.
- Non-essential personnel shall be evacuated from plant site during General Emergency.

1.3 Site Evacuation warrants evacuation of non-essential personnel:

- Visitors without site contacts along discharge canal, Nature Trail and beach
- Site Area Emergency
- General Emergency
- Emergency Coordinator Judgment

1.4 Containment Evacuation warrants evacuation of personnel from the containment and annulus:

- Unit 1 (2) EMF-39L Trip 2
- Refueling Bridge Radiation Monitor Alarm 1EMF-16 or 2EMF-3 (Auto)
- Hi Flux At Shutdown Alarm from source range detectors (Auto)
- Loss of ND
- Spent Fuel Damage
- Hi flux at shutdown alarm on either WR neutron flux detector
- Emergency Coordinator Judgment

Information Use

NUCLEAR OPERATING FLEET

ADMINISTRATIVE PROCEDURE

AD-EP-ALL-0109

OFFSITE PROTECTIVE ACTION RECOMMENDATIONS

REVISION 4

Effective Dates:

10/24/2018	10/24/2018	10/24/2018	10/24/2018	10/24/2018
Brunswick	Catawba	Harris (HNP)	McGuire	Oconee
10/24/2018	10/24/2018			
Robinson	NGO			

1.0 PURPOSE

1. This procedure provides guidelines for the determination of Protective Action Recommendations (PARs) to be made to offsite authorities.

2.0 SCOPE

1. This procedure is used by all Duke Energy nuclear sites when a General Emergency has been declared.

3.0 DEFINITIONS

1. **Committed Dose Equivalent (CDE):** The radiation dose to a specific organ or tissue received by an individual during the 50-year period following the inhalation or ingestion of radioactive material.

2. **Emergency Release:** Any unplanned, quantifiable airborne radiological release to the environment attributed to the emergency event.

3. **Impediment:** An offsite condition (e.g., flooding, bridge/road closures, traffic control not yet in place) for which offsite agencies have provided prior communication to the site and specifically requested that the site not issue an evacuation PAR.

4. **Non-Summer:** Time period from September 1 to May 31.

3.0 DEFINITIONS (continued)

5. **Protective Action Guideline (PAG):** Projected dose for which the Environmental Protection Agency recommends actions be taken to protect members of the public.

    a. The Protective Action Guides (PAGs), based on EPA-400-R-92-001 Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, are levels of radiation dose, based on Total Effective Dose Equivalent (TEDE) and Committed Dose Equivalent (CDE) Thyroid, at which prompt protective actions should be initiated are as follows:

    - Less than 1 Rem TEDE and less than 5 Rem CDE Thyroid - No Protective Action is required
    - Greater than or equal to 1 Rem TEDE or greater than or equal to 5 Rem CDE Thyroid – Evacuate affected zones
    - Greater than or equal to 5 Rem CDE Thyroid – Consider the use of KI (potassium iodide) for the general public in accordance with State Plans and Policy

6. **Protective Action Recommendations (PARs):** Recommendations made by Duke Energy ERO to state and local agencies to protect members of the public. PARs may include evacuation and sheltering. PARs are made whenever a General Emergency is declared.

7. **Short Term Release**: A release for which the duration can be projected to be less than the time specified on the site specific PAR Worksheet (e.g., a "puff release"). A controlled release may be considered short term if it can be started and stopped at the licensee's discretion, such as the venting of containment for pressure control.

    - Shelter should be considered in lieu of evacuation if a release is short term and controlled.

8. **Site Boundary:** That area, including the protected area, in which Duke Energy has the authority to control all activities, including exclusion or removal of personnel and property.

9. **Staged Evacuation:** A protective action strategy that reduces traffic congestion to emphasize protection of those members of the public most at risk and reduce the overall impact upon the public in the event of the General Emergency.

10. **Summer:** Time period from June 1 to August 31.

Given the following conditions on Unit 1:

0200	A LOCA occurs
0210	The SM declared an Alert
0215	The SM completed the Emergency Notification Form

The LATEST allowable notification time required by RP/0/A/5000/06A (Notifications to States and Counties from the Control Room) is _____(1)_____.

A Site Assembly _____(2)_____ required.

Which ONE of the following completes the statements above?

A. 1. 0225
2. is NOT

B. 1. 0225
2. is

C. 1. 0230
2. is NOT

D. 1. 0230
2. is

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EXAM BANK QUESTION: 6478 CNS

B

General Discussion

In accordance with RP-06A, the state and counties must be notified within 15 minutes of the declaration of an event.

A site assembly is required for all "Alert" and higher classifications.

Answer A Discussion

The first part is correct.

The second part is plausible if the applicant reasons that a site assembly is only required for a SAE and higher.

Answer B Discussion

CORRECT. See explanation above.

Answer C Discussion

First part is plausible because the SM is allowed 15 minutes to make the declaration and an additional 15 minutes is allowed for notification - totaling 30 minutes from discovery of event. However, the notification is required to be made within 15 minutes of declaration.

The second part is plausible if the applicant reasons that a site assembly is only required for a SAE and higher.

Answer D Discussion

First part is plausible because the SM is allowed 15 minutes to make the declaration and an additional 15 minutes is allowed for notification - totaling 30 minutes from discovery of event. However, the notification is required to be made within 15 minutes of declaration.

The second part is correct.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge of the reporting requirements to offsite agencies related to an event that has effected the status of the unit.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant must recall from memory the reporting time requirements to the states and counties (15 minutes).

Next, the applicant must analyze the sequence of events to determine when the "reporting clock" starts, add the appropriate reporting time requirement to the start time, and determine from times in each answer which one corresponds to the calculated time.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	ILT16 CNS Audit Examination

Development References

References:
RP-06A, Encl. 4.1, Note 1

Student References Provided

KA	KA_desc
GEN2.4 2.4.30	Emergency Procedures / PlanKnowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator. (CFR: 41.10 / 43.5 / 45.11)

Facility:	**McGuire**	Scenario No.: **1**	Op Test No.: **N20-1**
Examiners:	____________	Operators:	____________ (SRO)
	____________		____________ (RO)
	____________		____________ (BOP)

Initial Conditions:	The plant is at 100% power (EOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.
Turnover:	The following equipment is Out-Of-Service: The 1A NS Pump is OOS for preventative maintenance. ACTION has been taken in accordance with Technical Specification LCO 3.6.6 ACTION A. 1NCPT-5150, Pzr Pressure Channel 2, has failed and has been removed from service in accordance with plant procedures. ACTION has been taken in accordance with Technical Specification LCO 3.3.1 and 3.3.2. MCB Annunciator 1AD-12, F-5, "FWST EMERGENCY LO TEMP," has alarmed spuriously several times over the last hour and has currently failed ON (IAE has verified that the issue is limited to an annunciator card issue).
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	REM CF0075	C-RO C-SRO	High Pressure Heaters Bypass/Overpower
2	MAL ENB013D	C-BOP C(TS)-SRO	Power Range Failure
3	REM HS0179	R-RO N-BOP N-SRO	MSR Relief Valve fails OPEN/Downpower
4	MAL IRE006K2	C-RO C(TS)-SRO	Dropped Rod/Downpower
5	MAL NCP007BU	C-RO C-BOP C-SRO	1B NCP Pump Bearing Oil Cooler Leak
6	MAL EPL003C	M-RO M-BOP M-SRO	Loss of VIAC 1EKVC/Inadvertent SI Actuation
7	MAL DEH003A	C-RO C-SRO	Failure of the Turbine to Trip in AUTO

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2020 NRC Scenario #1

The plant is at 100% power (EOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.

The following equipment is Out-Of-Service: The 1A NS Pump is OOS for preventative maintenance. ACTION has been taken in accordance with Technical Specification LCO 3.6.6 ACTION A. 1NCPT-5150, Pzr Pressure Channel 2, has failed and has been removed from service in accordance with plant procedures. ACTION has been taken in accordance with Technical Specification LCO 3.3.1 and 3.3.2. MCB Annunciator 1AD-12, F-5, “FWST EMERGENCY LO TEMP,” has alarmed spuriously several times over the last hour and has currently failed ON (IAE has verified that the issue is limited to an annunciator card issue).

Shortly after taking the watch, the High-Pressure Heater Bypass Valve (1CF-75) will inadvertently open. The operator will respond in accordance with OAC Alarm Response Procedure M1L2917, “U1 WATER BYPASSING A&B HEATERS,” and OMP 4-3, “Use of Emergency and Abnormal Procedures and FLEX Support Guidelines,” and immediately reduce Turbine load as needed to maintain Rx power less than pre-transient condition.

After this, Power Range Instrument N42 will drift high. The operator will enter AP/1/A/5500/16, “Malfunction of Nuclear Instrumentation.” The operator will address Technical Specification LCO 3.3.1, “Reactor Trip System (RTS) Instrumentation.”

When the power range channel is removed from service, MSR Relief Valve 1HS179 will fail open causing a loss of turbine efficiency and an increase in reactor power. The operator will implement AP/1/A/5500/01, “Steam Leak.” The operator will recognize the failure and perform a rapid downpower in accordance with AP/1/A/5500/04, “Rapid Downpower,” in an attempt to shut the valve. Eventually the valve will re-close and the downpower will be stabilized.

Subsequently, one Control Bank B Control Rod will drop into the core. The operator will respond in accordance with ARP 1AD-2/D-9, “RPI at Bottom Rod Drop” and will implement AP/1/A/5500/14, “Rod Control Malfunction,” and ultimately reduce power to less than 50% using AP/1/A/5500/04, “Rapid Downpower.” The operator will address Technical Specification LCO 3.1.4, “Rod Group Alignment Limits” and LCO 3.2.4 “Quadrant Power Tilt Ratio (QPTR)”.

During the downpower, a leak will develop on the 1B NCP Upper Bearing Oil Reservoir. The operator will respond in accordance with AP/1/A/5500/08, “Malfunction of NC Pump,” and the operator will be required to trip the reactor, stop the 1B NCP, and go to EP/1/A/5000/E-0, “Reactor Trip and/or Safety Injection.”

Upon the reactor trip, a loss of Vital AC Panel 1EKVC will occur resulting in an inadvertent Safety Injection. Also, on the reactor trip, the Turbine will fail to trip automatically, and must be tripped manually. The operator will enter EP/1/A/5000/E-0, “Reactor Trip or Safety Injection,” reset SI and stop all ECCS Pumps except for one NV Pump.

Ultimately, the crew will transition to step 9 of EP/1/A/5000/ES-1.1, “Safety Injection Termination.”

Once SI is terminated, the operator may address AP/1/A/5500/15, “Loss of Vital or Aux Control Power.”

The scenario will terminate in EP/1/A/5000/ES-1.1 at Step 14.I prior to the operator re-establishing Letdown.

Critical Tasks:

Trip the Reactor prior to stopping the NCP during a low oil level condition and trip the NCP only after Reactor power level has dropped to less than 5%.

Safety Significance: The P-8 interlock allows one NCP to be stopped less than 48% power. If an NCP is stopped in Mode 1 or 2, Tech Spec 3.4.4 requires the unit to be in Mode 3 within 6 hours. In addition, T-ave for the idle loop may violate Tech Spec 3.4.2, minimum temperature for criticality. In this case, the unit must be sub-critical within 30 minutes. The transient placed on the unit when an NCP is secured at power can challenge both reactor protection and control systems. Furthermore, an added burden is placed on the operator to stabilize the unit and shut down within 6 hours (possibly 30 minutes) to comply with Tech Specs. Even though the plant is designed and analyzed to operate in this configuration for a short time, station management has decided that the conservative approach to dealing with this transient is to trip the reactor anytime a NCP malfunction warrants stopping a pump in Mode 1 or 2. Guidance is given to wait until reactor power is less than 5% before stopping the NC pump. This will ensure the NC pump will provide adequate flow/core cooling until reactor power is sufficiently low enough to preclude a challenge to fuel integrity. If the action can be taken, and is not taken, this demonstrates “mis-operation” or incorrect operation that could unnecessarily challenge a fission product barrier (NCS).

Terminate SI by closing NI-9/10 within 15 minutes of SI actuation.

Safety Significance: An inadvertent SI rapidly injects inventory into the NCS causing Pzr Level, and correspondingly, Pzr Pressure to increase. Prolonged recovery unnecessarily challenges the Pzr Code Safety valves. PT/0/A/4600/113, Enclosure 13.6 states that when at NOP/NOT conditions, the FSAR commitment is to have SI terminated within 15 minutes (The Safety Analysis CANNOT credit the cycling of the Pzr PORVs since auto PORV operation can only be assured during LTOP Operation). The Safety Analysis assumes that the Pzr Code Safeties will lift and reseat ONLY if they are cycled for a short time and Pzr liquid temperature remains > 500°F. If this action is not taken, the conclusions of the Safety Analysis are invalid, and violates a License Condition.

Manually trip the Turbine before a valid Orange Path develops on the Subcriticality or Integrity Critical Safety Function.

Safety Significance: Failure to trip the Main Turbine when conditions exist that allow the operator to do so, constitutes mis-operation or incorrect operator performance that unnecessarily challenges the Subcriticality or Integrity Critical Safety Function. An overcooling event in the presence of an inadvertent actuation of Safety Injection creates the potentiality of creating a Pressurized Thermal Shock conditions that otherwise would not exist. It is necessary to specify the valid Orange Path on the Critical Safety Function Status Trees because due to a previous failure (Power Range Channel N42 fails high) the OAC will indicate a Red Path on Subcriticality post-reactor trip.

PROGRAM: McGuire Operations Training

MODULE: Initial License Operator Training Class ILT 20-1

TOPIC: NRC Simulator Exam

Scenario N20-1-1

REFERENCES:

1. Technical Specification LCO 3.3.1, “Reactor Trip System (RTS) Instrumentation” (184/166)
2. Technical Specification LCO 3.3.2, “Engineered Safety Feature Actuation System (ESFAS) Instrumentation” (Amendment 184/166)
3. Technical Specification LCO 3.6.6, “Containment Spray System” (Amendment 308/287)
4. PT/0/A/4600/113, “McGuire Time Critical Action/Time Sensitive Actions” (Rev 28)
5. OMP 4-3, “Use of Emergency and Abnormal Procedures and FLEX Support Guidelines” (Rev 48)
6. AP/1/A/5500/16, “Malfunction of Nuclear Instrumentation” (Rev 15)
7. AP/1/A/5500/01, “Steam Leak” (Rev 19)
8. AP/1/A/5500/04, “Rapid Downpower” (Rev 31)
9. AP/1/A/5500/14, “Rod Control Malfunction” (Rev 16)
10. Technical Specification LCO 3.1.4, “Rod Group Alignment Limits” (Amendment 184/166)
11. Technical Specification LCO 3.2.4, “Quadrant Power Tilt Ratio (QPTR)” (Amendment 184/166)
12. OP/1/A/6100/010 C, “Annunciator Response for Panel 1AD-12” (Rev 71)
13. AP/1/A/5500/08, “Malfunction of NC Pump” (Rev 17)
14. EP/1/A/5000/E-0, “Reactor Trip or Safety Injection” (Rev 36)
15. EP/1/A/5000/ES-1.1, “Safety Injection Termination” (Rev 30)

Validation Time: 120 minutes

Author: David Lazarony, Essential Training & Consulting, LLC

Facility Review: ________________________

Rev. 101419

McGuire 2020 NRC Scenario #1 Objectives:

Given the simulator at an initial condition of 100% power evaluate:

1. the SRO's ability to supervise the control room team during the normal, abnormal, and emergency situations that arise, including compliance with all facility procedures, Technical Specifications, and other commitments.

2. each crew member's ability to effectively communicate as part of a control room team during the normal, abnormal, and emergency situations that arise.

3. the RO's ability to effectively diagnose and mitigate the consequences an overpower event in accordance with OMP 4-3, "Use of Emergency and Abnormal Procedures and FLEX Support Guidelines."

4. each crew member's ability to effectively diagnose an Excore Power Range Instrument failure and the BOP's ability to mitigate the consequences in accordance with AP/1/A/5500/16, "Malfunction of Nuclear Instrumentation."

5. each crew member's ability to effectively diagnose a failed open MSR Relief Valve and the RO and BOP's ability to respond to such an event in accordance with AP/1/A/5500/01, "Steam Leak."

6. each crew member's ability to conduct a rapid downpower in accordance with AP/1/A/5500/04, "Rapid Downpower," whenever plant conditions dictate the need to do so."

7. each crew member's ability to effectively diagnose a dropped control rod at power, and the RO's ability to respond to such an event in accordance with AP/1/A/5500/14, "Rod Control Malfunction."

8. each crew member's ability to effectively diagnose an NCP Pump Bearing Oil Cooler leak, and their ability to respond to such an event in accordance with AP/1/A/5500/08, "Malfunction of NC Pump."

9. each crew member's ability to effectively diagnose an inadvertent actuation of Safety Injection and the RO and BOP's ability to respond to such an event in accordance with EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," and EP/1/A/5000/ES-1.1, "Safety Injection Termination."

10. the RO's ability to determine that the Main Turbine has failed to automatically trip during a reactor trip from power and take action to manually trip the Main Turbine.

Facility: **McGuire**		Scenario No.: **1**	Op Test No.: **N20-1**
Examiners:		Operators:	(SRO)
			(RO)
			(BOP)

Initial Conditions:	The plant is at 100% power (EOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.
Turnover:	The following equipment is Out-Of-Service: The 1A NS Pump is OOS for preventative maintenance. ACTION has been taken in accordance with Technical Specification LCO 3.6.6 ACTION A. 1NCPT-5150, Pzr Pressure Channel 2, has failed and has been removed from service in accordance with plant procedures. ACTION has been taken in accordance with Technical Specification LCO 3.3.1 and 3.3.2. MCB Annunciator 1AD-12, F-5, "FWST EMERGENCY LO TEMP," has alarmed spuriously several times over the last hour and has currently failed ON (IAE has verified that the issue is limited to an annunciator card issue).
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	REM CF0075	C-RO C-SRO	High Pressure Heaters Bypass/Overpower
2	MAL ENB013D	C-BOP C(TS)-SRO	Power Range Failure
3	REM HS0179	R-RO N-BOP N-SRO	MSR Relief Valve fails OPEN/Downpower
4	MAL IRE006K2	C-RO C(TS)-SRO	Dropped Rod/Downpower
5	MAL NCP007BU	C-RO C-BOP C-SRO	1B NCP Pump Bearing Oil Cooler Leak
6	MAL EPL003C	M-RO M-BOP M-SRO	Loss of VIAC 1EKVC/Inadvertent SI Actuation
7	MAL DEH003A	C-RO C-SRO	Failure of the Turbine to Trip in AUTO

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2020 NRC Scenario #1

The plant is at 100% power (EOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.

The following equipment is Out-Of-Service: The 1A NS Pump is OOS for preventative maintenance. ACTION has been taken in accordance with Technical Specification LCO 3.6.6 ACTION A. 1NCPT-5150, Pzr Pressure Channel 2, has failed and has been removed from service in accordance with plant procedures. ACTION has been taken in accordance with Technical Specification LCO 3.3.1 and 3.3.2. MCB Annunciator 1AD-12, F-5, "FWST EMERGENCY LO TEMP," has alarmed spuriously several times over the last hour and has currently failed ON (IAE has verified that the issue is limited to an annunciator card issue).

Shortly after taking the watch, the High-Pressure Heater Bypass Valve (1CF-75) will inadvertently open. The operator will respond in accordance with OAC Alarm Response Procedure M1L2917, "U1 WATER BYPASSING A&B HEATERS," and OMP 4-3, "Use of Emergency and Abnormal Procedures and FLEX Support Guidelines," and immediately reduce Turbine load as needed to maintain Rx power less than pre-transient condition.

After this, Power Range Instrument N42 will drift high. The operator will enter AP/1/A/5500/16, "Malfunction of Nuclear Instrumentation." The operator will address Technical Specification LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation."

When the power range channel is removed from service, MSR Relief Valve 1HS179 will fail open causing a loss of turbine efficiency and an increase in reactor power. The operator will implement AP/1/A/5500/01, "Steam Leak." The operator will recognize the failure and perform a rapid downpower in accordance with AP/1/A/5500/04, "Rapid Downpower," in an attempt to shut the valve. Eventually the valve will re-close and the downpower will be stabilized.

Subsequently, one Control Bank B Control Rod will drop into the core. The operator will respond in accordance with ARP 1AD-2/D-9, "RPI at Bottom Rod Drop" and will implement AP/1/A/5500/14, "Rod Control Malfunction," and ultimately reduce power to less than 50% using AP/1/A/5500/04, "Rapid Downpower." The operator will address Technical Specification LCO 3.1.4, "Rod Group Alignment Limits" and LCO 3.2.4 "Quadrant Power Tilt Ratio (QPTR)".

During the downpower, a leak will develop on the 1B NCP Upper Bearing Oil Reservoir. The operator will respond in accordance with AP/1/A/5500/08, "Malfunction of NC Pump," and the operator will be required to trip the reactor, stop the 1B NCP, and go to EP/1/A/5000/E-0, "Reactor Trip and/or Safety Injection."

Upon the reactor trip, a loss of Vital AC Panel 1EKVC will occur resulting in an inadvertent Safety Injection. Also, on the reactor trip, the Turbine will fail to trip automatically, and must be tripped manually. The operator will enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," reset SI and stop all ECCS Pumps except for one NV Pump.

Ultimately, the crew will transition to step 9 of EP/1/A/5000/ES-1.1, "Safety Injection Termination."

Once SI is terminated, the operator may address AP/1/A/5500/15, "Loss of Vital or Aux Control Power."

The scenario will terminate in EP/1/A/5000/ES-1.1 at Step 14.l prior to the operator re-establishing Letdown.

Critical Tasks:

Trip the Reactor prior to stopping the NCP during a low oil level condition and trip the NCP only after Reactor power level has dropped to less than 5%.

Safety Significance: The P-8 interlock allows one NCP to be stopped less than 48% power. If an NCP is stopped in Mode 1 or 2, Tech Spec 3.4.4 requires the unit to be in Mode 3 within 6 hours. In addition, T-ave for the idle loop may violate Tech Spec 3.4.2, minimum temperature for criticality. In this case, the unit must be sub-critical within 30 minutes. The transient placed on the unit when an NCP is secured at power can challenge both reactor protection and control systems. Furthermore, an added burden is placed on the operator to stabilize the unit and shut down within 6 hours (possibly 30 minutes) to comply with Tech Specs. Even though the plant is designed and analyzed to operate in this configuration for a short time, station management has decided that the conservative approach to dealing with this transient is to trip the reactor anytime a NCP malfunction warrants stopping a pump in Mode 1 or 2. Guidance is given to wait until reactor power is less than 5% before stopping the NC pump. This will ensure the NC pump will provide adequate flow/core cooling until reactor power is sufficiently low enough to preclude a challenge to fuel integrity. If the action can be taken, and is not taken, this demonstrates "mis-operation" or incorrect operation that could unnecessarily challenge a fission product barrier (NCS).

Terminate SI by closing NI-9/10 within 15 minutes of SI actuation.

Safety Significance: An inadvertent SI rapidly injects inventory into the NCS causing Pzr Level, and correspondingly, Pzr Pressure to increase. Prolonged recovery unnecessarily challenges the Pzr Code Safety valves. PT/0/A/4600/113, Enclosure 13.6 states that when at NOP/NOT conditions, the FSAR commitment is to have SI terminated within 15 minutes (The Safety Analysis CANNOT credit the cycling of the Pzr PORVs since auto PORV operation can only be assured during LTOP Operation). The Safety Analysis assumes that the Pzr Code Safeties will lift and reseat ONLY if they are cycled for a short time and Pzr liquid temperature remains > 500°F. If this action is not taken, the conclusions of the Safety Analysis are invalid, and violates a License Condition.

Manually trip the Turbine before a valid Orange Path develops on the Subcriticality or Integrity Critical Safety Function.

Safety Significance: Failure to trip the Main Turbine when conditions exist that allow the operator to do so, constitutes mis-operation or incorrect operator performance that unnecessarily challenges the Subcriticality or Integrity Critical Safety Function. An overcooling event in the presence of an inadvertent actuation of Safety Injection creates the potentiality of creating a Pressurized Thermal Shock conditions that otherwise would not exist. It is necessary to specify the valid Orange Path on the Critical Safety Function Status Trees because due to a previous failure (Power Range Channel N42 fails high) the OAC will indicate a Red Path on Subcriticality post-reactor trip.

SIMULATOR OPERATOR INSTRUCTIONS

	Bench Mark	ACTIVITY	DESCRIPTION
☐		**Reset to Temp IC 230** **(Base IC-53, [100% EOL])**	**T = 0 Malfunctions (From IC-53):** **insert LOA_NS005 eq RACKED_OUT, insert LOA_NS005A eq RACKED_OUT (1A NS Pump is OOS)** **insert XMT_NC_1NCPT5150 eq 1700 (1NCPT-5150 is OOS)** **insertBST_NC_PB_456A SET** **insertBST_NC_PB_456C SET** **insertBST_NC_PB_456D SET** **insertBST_NC_TB_421C SET** **insert OVR_1AD12_F05 eq ON (MCB Annunciator 1AD12/F5)** **insert MAL_EPL003C eq ACTIVE (Loss of EKVC); cd = H_X01_094_2 = 1 (RTB Open Light)** **insert MAL_DEH003A (Failure of the Turbine to Trip in AUTO)**
☐		**RUN** **Reset all SLIMs**	**Place Tagout/O-Stick on:** • **1A NS Pump (Tagout)** • **1NCPT-5150 (O-stick)** • **MCB Annunciator 1AD12/F5 (O-stick)**
☐		**Update** Status Board, **Setup OAC**	**NOTE:** RMWST DO = >1000 ppb.
☐		**Freeze.**	
☐		**Update Fresh Tech. Spec. Log.**	
☐		**Fill out the AO's Available section of Shift Turnover Info.**	
☐	Prior to Crew Briefing	**RUN**	

	Bench Mark	ACTIVITY	DESCRIPTION
☐	**Crew Briefing** 1. Assign Crew Positions based on evaluation requirements 2. Review the Shift Turnover Information with the crew. 3. Direct the crew to Review the Control Boards taking note of present conditions, alarms.		
☐	T-0	Begin Familiarization Period	
☐	At direction of examiner	**Execute Simulator Scenario N20-1-1.**	
☐	At direction of examiner	**Event 1** **Insert REM_CF0075=0.5, Ramp = 30**	High Pressure Heaters Bypass/Overpower
☐	At direction of examiner	**Event 2** **Insert MAL_ENB013D = 100 (High)** **Ramp = 20 Seconds**	Power Range Failure
☐	At direction of examiner	**Event 3** **insert REM_HS0179 = 1.0**	MSR Relief Valve fails OPEN/Downpower
☐	At direction of examiner	**Event 4** **insert MAL_IRE006K2 STATIONARY_GRPPR (Control Rod K2 drops)**	Dropped Rod/Downpower
☐	At direction of examiner	**Event 5** **insertMAL_NCP007BU = TRUE**	1B NCP Pump Bearing Oil Cooler Leak

	Bench Mark	ACTIVITY	DESCRIPTION
☐	Post-Rx Trip	**Event 6** **Insert MAL_EPL003C= ACTIVE (cd = H_X01_094_2 = 1)**	Loss of VIAC 1EKVC/Inadvertent SI Actuation **NOTE: The Loss of VIAC 1EKVC will occur on Rx Trip.**
☐	Post-Rx Trip	**Event 7** **Insert:** **MAL_DEH003A = 2**	Failure of the Turbine to Trip in AUTO **NOTE: The Malfunction is inserted at T=0.**
☐	**Terminate the scenario upon direction of Lead Examiner**		

Op Test No.:	N20-1	Scenario #	1	Event #	1	Page	9 of 59
Event Description:	**High Pressure Heaters Bypass/Overpower**						

Shortly after taking the watch, the High-Pressure Heater Bypass Valve (1CF-75) will inadvertently open. The operator will respond in accordance with OAC Alarm Response Procedure M1L2917, “U1 WATER BYPASSING A&B HEATERS,” and OMP 4-3, “Use of Emergency and Abnormal Procedures and FLEX Support Guidelines,” and immediately reduce Turbine load as needed to maintain Rx power less than pre-transient condition.

Booth Operator Instructions: **Insert REM_CF0075=0.5, Ramp = 30**

Indications Available:

- OAC Alarm M1L2917 (U1 Water Bypassing A&B Heaters).
- TPBE will update over 100%.
- Excore NI’s will read in excess of 100%.
- Main Generator MW output rises.

Time	Pos.	Expected Actions/Behavior	Comments
		M1L2917, U1 WATER BYPASSING A&B HEATERS	
	CRS	(Step 1) Dispatch operator to check position of 1CF-75 (HP HTRS Bypass Vlv).	
	CRS	(Step 2) Investigate for leakage through 1CF-75 (HP HTRS Bypass Vlv).	
	CRS	(Step 3) Notify System Engineering.	
			NOTE: The crew may diagnose an overpower condition and adjust turbine load per OMP 4-3.
		OMP 4-3, USE OF EMERGENCY AND ABNORMAL PROCEDURES AND FLEX SUPPORT GUIDELINES **ATTACHMENT 10.1, PRUDENT OPERATOR ACTIONS**	
	RO	Transient Load Changes	

Op Test No.:	N20-1	Scenario #	1	Event #	1	Page	10 of 59
Event Description:	**High Pressure Heaters Bypass/Overpower**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Manual is preferred - Immediately reduce up to 20 MWe and then reduce as needed to maintain reactor power less than pre-transient condition. After the initial load reduction, the operators should use multiple and diverse indications to determine any additional load reduction.	
		• TPBE on the OAC updates once per minute. Other indications (PR meters and Delta T meters) will indicate reactor response more quickly and will enable the operators to control the plant more precisely. (This combines the Operator Fundamentals of Conservatism and Controlling Plant Evolutions Precisely.)	
			NOTE: The CRS will dispatch an AO. If so, **Floor/Booth Instructor** acknowledge as AO. Wait **3 minutes** of time, and report that 1CF-75 is OPEN.
			NOTE: The CRS may call WCC/IAE to address the valve position. If so, **Booth Instructor** acknowledge as WCC. If the CRS directs that the valve be closed, **Booth Instructor**, as the WCC Supervisor, inform CRS that IAE will investigate prior to operating valve.
			NOTE: The CRS will likely conduct a Focus Brief.
At the discretion of the Lead Examiner move to Event #2.			

Op Test No.:	N20-1	Scenario #	1	Event #	2	Page	11 of 59
Event Description:	**Power Range Failure**						

After this, Power Range Instrument N42 will drift high. The operator will enter AP/1/A/5500/16, "Malfunction of Nuclear Instrumentation." The operator will address Technical Specification LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation."

Booth Operator Instructions: **Insert MAL_ENB013D = 100 (High) Ramp = 20 Seconds**

Indications Available:

- MCB Annunciator 1AD-2 B3, P/R CHANNEL DEVIATION
- MCB Annunciator 1AD-2 C8, P/R OVERPOWER ROD STOP
- MCB Annunciator 1AD-2 A8, OTDT RUNBACK/ROD STOP ALERT
- MCB Annunciator 1AD-2 E8, DCS TROUBLE
- MCB Annunciator 1AD-6, F8, OPDT PROTECTION ALERT
- MCB PR N42 indicates HIGHER than other Power Range channels
- PR N42 Drawer indicates HIGHER than other Power Range drawers
- PR N42 Drawer Upper Detector indicates HIGH.

Time	Pos.	Expected Actions/Behavior	Comments
		AP/1/A/5500/16, MALFUNCTION OF NUCLEAR INSTRUMENTATION CASE III, POWER RANGE MALFUNCTION	
	RO	(Step 1) Place control rods in manual.	
	RO	(Step 2) Check S/G levels – AT PROGRAMMED LEVEL.	
	CRS	(Step 3) Announce occurrence on paging system.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 4) Check P/R channels – ONLY ONE CHANNEL FAILED.	**NOTE:** A Channel Check will reveal that only N42 has failed.
	CRS	(Step 5) Secure any power increase in progress.	

Op Test No.:	N20-1	Scenario #	1	Event #	2	Page	12	of	59
Event Description:	**Power Range Failure**								

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 6) Check the following interlocks – IN REQUIRED STATE FOR EXISTING PLANT CONDITONS:	
		• P-7 Lo Power Rx Trips Blocked	
		• P-8 Hi Pwr Lo Flo Rx Trip Blocked	
		• P-10 Nuclear at Power.	
	BOP	(Step 7) Perform the following actions at the “MISCELLANIOUS CONTROL AND INDICATION PANEL” drawer:	
		• Place the appropriate “ROD STOP BYPASS” switch to the failed channel position.	**NOTE:** The BOP will operate the switch for N42.
		• Place the “POWER MISMATCH BYPASS” switch to the failed channel position.	**NOTE:** The BOP will place the switch in the N42 position.
	BOP	(Step 8) Perform the following actions at the “DETECTOR CURRENT COMPARATOR” drawer:	
		• Place the “UPPER SECTION” switch to the failed channel position.	**NOTE:** The BOP will place the switch in the N42 position.
		• Check the “CHANNEL DEFEAT” light for the upper section – LIT.	
		• Place the “LOWER SECTION” switch to the failed channel position.	**NOTE:** The BOP will place the switch in the N42 position.
		• Check the “CHANNEL DEFEAT” light for the lower section – LIT.	
	BOP	(Step 9) Perform the following action at the “COMPARATOR AND RATE” drawer:	
		• Place the “COMPARATOR CHANNEL DEFEAT” switch to the failed channel position.	**NOTE:** The BOP will place the switch in the N42 position.
		• Check the “COMPARATOR DEFEAT” light – LIT.	

Op Test No.:	N20-1	Scenario #	1	Event #	2	Page	13 of 59
Event Description:	**Power Range Failure**						

Time	Pos.	Expected Actions/Behavior	Comments
NOTE Removing fuses from power range drawers may cause associated NIS annunciators to alarm.			
	BOP	(Step 10) Trip bistables of failed channel as follows:	
		• Remove Control Power fuses from "POWER RANGE A" drawer for failed channel.	**NOTE:** This action will cause Annunciators to alarm on MCB Panel 1AD-2.
	BOP	• IF Power Range Cabinet shows evidence of damage …	**NOTE:** There is no such evidence displayed.
	BOP/ RO	(Step 11) Check the following status lights for the failed channel – LIT:	
		• "NUC OVERPOWER ROD STOP CH I(II, III, IV) BYP" (1SI-19)	
		• "P/R HI FLUX LO STPT" (1SI-2)	
		• "P/R HI FLUX HI STPT" (1SI-2)	
		• "P/R HI FLUX RATE" (1SI-3)	
	BOP/ RO	(Step 12) Check the following annunciator lights – LIT:	
		• "P/R HI VOLTAGE FAILURE" (1AD-2, F-3)	
		• "P/R HI FLUX HI STPT ALERT" (1AD-2. A-3)	
		• "P/R HI FLUX RATE ALERT" (1AD-2, A-1)	
	BOP/ RO	(Step 13) Check the following status lights on 1SI-18 – LIT:	
		• "P/R LO SETPOINT TRAIN A TRIP BLOCKED"	
		• "P/R LO SETPOINT TRAIN B TRIP BLOCKED"	

Op Test No.:	N20-1	Scenario #	1	Event #	2	Page	14 of	59
Event Description:		**Power Range Failure**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 14) Check all CF control valves – IN AUTO.	
	RO	(Step 15) Adjust control rods to maintain T-Avg at T-Ref.	
	RO	(Step 16) WHEN T-Avg within 1°F of T-Ref AND auto rod control desired, THEN return control rods to auto.	**NOTE:** The RO may place the Control Rods back in AUTO.
	CRS	(Step 17) Instruct IAE to trip the following bistables associated with failed P/R channel within 72 hours of failure PER IP/1/A/3090/014 (Tripping Inoperable Protection Channels):	**NOTE:** The CRS may call WCC/IAE to address the failed channel and insert bistables. If so, **Booth Instructor** acknowledge as WCC (Note that there are already four Channel II Bistables tripped already due to the failed Pzr Pressure Channel).
		• OPDT	
		• OTDT	
	CRS	(Step 18) IF AT ANY TIME failed P/R channel is repaired prior to IAE tripping bistables,….	**NOTE:** The Power Range Channel will NOT be repaired.
	CRS	(Step 20) IF AT ANY TIME IAE completes Step 17….	**NOTE:** IAE will not complete Step 17.
	CRS	(Step 20) WHEN malfunctioning P/R channel repaired, …..	
			NOTE: The CRS will likely conduct a Focus Brief.
TECHNICAL SPECIFICATION 3.3.1, REACTOR TRIP SYSTEM (RTS) INSTRUMENTATION			

Op Test No.:	N20-1	Scenario #	1	Event #	2	Page	15 of 59
Event Description:	**Power Range Failure**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	LCO 3.3.1 The RTS instrumentation for each Function in Table 3.3.1-1 shall be OPERABLE	
	CRS	APPLICABILITY: According to Table 3.3.1-1	
		ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one or more required channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.1-1 for the channel(s).	Immediately **NOTE:** The CRS will determine that Functions 2a, 2b, 3, 6, 7, 16b, 16c, and 16d are affected by this failure and that Condition A is required and that ACTION A.1 must be taken.
D. One channel inoperable	D.1.1 Perform SR 3.2.4.2 AND D.1.2 Place channel in trip. OR D.2 Be in MODE 3	12 hours 72 hours 78 Hours **NOTE:** This Action is associated with Functions 2.a and 3 (Hi Flux Hi setpoint and hi positive rate trips).
E. One channel inoperable.	E.1 Place channel in trip. OR E.2 Be in MODE 3	72 hours 78 hours **NOTE:** This Action is associated with Functions 2.b, 6 and 7 (Hi Flux Lo setpoint, OPDT and OTDT trips).

Op Test No.:	N20-1	Scenario #	1	Event #	2	Page	16 of 59
Event Description:	**Power Range Failure**						

Time	Pos.	Expected Actions/Behavior	Comments
T. One or more channel(s) inoperable.		T.1 Verify interlock is in required state for existing unit conditions. OR T.2 Be in MODE 2	1 hour 7 hours **NOTE:** This Action is associated with Functions 16.b and 16.c (P-7 and P-8)
S. One or more channel(s) inoperable.		S.1 Verify interlock is in required state for existing unit conditions. OR S.2 Be in MODE 3	1 hour 7 hours **NOTE:** This Action is associated with Function 16.c (P-10).
			NOTE: The CRS will likely conduct a Focus Brief.
At the discretion of the Lead Examiner move to Event #3.			

Op Test No.:	N20-1	Scenario #	1	Event #	3	Page	17	of	59
Event Description:	MSR Relief Valve fails OPEN/Downpower								

When the power range channel is removed from service, MSR Relief Valve 1HS179 will fail open causing a loss of turbine efficiency and an increase in reactor power. The operator will implement AP/1/A/5500/01, "Steam Leak." The operator will recognize the failure and perform a rapid downpower in accordance with AP/1/A/5500/04, "Rapid Downpower," in an attempt to shut the valve. Eventually the valve will re-close and the downpower will be stabilized.

Booth Operator Instructions: **insert REM_HS0179 = 1.0 (Once inserted reduce size to ensure that leak stays within allowable makeup limit).**

Indications Available:

- Turbine MWe lowers rapidly
- Core ΔTs initially lowers and then starts to rise
- Reactor power rises
- Steam pressure initially lowers and then starts to rise
- OAC Alarm: 1C1 L/P TURBINE CROSSOVER STEAM TEMP RATE
- OAC Alarm: 1C2 L/P TURBINE CROSSOVER STEAM TEMP RATE

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The crew may diagnose an overpower condition and adjust turbine load per OMP 4-3.
OMP 4-3, USE OF EMERGENCY AND ABNORMAL PROCEDURES AND FLEX SUPPORT GUIDELINES ATTACHMENT 10.1, PRUDENT OPERATOR ACTIONS			
	RO	Transient Load Changes	
		• Manual is preferred - Immediately reduce up to 20 MWe and then reduce as needed to maintain reactor power less than pre-transient condition. After the initial load reduction, the operators should use multiple and diverse indications to determine any additional load reduction.	

Op Test No.:	N20-1	Scenario #	1	Event #	3	Page	18 of 59
Event Description:		**MSR Relief Valve fails OPEN/Downpower**					

Time	Pos.	Expected Actions/Behavior	Comments
		• TPBE on the OAC updates once per minute. Other indications (PR meters and Delta T meters) will indicate reactor response more quickly and will enable the operators to control the plant more precisely. (This combines the Operator Fundamentals of Conservatism and Controlling Plant Evolutions Precisely.)	
AP/1/A/5500/01, STEAM LEAK			
			NOTE: The CRS may dispatch AOs to look for steam leaks. If so, **Booth Instructor** as AO, respond back in 3-5 minutes per script (See **Page 20**). After 3-5 minutes of Non-investigatory Action, Call as Security and report **Steam Release to atmosphere on U1 TB Roof**.
	RO/ BOP	(Step 1) Monitor Foldout page.	
		Manual Reactor Trip Criteria: (IF any of the following occur: (1) Steam leak is jeopardizing personnel safety or plant equipment, (2) T-Avg is less than 551°F AND going down, or (3) UST level is less than 1 ft – NOT Expected).	
	RO	(Step 2) Reduce turbine load to maintain the following:	**NOTE:** The RO may take the Turbine Control to MANUAL.
		• Excore NI's – LESS THAN OR EQUAL TO 100%	**NOTE:** Per OMP 4-3, the RO has the authority to remove ≈20 Mwe initially, and then additional load as needed to stabilize temperature.
		• NC Loop D/T's – LESS THAN 60ºF D/T	
		• T-Avg – AT T-REF.	

Op Test No.:	N20-1	Scenario #	1	Event #	3	Page	19 of 59
Event Description:	**MSR Relief Valve fails OPEN/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS/ BOP	(Step 3) Check containment entry – IN PROGRESS.	**NOTE:** There is no Containment Entry in progress.
	CRS	(Step 3 RNO) GO TO Step 5.	
	BOP	(Step 5) Check Pzr pressure prior to event – GREATER THAN P-11 (1955 PSIG)	
	BOP	(Step 6) Check Pzr level – STABLE OR GOING UP	**NOTE:** If Pzr level is lowering the crew will perform the RNO prior to performing Step 7.
	CRS	(Step 7) IF AT ANY TIME while in this procedure Pzr level cannot be maintained stable, THEN RETURN TO Step 6.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 8) GO TO Step 12.	
	CRS	(Step 12) Announce occurrence on paging system.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 13) Identify and isolate leak on Unit 1 as follows:	
		• Check SM PORVs – CLOSED.	
		• Check condenser dump valves – CLOSED.	
	BOP	• Check containment conditions – NORMAL:	
		• Containment temperature	
		• Containment pressure	
		• Containment humidity	

Op Test No.:	N20-1	Scenario #	1	Event #	3	Page	20 of 59
Event Description:	**MSR Relief Valve fails OPEN/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Containment floor and equipment sump level.	
		• Check TD CA pump – OFF.	
		• Check valves on "STEAM LINE DRAIN VALVES" board (1MC-9) - CLOSED.	**NOTE:** The BOP may need to perform the RNO and close valves.
	RO/ BOP	• Check opposite Unit (Unit 2) "STEAM HEADER PRESSURE" – GREATER THAN 200 PSIG.	**NOTE:** The CRS will ask U2 RO. If so, **Floor Instructor** acknowledge as U2 RO, and report U2 Steam Header Pressure is ≈1000 psig.
	CRS	• Dispatch operator to check for leaks.	**NOTE:** If not already done, the CRS will dispatch AOs to look for steam leaks. After **2-3 minutes**, **Booth Instructor,** as **AO**, report that **MSR 1C1 Shell Side Relief Valve (1HS179) is lifting**.
	BOP	(Step 14) Check UST level – STABLE OR GOING UP.	**NOTE:** The UST level may be rising or lowering. If rising go to Step 15.
	BOP	(Step 14 RNO) Makeup to UST as required to maintain level.	
	CRS	(Step 15) Evaluate unit shutdown as follows:	
		• Check unit status – IN MODE 1 OR 2.	
		• Determine if unit shutdown or load reduction is warranted based on the following criteria:	
		• Size of leak	
		• Location of leak	
		• Rate of depletion of secondary inventory	

Op Test No.:	N20-1	Scenario #	1	Event #	3	Page	21 of 59
Event Description:	**MSR Relief Valve fails OPEN/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
		• IF steam is leaking from a secondary heater relief OR MSR relief valve, THEN reducing turbine load may reduce pressure enough to close relief valve.	**NOTE:** Steam is leaking from an MSR relief valve.
		• IF turbine trip will isolate steam leak (such as feedwater heater leak or MSR leak), THEN it may be desirable to perform an orderly shutdown of the turbine and maintain reactor power in Mode 1.	**NOTE:** It is NOT necessary to trip the Turbine.
	CRS	• Check unit shutdown or load reduction – REQUIRED.	**NOTE:** It is necessary to reduce load in an attempt to close the lifting relief valve.
	CRS	• Check reactor trip – REQUIRED.	**NOTE:** A reactor trip is NOT required.
	CRS	(Step 15.D RNO) GO TO Step 15.H.	
	CRS	• (Step 15.H) Determine if turbine trip is desired to isolate steam leak:	
		• Check steam leak location – KNOWN TO BE ISOLABLE BY TURBINE TRIP	
		• Turbine trip – DESIRED.	**NOTE:** A turbine trip is NOT desired.
	CRS	(Step 15.H RNO) Perform the following:	
		• Reduce load as necessary PER one of the following:	
		• OP/1/A/6100/003	
		OR	

Op Test No.:	N20-1	Scenario #	1	Event #	3	Page	22 of 59	
Event Description:	**MSR Relief Valve fails OPEN/Downpower**							

Time	Pos.	Expected Actions/Behavior	Comments
		• AP/1/A/5500/04 (Rapid Downpower).	**NOTE:** The CRS will transition to AP-4. **Floor/Booth Instructor:** If it appears likely that the crew will use the OP rather than the AP, state as the Operations Manager that it is desired to use AP-4.
AP/1/A/5500/04, RAPID DOWNPOWER			
	RO/ BOP	(Step 1) Monitor Foldout page.	
		Uncontrolled Cooldown (If Tavg < 551°F and lowering…..Not Expected)	
		Power Factor (Adjust power factor during load reduction to maintain power factor between 0.9 to 1.0 lagging, using "VOLTAGE ADJUST" pushbutton)	**NOTE:** The RO will adjust MVARS as needed.
		Manual Rx Power Control (< C-5, Not Expected)	
		Turbine Shutdown (Turbine Load < 15 MWe Not Expected)	
	CRS	(Step 2) Announce occurrence on page.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 3) Check turbine control – IN AUTO.	
	RO	(Step 4) Check “MW LOOP” – IN SERVICE.	**NOTE:** If MW LOOP is NOT in service, the RO will place MW LOOP in service per RNO.
	RO	(Step 4 RNO) Depress "MW IN/MW OUT" pushbutton.	

Op Test No.: N20-1	Scenario # 1	Event # 3		Page 23 of 59	
Event Description:	**MSR Relief Valve fails OPEN/Downpower**				

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 5) Check shutdown to Mode 3 – DESIRED.	
	CRS	(Step 5 RNO) Observe Note prior to Step 8 and GO TO Step 8.	
NOTE The following table can be used to determine unloading rates. Rates other than specified are acceptable.			
	CRS	(Step 8) Determine the required power reduction rate (MW/min).	**NOTE:** The CRS will reduce load at ≈10-20 MWe/minute.
	BOP	(Step 9) Notify DEC BA (Balancing Authority) of load reduction.	**Booth Instructor:** as **DEC BA**, acknowledge.
	RO	(Step 10) Check control rods – IN AUTO.	
	BOP	(Step 11) Borate NC System as follows:	
		• Energize all backup Pzr heaters.	
		• Check unit to be shutdown – VIA REACTOR TRIP FROM 15% POWER.	
	CRS	(Step 11.B RNO) GO TO Step 11.D.	
	BOP	(Step 11.D) Determine boration amount based on the following:	
		• Power Reduction Rate (MW/min)	
		• Present NC System Boron Concentration (ppm)	

Op Test No.:	N20-1	Scenario #	1	Event #	3	Page	24 of 59
Event Description:	MSR Relief Valve fails OPEN/Downpower						

Time	Pos.	Expected Actions/Behavior	Comments
		• Total Power change (%).	**NOTE:** The total power change will be determined by the CRS and will affect the amount of boron inserted by the BOP. (Expected 300-500 gallons)
		• Record calculated boration amount:	
	RO	• Check auto or manual rod control – AVAILABLE.	
NOTE If load reduction of greater than 60% is planned and Unit 1 is to remain in Mode 1, the final (1/4) addition of boron may not be required based on rate of Xenon production and control rod response.			
	BOP	• Perform boration in four equal additions during load reduction PER Enclosure 2 (Emergency Boration).	
			NOTE: The CRS may assign the BOP to perform this action. If so, **BOP Examiner** follow actions of Enclosure 2. **Other Examiners** follow **AP-4** Actions, **Step 12**, on **Page 25**.
AP/1/A/5500/04, RAPID DOWNPOWER **ENCLOSURE 2, EMERGENCY BORATION**			
	BOP	(Step 1) Check OAC - AVAILABLE.	
	BOP	(Step 2) Use OAC point M1P0785 (U1 Gallons Boric Acid Added Via 1NV-265B) to monitor boric acid gallons added while 1NV-265B (U1 NV Pump Boric Acid Sup Isol) is open.	
	BOP	(Step 3) GO TO Step 5.	

Op Test No.:	N20-1	Scenario #	1	Event #	3	Page	25 of 59
Event Description:	**MSR Relief Valve fails OPEN/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 5) Check boric acid transfer pump - RUNNING.	**NOTE:** The 1B Boric Acid Transfer Pump is running.
	BOP	(Step 6) OPEN 1NV-265B (U1 NV Pump Boric Acid Sup Isol).	
	BOP	(Step 7) Do not continue until desired amount of boric acid has been added.	
	BOP	(Step 8) CLOSE 1NV-265B (U1 NV Pump Boric Acid Sup Isol).	
	BOP	(Step 9) IF boric acid transfer pump was started in Step 5 RNO, THEN ….	**NOTE:** The 1B Boric Acid Transfer Pump was running initially.
	BOP	(Step 10) Repeat enclosure as required.	
AP/1/A/5500/04, RAPID DOWNPOWER			
			Examiner NOTE: Examiners following the **CRS/RO** continue **HERE**.
	RO	(Step 12) WHEN boration commenced, THEN initiate turbine load reduction to desired load at desired rate.	
	BOP	(Step 13) Display Rod Insertion Limits on OAC by entering turn on code “RIL.”	
NOTE Control Rods may approach rod insertion limits during load reduction.			

Op Test No.:	N20-1	Scenario #	1	Event #	3	Page	26 of 59
Event Description:	**MSR Relief Valve fails OPEN/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 14) IF AT ANY TIME "CONTROL ROD BANK LO LO LIMIT" alarm (1AD-2, B-9) is lit, THEN perform one of the following to comply with Tech Spec 3.1.6 (Control Bank Insertion Limits):	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Ensure alarm clears within one hour as Xenon builds in.	
		OR	
		• Initiate boration as necessary within one hour to restore control rods above insertion limits.	
NOTE Unloading rates greater than 55 MW/min will meet C-7A interlock.			
	CRS	(Step 15) IF AT ANY TIME during this procedure C-7A is received, THEN ensure Transient Monitor freeze is triggered.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 16) REFER TO the following:	**NOTE:** The CRS may ask SM to address. If so, **Floor Instructor** acknowledge as SM.
		• RP/0/A/5700/000 (Classification of Emergency)	
		• RP/0/A/5700/010 (NRC Immediate Notification Requirements).	
	CRS	(Step 17) Notify Reactor Engineer on duty of load reduction.	**NOTE:** The CRS may call WCC/RE. If so, **Booth Instructor** acknowledge.

Op Test No.:	N20-1	Scenario #	1	Event #	3	Page	27 of 59
Event Description:	**MSR Relief Valve fails OPEN/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 18) Check target load - LESS THAN 1000 MW.	**NOTE:** The CRS may have selected a target load greater than 1000 MWe. If so, the crew will perform the RNO and wait until target load is reached. If not, continue to Step 19
Booth Operator Instructions:			**Insert REM_HS0179 = 0 (Remove 1HS179 Relief Valve Failure – At direction of Lead Examiner and after the 1st boration is complete.)**
			Booth Instructor: as **AO**, report that 1HS179 Relief Valve has reseated.
			NOTE: The CRS will direct the RO to go to HOLD on the Turbine. The BOP may adjust boron concentration as needed to stabilize the plant.
	CRS	(Step 19) Check Unit 2 available to supply aux steam as follows:	**NOTE:** The CRS will ask U2 RO. **Floor Instructor:** As U2 RO report "All these conditions are met."
		• Unit 2 Reactor power - GREATER THAN 15%	
		• Unit 2 2AS-12 (U2 SM to AS Hdr Control Inlet Isol) - OPEN	
		• Unit 2 - AVAILABLE TO SUPPLY AS HEADER.	
	RO	(Step 20) Check SM flow on all S/Gs – GREATER THAN 25%.	

Op Test No.: N20-1	Scenario # 1	Event # 3		Page 28 of 59	
Event Description:	**MSR Relief Valve fails OPEN/Downpower**				

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 21) WHEN all SM flows are less than 75%, THEN ensure the following valves ramp CLOSED:	**NOTE:** This is a conditional step. The CRS will make the RO aware of this action, if NOT already done.
		• 1CF-104AB (1A S/G CF Control Bypass)	
		• 1CF-105AB (1B S/G CF Control Bypass)	
		• 1CF-106AB (1C S/G CF Control Bypass)	
		• 1CF-107AB (1D S/G CF Control Bypass)	**Examiner NOTE:** It may be necessary to allow the crew to stabilize the plant prior to moving to Event 4.
			NOTE: The CRS may continue beyond this step in AP-4, however, it is expected that the plant will be stabilizing, and Event 4 is imminent.
After the RO has lowered Turbine Load by 20-40MWe, AND an AUTO Rod motion signal exists with Tavg > Tref by 2°F, at the discretion of the Lead Examiner, move to Event #4.			

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	29 of 59
Event Description:	Dropped Rod/Downpower						

Subsequently, one Control Bank B Control Rod will drop into the core. The operator will respond in accordance with ARP 1AD-2/D-9, "RPI at Bottom Rod Drop" and will implement AP/1/A/5500/14, "Rod Control Malfunction," and ultimately reduce power to less than 50% using AP/1/A/5500/04, "Rapid Downpower." The operator will address Technical Specification LCO 3.1.4, "Rod Group Alignment Limits" and LCO 3.2.4 "Quadrant Power Tilt Ratio (QPTR)".

Booth Operator Instructions: **insert MAL_IRE006K2 STATIONARY_GRPPR (Control Rod K2 drops)**

Indications Available:

- DRPI for Control Rod K-2 indicates Rod on Bottom
- MCB Annunciator 1AD-2/B-3, P/R CHANNEL DEVIATION
- MCB Annunciator 1AD-2/B-10, ROD CONTROL NON URGENT FAILURE
- MCB Annunciator 1AD-2/D-9, RPI AT BOTTOM ROD DROP
- Tref > Tavg

Time	Pos.	Expected Actions/Behavior	Comments
		AP/1/A/5500/14, ROD CONTROL MALFUNCTION	
	RO	(Step 1) IF two or more rods are either dropped OR misaligned by greater than 24 steps,…	**Immediate Action** **NOTE:** Only one Rod Dropped during this event.
	RO	(Step 2) Place control rods in manual.	**Immediate Action** **NOTE:** The RO will place the rods in Manual.
	RO	(Step 3) Check rod movement – STOPPED.	**Immediate Action**
	RO	(Step 4) Check all rods – ALIGNED WITH ASSOCIATED BANK.	
	RO	(Step 4 RNO) Perform the following.	

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	30 of 59
Event Description:	**Dropped Rod/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
NOTE DRPI problems are not addressed by this AP.			
		• IF misaligned rod(s) due to DRPI indication failure only,…	**NOTE:** The misaligned rod is NOT a DRPI indication failure.
		• IF T-Avg has gone down, THEN lower Turbine load as necessary to restore T-Avg to T-Ref.	**NOTE:** The RO may adjust load on the Turbine to maintain Tavg-Tref = 1°F.
		• GO TO Enclosure 1 (Response To Dropped or Misaligned Rod)	
			NOTE: The CRS will transition to Enclosure 1.
AP/1/A/5500/14, ROD CONTROL MALFUNCTION **ENCLOSURE 1, RESPONSE TO DROPPED OR MISALIGNED ROD**			
	CRS	(Step 1) Announce occurrence on paging system.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	CRS	(Step 2) Dispatch rod control system qualified IAE to perform the following:	**NOTE:** The CRS may call WCC/IAE to address. If so, **Booth Instructor** acknowledge as WCC/IAE as appropriate.
		• Correct cause of misaligned rod.	
		• Notify Control Room operators when auto or manual rod motion is available for reactivity control.	
	RO	(Step 3) Do not move rods until IAE determines rod movement is available.	
	RO	(Step 4) IF AT ANY TIME a runback occurs while in this procedure, THEN observe the following guidance:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	31 of 59
Event Description:	**Dropped Rod/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
		• IF IAE has determined that it is permissible to move rods, THEN respond to the runback PER AP/1/A/5500/03 (Load Rejection).	
		• For all other circumstances, assume rod control is not available and respond to the runback as follows:	
		• Trip Reactor.	
		• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection.	
	RO	(Step 5) Check “ROD CONTROL URGENT FAILURE” alarm (1AD-2, A-10) – DARK.	
	RO	(Step 6) Use OAC point M1P1385 (Reactor Thermal Power, Best Estimate) to determine reactor power in subsequent steps.	
	RO	(Step 7) Check AFD (Tech Spec 3.2.3) – WITHIN TECH SPEC LIMITS.	
NOTE If any control rod is misaligned more than 12 steps, Step 15 will provide guidance for performing any Tech Spec required power reduction.			
	CRS	(Step 8) REFER TO the following Tech Specs while continuing in the enclosure:	
		• Tech Spec 3.1.4 (Rod Group Alignment Limits).	**NOTE:** The CRS may check the TS now and conclude that LCO 3.1.4 must be entered.
		• Tech Spec 3.1.5 (Shutdown Bank Insertion Limits).	
		• Tech Spec 3.1.6 (Control Bank Insertion Limits).	**NOTE:** The CRS may check the TS now and conclude that LCO 3.1.6 is NOT required to be entered.

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	32 of 59
Event Description:	**Dropped Rod/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Tech Spec 3.2.4 (QPTR)	**NOTE:** The CRS may check the TS now and conclude that LCO 3.2.4 must be entered.
		• Ensure shutdown margin calculation is performed within 1 hour.	**NOTE:** The CRS may ask the U2 BOP or call WCC to perform SDM calculation. If so, **Floor/Booth Instructor** acknowledge as WCC as appropriate.
	CRS	(Step 9) Contact Reactor Engineer for instructions.	**NOTE:** The CRS may call WCC/RE to address. If so, **Booth Instructor** acknowledge as WCC/RE as indicate that a dropped Rod recovery plan will be developed.
	CRS	(Step 10) If Tech Specs permit continued operation in the current mode for an unlimited period of time with control rods misaligned……..	**NOTE:** The CRS may direct the SM to evaluate. If so, **Floor Instructor**, acknowledge as SM.
	CRS	(Step 11) IF AT ANY TIME IAE desires to operate the lift coil disconnect switches as part of troubleshooting activities, THEN REFER TO OP/1/A/6150/008 (Rod Control), Enclosure 4.9 (Operating Lift Coil Disconnect Switches for Maintenance Troubleshooting).	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	RO	(Step 12) Check reactor power – GREATER THAN OR EQUAL TO 5%	
	RO	(Step 13) Maintain T-Avg within 1°F of T-Ref as follows:	
		• Adjust Turbine load.	**NOTE:** The RO may adjust load on the Turbine as needed.
		OR	
		• Borate/Dilute NC System.	

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	33 of 59
Event Description:	**Dropped Rod/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 14) Determine if power reduction is required as follows:	
		• Check any misaligned rod – GREATER THAN 12 STEPS MISALIGNED.	
	RO	• Check only one rod – MISALIGNED.	**NOTE:** Control Rod K-2 is dropped.
		• Check reactor power – GREATER than 50%	**NOTE:** Power is > 50%.
	CRS	(Step 15) Reduce reactor power below 50% prior to rod realignment as follows:	**Booth Instructor:** If the CRS contacts the WCC, as the Operations Manager direct that **AP-4** be used; and lower power to **40% at 10MWe/min within 30 minutes**.
		• Ensure reactor power is less than 75% within 2 hours of rod misalignment to comply with Tech Spec 3.1.4.	**NOTE:** The CRS may check the TS now and conclude that LCO 3.1.4 must be entered.
		• Check QPTR (Tech Spec 3.2.4) – WITHIN TECH SPEC LIMITS.	**NOTE:** The CRS may check the TS now and conclude that LCO 3.2.4 must be entered.
		(Step 15.b RNO) Ensure reactor power is also reduced in subsequent steps as required PER Tech Spec 3.2.4 (QPTR).	
		• Continue reducing load as directed in subsequent steps until reactor power is less than 50% to comply with Reactor Engineering requirements.	
	RO/ BOP	• Observe the following limitations during power reduction:	
		• Do not move rods until IAE determines rod movement is available.	
		• Borate as required during power reduction to maintain T-Avg at T-Ref.	
		• Monitor AFD during load reduction.	

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	34 of 59
Event Description:	**Dropped Rod/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
		• IF AT ANY TIME AFD reaches Tech Spec limit AND reactor power is greater than 50%, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Trip Reactor	
		• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	
		• Reduce reactor power to less than 50% PER one of the following procedures:	
		• OP/1/A/6100/003 (Controlling Procedure For Unit Operation). Enclosure 4.2 (Power Reduction)	
		OR	
		• AP/1/A/5500/04 (Rapid Downpower).	**Booth Instructor:** If the CRS contacts the WCC, as the Operations Superintendent direct that **AP-4** be used; and lower power to **40% at 10MWe/min within 30 minutes**.
			NOTE: The CRS will likely conduct a Focus Brief.
AP/1/A/5500/04, RAPID DOWNPOWER			
	RO/ BOP	(Step 1) Monitor Foldout page.	
		Uncontrolled Cooldown (If Tavg < 551°F and lowering…..Not Expected)	
		Power Factor (Adjust power factor during load reduction to maintain power factor between 0.9 to 1.0 lagging, using "VOLTAGE ADJUST" pushbutton)	**NOTE:** The RO will adjust MVARS as needed.
		Manual Rx Power Control (< C-5, Not Expected)	
		Turbine Shutdown (Turbine Load < 15 MWe Not Expected)	

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	35 of 59
Event Description:	**Dropped Rod/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 2) Announce occurrence on page.	
	RO	(Step 3) Check turbine control – IN AUTO.	
	RO	(Step 4) Check "MW LOOP" – IN SERVICE.	**NOTE:** MW Loop may be in service
	RO	(Step 4 RNO) Depress "MW IN/MW OUT" pushbutton.	
	CRS	(Step 5) Check shutdown to Mode 3 – DESIRED.	
	CRS	(Step 5 RNO) Observe Note prior to Step 8 and GO TO Step 8.	
NOTE The following table can be used to determine unloading rates. Rates other than specified are acceptable.			
	CRS	(Step 8) Determine the required power reduction rate (MW/min).	**NOTE:** The CRS will reduce load at ≈10-12 MWe/minute.
	BOP	(Step 9) Notify DEC BA (Balancing Authority) of load reduction.	**Booth Instructor:** as **DEC BA**, acknowledge.
	RO	(Step 10) Check control rods – IN AUTO.	**NOTE:** The control rods are in MANUAL for the dropped Rod event.
	RO	(Step 10 RNO) Perform the following:	
		• IF auto control available,…	**NOTE:** AUTO rod control is NOT available.

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	36	of 59
Event Description:	**Dropped Rod/Downpower**							

Time	Pos.	Expected Actions/Behavior	Comments
		• IF manual control available, THEN…	**NOTE:** MANUAL rod control is NOT available.
	BOP	• IF rods cannot be moved in auto or manual, THEN perform the following:	
		• Borate as required to maintain T-Avg at T-Ref.	
		• Monitor AFD during load reduction.	
	RO/ BOP	• IF AT ANY TIME AFD reaches Tech Spec limit AND reactor power is greater than 50%, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Trip Reactor.	
		• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	
CAUTION Power reduction without rod control may require periodically halting or varying the load reduction rate to allow boration time to take effect. Focused coordination of load reduction rate and boration will be required to maintain T-Avg at T-Ref.			
		• Maintain T-Avg at T-Ref	
	BOP	(Step 11) Borate NC System as follows:	
		• Energize all backup Pzr heaters.	**NOTE:** All Pzr Heaters are expected to be energized.
		• Check unit to be shutdown – VIA REACTOR TRIP FROM 15% POWER.	
	CRS	(Step 11.B RNO) GO TO Step 11.D.	
	BOP	(Step 11.D) Determine boration amount based on the following:	
		• Power Reduction Rate (MW/min)	
		• Present NC System Boron Concentration (ppm)	

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	37 of 59
Event Description:	**Dropped Rod/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Total Power change (%).	**NOTE:** The total power change will be determined by the CRS and will affect the amount of boron inserted by the BOP.
		• Record calculated boration amount:	
	RO	• Check auto or manual rod control – AVAILABLE.	
NOTE If load reduction of greater than 60% is planned and Unit 1 is to remain in Mode 1, the final (1/4) addition of boron may not be required based on rate of Xenon production and control rod response.			
	BOP	• Perform boration in four equal additions during load reduction PER Enclosure 2 (Emergency Boration).	
			NOTE: The CRS may assign the BOP to perform this action. If so, **BOP Examiner** follow actions of Enclosure 2. **Other Examiners** follow **AP-4** Actions, **Step 12**, on **Page 38**.
AP/1/A/5500/04, RAPID DOWNPOWER **ENCLOSURE 2, EMERGENCY BORATION**			
	BOP	(Step 1) Check OAC - AVAILABLE.	
	BOP	(Step 2) Use OAC point M1P0785 (U1 Gallons Boric Acid Added Via 1NV-265B) to monitor boric acid gallons added while 1NV-265B (U1 NV Pump Boric Acid Sup Isol) is open.	
	BOP	(Step 3) GO TO Step 5.	

Op Test No.: N20-1	Scenario # 1	Event # 4	Page 38 of 59
Event Description:	**Dropped Rod/Downpower**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 5) Check boric acid transfer pump - RUNNING.	**NOTE:** The 1B Boric Acid Transfer Pump is running.
	BOP	(Step 6) OPEN 1NV-265B (U1 NV Pump Boric Acid Sup Isol).	
	BOP	(Step 7) Do not continue until desired amount of boric acid has been added.	
	BOP	(Step 8) CLOSE 1NV-265B (U1 NV Pump Boric Acid Sup Isol).	
	BOP	(Step 9) IF boric acid transfer pump was started in Step 5 RNO, THEN ….	**NOTE:** The 1B Boric Acid Transfer Pump was running initially.
	BOP	(Step 10) Repeat enclosure as required.	
AP/1/A/5500/04, RAPID DOWNPOWER			
			Examiner NOTE: Examiners following the **CRS/RO** continue **HERE**.
	RO	(Step 12) WHEN boration commenced, THEN initiate turbine load reduction to desired load at desired rate.	
			Examiner NOTE: Once the 1st boration is initiated **MOVE to Event #5.**
TECHNICAL SPECIFICATION 3.1.4, ROD GROUP ALIGNMENT LIMITS			
	CRS	LCO 3.1.4 All shutdown and control rods shall be OPERABLE, with all individual indicated rod positions within 12 steps of their group step counter demand position.	

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	39 of 59
Event Description:	**Dropped Rod/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	APPLICABILITY: MODES 1 and 2.	
		ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One rod not within alignment limits.	B.1Restore rod to within alignment limits. <u>OR</u> B.2.1.1 Verify SDM is within the limit specified in the COLR. <u>OR</u> B.2.1.2 Initiate boration to restore SDM to within limit. AND B.2.2 Reduce THERMAL POWER to ≤ 75% RTP. AND B.2.3 Verify SDM is within the limit specified in the COLR. AND B.2.4 Perform SR 3.2.1.1. AND B.2.5 Perform SR 3.2.2.1. AND B.2.6 Re-evaluate safety analyses and confirm results remain valid for duration of operation under these conditions.	1 hour 1 hour 1 hour 2 hours Once per 12 hours 72 hours 72 hours 5 days

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will determine that Condition B is required and that ACTION B.1 or B.2.1.1 and B.2.1.2 and B.2.2, B.2.3, B.2.4, B.2.5 and B.2.6 must be taken.
		TECHNICAL SPECIFICATION 3.2.4, QPTR	
	CRS	LCO 3.2.4 The QPTR shall be ≤ 1.02.	
	CRS	APPLICABILITY: MODE 1 with THERMAL POWER > 50% RTP.	

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	40	of	59
Event Description:	**Dropped Rod/Downpower**								

Time	Pos.	Expected Actions/Behavior	Comments
		ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. QPTR not within limit	A.1.1Reduce THERMAL POWER ≥ 3% from RTP for each 1% of QPTR > 1.02. AND	2 hours
	A.2.2 Perform SR 3.2.4.1 and reduce THERMAL POWER ≥ 3% from RTP for each 1% of QPTR > 1.02. AND	Once per 12 hours
	A.3 Perform SR 3.2.2.1 and SR 3.2.2.1. AND	24 hours AND Once per 7 days thereafter
	A.4 Reduce Power Range Neutron Flux – High Trip Setpoint ≥ 3% for each 1% of QPTR > 1.02. AND	72 hours
	A.5 Reevaluate safety analyses and confirm results remain valid for duration of operation under this condition. AND	Prior to increasing THERMAL POWER above the more restrictive limit of Required Action A.1 or A.2.
	A.6 Calibrate excore detectors to show zero QPT. AND	Prior to increasing THERMAL POWER above the more restrictive limit of Required Action A.1 or A.2.
	A.7 Perform SR 3.2.1.1 and SR 3.2.21	Within 24 hours after reaching RTP. OR Within 48 hours after increasing THERMAL POWER above the more restrictive limit of Required Action A1 or A.2.

Op Test No.:	N20-1	Scenario #	1	Event #	4	Page	41 of 59
Event Description:	**Dropped Rod/Downpower**						

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will determine that Condition A is required and that ACTION A.1, A.2, A.3, A.4, A.5, A.6, and A.7 must be taken.
At the discretion of the Lead Examiner, move to Event #5.			

Op Test No.:	N20-1	Scenario #	1	Event #	5	Page	42 of 59
Event Description:	**1B NCP Pump Bearing Oil Cooler Leak**						

During the downpower, a leak will develop on the 1B NCP Upper Bearing Oil Reservoir. The operator will respond in accordance with AP/1/A/5500/08, “Malfunction of NC Pump,” and the operator will be required to trip the reactor, stop the 1B NCP, and go to EP/1/A/5000/E-0, “Reactor Trip and/or Safety Injection.”

Booth Operator Instructions: **insertMAL_NCP007BU = TRUE**

Indications Available:

- OAC Alarm M1P2764 1B NCP UPPER OIL RESERVOIR LVL 1 MIN AVG
- OAC Alarm M1A0732 1B NCP MTR UPPER BRG TEMP (will alarm 8-9 minutes after the first OAC alarm)

Time	Pos.	Expected Actions/Behavior	Comments
		OAC ALARM M1P2764 1B NCP UPPER OIL RESERVOIR LVL 1 MIN AVG	
	CRS	(LO-LO Step 1) Go To AP/1/A/5500/08, Malfunction of NC Pump.	
			NOTE: The CRS will enter AP-08.
		AP/1/A/5500/08, MALFUNCTION OF NC PUMP **CASE II, NC PUMP MOTOR BEARING MALFUNCTION**	
		NOTE Step 1 RNO should be used to validate the abnormal parameter unless it has been previously validated or is clearly known to be valid.	
	BOP	(Step 1) Check abnormal NC pump parameter – KNOWN TO BE VALID.	**NOTE:** The BOP will use the Step 1 RNO and Enclosure 1 to determine that the parameter is known to be valid. (NOT scripted)
	BOP	(Step 2) Check NC pump parameters within operating limits:	
		• All NC pump stator winding temperatures – LESS THAN 311°F.	
		• All NC pump motor bearing temperatures – LESS THAN 195°F.	

Op Test No.: N20-1	Scenario # 1	Event # 5		Page 43	of 59		
Event Description:	**1B NCP Pump Bearing Oil Cooler Leak**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 3) IF AT ANY TIME any operating limit in Step 2 exceeded, THEN GO TO Step 5.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 4) GO TO Step 6.	
	CRS	(Step 6) Announce occurrence on paging system.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO/ BOP	(Step 7) Correct any of the following which may affect NC Pump stator or motor bearing cooling:	
		• High ambient temperature	
		• Abnormal NC Pump bus voltage	
		• Interference with ventilation	
		• Abnormal RN alignment and flow	
		• Abnormal KC alignment and flow	
		• High KC temperature.	
	RO/ BOP	(Step 8) Check all NC Pump oil reservoir level computer alarms - CLEAR.	**NOTE:** The 1B NC Pump oil reservoir level computer alarm is NOT clear.
	RO/ BOP	(Step 8 RNO) Perform the following:	
		• Evaluate clearing level alarm by adjusting KC temperature to NC Pump oil cooler.	
		• IF upper oil reservoir in alarm, THEN trend the following indications on affected NC pump:	
		• Motor upper bearing temperature	
		• Motor upper thrust bearing temperature	

Op Test No.:	N20-1	Scenario #	1	Event #	5	Page	44 of 59
Event Description:	**1B NCP Pump Bearing Oil Cooler Leak**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Motor lower thrust bearing temperature.	
		• IF lower oil reservoir in alarm, THEN trend motor lower bearing temperature on affected NC pump.	
		• IF AT ANY TIME oil level is in alarm AND associated bearing temperature is greater than 160°F, THEN RETURN TO Step 5 to trip affected NC pump.	**NOTE:** The CRS will return to Step 5 and stop the 1B NC Pump.
	BOP	(Step 5) Stop affected NC pump as follows:	
	BOP	• IF A or B NC pump is the affected pump, THEN CLOSE associated spray valve:	**NOTE:** The 1B NC Pump is the affected NC Pump.
		• 1NC-29C (B NC Loop PZR Spray Control).	
		• Check unit status – IN MODE 1 OR 2.	
	RO	• Trip reactor.	
	BOP	• WHEN reactor power less than 5%, THEN stop affected NC pump.	**NOTE:** The plant power is currently < 5%.
	CRS	• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	

Op Test No.:	N20-1	Scenario #	1	Event #	5	Page	45	of	59
Event Description:	**1B NCP Pump Bearing Oil Cooler Leak**								

Time	Pos.	Expected Actions/Behavior	Comments
<u>Critical Task:</u> **Trip the Reactor prior to stopping the NCP during a low oil level condition and trip the NCP only after Reactor power level has dropped to less than 5%.** Safety Significance: The P-8 interlock allows one NCP to be stopped less than 48% power. If a NCP is stopped in Mode 1 or 2, Tech Spec 3.4.4 requires the unit to be in Mode 3 within 6 hours. In addition, T-ave for the idle loop may violate Tech Spec 3.4.2, minimum temperature for criticality. In this case, the unit must be sub-critical within 30 minutes. The transient placed on the unit when a NCP is secured at power can challenge both reactor protection and control systems. Furthermore, an added burden is placed on the operator to stabilize the unit and shut down within 6 hours (possibly 30 minutes) to comply with Tech Specs. Even though the plant is designed and analyzed to operate in this configuration for a short time, station management has decided that the conservative approach to dealing with this transient is to trip the reactor anytime a NCP malfunction warrants stopping a pump in Mode 1 or 2. Guidance is given to wait until reactor power is less than 5% before stopping the NC pump. This will ensure the NC pump will provide adequate flow/core cooling until reactor power is sufficiently low enough to preclude a challenge to fuel integrity. If the action can be taken, and is not taken, this demonstrates “mis-operation” or incorrect operation that could unnecessarily challenge a fission product barrier (NCS).			
At the discretion of the Lead Examiner, move to Events #6-7.			

Op Test No.:	N20-1	Scenario #	1	Event #	6-7	Page	46 of 59
Event Description:	**Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**						

Upon the reactor trip, a loss of Vital AC Panel 1EKVC will occur resulting in an inadvertent Safety Injection. Also, on the reactor trip, the Turbine will fail to trip automatically, and must be tripped manually. The operator will enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," reset SI and stop all ECCS Pumps except for one NV Pump. Ultimately, the crew will transition to step 9 of EP/1/A/5000/ES-1.1, "Safety Injection Termination." Once SI is terminated, the operator may address AP/1/A/5500/15, "Loss of Vital or Aux Control Power." The scenario will terminate in EP/1/A/5000/ES-1.1 at Step 14.l prior to the operator re-establishing Letdown.

Booth Operator Instructions:

MAL_DEH003A (Failure of the Turbine to Trip in AUTO)

MAL_EPL003C = ACTIVE (Loss of EKVC); cd = H_X01_094_2 = 1(RTB Open Light)

(Both malfunctions occur on Rx Trip - No Action Needed)

Indications Available:

- All Control Rods Fully Inserted
- 3rd Row of Status Lights are all LIT
- Safety Injection actuation has occurred (1SI-18 is LIT)
- Main Turbine Governor Valves are OPEN

Time	Pos.	Expected Actions/Behavior	Comments
			Examiner NOTE: Mark Time of SI Actuation (To the Minute): ____________
			NOTE: Crew will carry out Immediate Actions of E-0, prior to the CRS addressing the EP.
		E-0, REACTOR TRIP OR SAFETY INJECTION	
	RO/ BOP	(Step 1) Monitor Foldout page.	
		NC Pump Trip Criteria (Not Expected)	
		CA Suction Sources (CA storage tank (water tower) goes below 1.5 ft – Not expected)	
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	

Op Test No.:	N20-1	Scenario #	1	Event #	6-7	Page	47	of	59

Event Description: **Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	**NOTE:** The BOP will monitor these conditions.
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	
		Ruptured S/G Aux Feedwater Isolation Criteria (Not expected)	
		Faulted S/G Aux Feedwater Isolation Criteria (Not expected)	
	RO	(Step 2) Check Reactor Trip:	**Immediate Action**
		• All rod bottom lights – LIT	
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 3) Check Turbine Trip:	**Immediate Action**
		• All throttle valves – CLOSED.	**NOTE:** The Turbine will fail to Auto Trip.
	RO	(Step 3 RNO) Perform the following:	**Immediate Action**
		• Trip turbine.	
		• IF turbine will not trip….	

Op Test No.:	N20-1	Scenario #	1	Event #	6-7	Page	48 of 59
Event Description:	**Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**						

Time	Pos.	Expected Actions/Behavior	Comments
<u>Critical Task:</u> **Manually trip the Turbine before a valid Orange Path develops on the Subcriticality or Integrity Critical Safety Function.** Safety Significance: Failure to trip the Main Turbine when conditions exist that allow the operator to do so, constitutes mis-operation or incorrect operator performance that unnecessarily challenges the Subcriticality or Integrity Critical Safety Function. An overcooling event in the presence of an inadvertent actuation of Safety Injection creates the potentiality of creating a Pressurized Thermal Shock conditions that otherwise would not exist. It is necessary to specify the valid Orange Path on the Critical Safety Function Status Trees because due to a previous failure (Power Range Channel N42 fails high) the OAC will indicate a Red Path on Subcriticality post-reactor trip.			
	BOP	(Step 4) Check 1ETA and 1ETB – ENERGIZED.	**Immediate Action**
	RO / BOP	(Step 5) Check if S/I is actuated:	**Immediate Action**
		• “SAFETY INJECTION ACTUATED” status light (1SI-18) – LIT.	
		• Both LOCA Sequencer Actuated status lights (1SI-14) – LIT.	
	CRS	(Step 6) Announce “Unit 1 Safety Injection”.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 7) Check all Feedwater Isolation status lights (1SI-4) - LIT	
	BOP	(Step 8) Check Phase A “RESET” lights – DARK.	

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Event Description: **Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 9) Check ESF Monitor Light Panel on energized train(s):	
		• Groups 1,2,5 – DARK.	
		• Group 3 – LIT.	
		• Group 4 – LIT AS REQUIRED.	
		• Group 6 – LIT.	
	CRS	• GO TO Step 10.	
	RO / BOP	(Step 10) Check proper CA pump status:	
		• MD CA pumps – ON.	
		• N/R level in at least 3 S/Gs – GREATER THAN 17%.	
	BOP	(Step 11) Check all KC pumps - ON	
	BOP	(Step 12) Check both RN pumps – ON.	
	CRS	(Step 13) Notify Unit 2 to perform the following:	**Floor Instructor:** As U2 RO report "2A RN Pump is running."
		• Start 2A RN pump.	
		• THROTTLE Unit 2 RN flow to minimum for existing plant conditions.	**Booth Instructor:** **insert LOA_RN087 (Start 2A RN Pump)** **insert LOA_RN083 8050.000000 delay=0 ramp=10 (Unit 2 Train A Demand Flow)**
	RO	(Step 14) Check all S/G pressures – GREATER THAN 775 psig.	
	BOP	(Step 15) Check Containment Pressure – HAS REMAINED LESS THAN 3 PSIG.	**NOTE:** Containment Pressure is ≈0.15 psig.

Op Test No.:	N20-1	Scenario #	1	Event #	6-7	Page	50	of	59

Event Description: **Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 16) Check S/I flow:	
		• Check "NV PMPS TO COLD LEG FLOW" gauge – INDICATING FLOW.	**NOTE:** NV Flow is ≈320 gpm.
		• Check NC pressures – LESS THAN 1600 PSIG.	**NOTE:** NC System pressure is ≈ 2250-2300 psig.
	BOP	(Step 16b RNO) Perform the following:	
		• Ensure ND pump miniflow valve on running pump(s) open:	
		• 1ND-68A (1A ND Pump & Hx Mini Flow Isol)	
		• 1ND-67B (1B ND Pump & Hx Mini Flow Isol).	
	CRS	• IF valve(s) open on all running ND pumps, THEN GO TO Step 17.	
	CRS	(Step 17) Notify Shift Manager or other SRO to perform EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 22 (Shift Manager Actions Following an S/I) within 10 minutes.	**NOTE:** CRS may ask SM to address. If so, **Floor Instructor** acknowledge as SM.
	RO / BOP	(Step 18) Check CA flow:	
		• Total CA flow – GREATER THAN 450 GPM.	
		• Check VI header pressure – GREATER THAN 60 PSIG.	
		• WHEN each S/G N/R level is greater than 11% (32% ACC), THEN control CA flow to maintain that S/G N/R level between 11% (32% ACC) and 50%.	
	RO	(Step 19) Check NC temperatures:	

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Event Description:	**Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		• IF any NC pump on, THEN check NC T-Avg – STABLE OR TRENDING TO 557°F	**NOTE:** All NC Pumps will be ON, except the 1B NCP.
	BOP	(Step 20) Check Pzr PORV and spray valves:	
		• All Pzr PORVs – CLOSED.	
		• Normal Pzr spray valves – CLOSED.	**NOTE:** depending on NC System pressure the Spray Valve may be OPEN requiring performance of the Step 20.b RNO (Close Spray valves).
	BOP	• At least one Pzr PORV isolation valve – OPEN.	
	BOP	(Step 21) Check NC subcooling based on core exit T/Cs – GREATER THAN 0°F.	**NOTE:** NC System Subcooling will be ≈80-90°F.
	RO	(Step 22) Check if main steamlines intact:	
		• All S/G pressure – STABLE OR GOING UP	**NOTE:** All SG Pressures are ≈1100psig.
		• All S/Gs – PRESSURIZED.	
	BOP	(Step 23) Check if S/G tubes intact:	**NOTE:** All EMF instrumentation reads normal.
		• The following secondary EMFs – NORMAL:	
		• 1EMF-33 (Condenser Air Ejector Exhaust)	
		• 1EMF-34(L) (S/G Sample (Lo Range))	
		• 1EMF-24 (S/G A)	
		• 1EMF-25 (S/G B)	
		• 1EMF-26 (S/G C)	

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Event Description: **Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		• 1EMF-27 (S/G D)	
		• S/G levels – STABLE OR GOING UP IN A CONTROLLED MANNER.	
	BOP	(Step 24) Check if NC System intact:	**NOTE:** All EMF instrumentation reads normal.
		• 1EMF-38(L) (Containment Particulate (LR)) - NORMAL	
		• 1EMF-39(L) (Containment Gas (Lo Range)) - NORMAL	
		• 1EMF-40 (Containment Iodine) - NORMAL	
		• Check containment pressure – LESS THAN 1 PSIG	**NOTE:** Containment Pressure is ≈0.20 psig.
		• Check containment sump level – NORMAL.	
	RO / BOP	(Step 25) Check S/I termination criteria:	
		• NC subcooling based on core exit T/Cs – GREATER THAN 0°F.	
		• Secondary heat sink:	
		• N/R level in at least one S/G – GREATER THAN 11%	
		OR	
		• Total feed flow to S/Gs – GREATER THAN 450 gpm.	
		• NC Pressure – STABLE OR GOING UP.	
		• Pzr level – GREATER THAN 11%.	
	BOP	(Step 26) Reset the following:	
		• S/I	
		• Sequencers.	

Op Test No.: N20-1	Scenario # 1	Event # 6-7	Page 53 of 59
Event Description:	**Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 27) Stop all but one NV pump.	**NOTE:** The BOP will stop one of the two NV Pumps.
	BOP	(Step 28) Check NC pressure – STABLE OR GOING UP.	
	BOP	(Step 29) Isolate NV S/I flowpath as follows:	
		• Check NV pumps miniflow valves – OPEN:	
		• 1NV-150B (U1 NV Pump Recirc Isol)	
		• 1NV-151A (U1 NV Pump Recirc Isol).	
		• CLOSE the following valves:	
		• 1NI-9A (NC Cold Leg Inj From NV)	
		• 1NI-10B (NC Cold Leg Inj From NV).	**Examiner NOTE:** Mark Time of 1NI-9A/10B Closure (To the Minute): ______________

Critical Task:

Terminate SI by closing NI-9/10 within 15 minutes of SI actuation.

Safety Significance: An inadvertent SI rapidly injects inventory into the NCS causing Pzr Level, and correspondingly, Pzr Pressure to increase. Prolonged recovery unnecessarily challenges the Pzr Code Safety valves. PT/0/A/4600/113, Enclosure 13.6 states that when at NOP/NOT conditions, the FSAR commitment is to have SI terminated within 15 minutes (The Safety Analysis CANNOT credit the cycling of the Pzr PORVs since auto PORV operation can only be assured during LTOP Operation). The Safety Analysis assumes that the Pzr Code Safeties will lift and reseat ONLY if they are cycled for a short time and Pzr liquid temperature remains > 500°F. If this action is not taken, the conclusions of the Safety Analysis are invalid, and violates a License Condition.

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 30) Establish charging as follows:	

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Event Description: **Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	• Check VI header pressure – GREATER THAN 60 PSIG.	
	BOP	• THROTTLE 1NV-238 (U1 Charging Hdr Control) to maintain 6-10 GPM seal injection flow to each NC pump.	
	BOP	• Close 1NV-241 (U1 Seal Water Inj Flow Control).	
	BOP	• Check one of the following valves – OPEN:	
		• 1NV-13B (U1 NV Supply to 1A NC Loop Isol).	**NOTE:** 1NV-13B is OPEN.
		OR	
		• 1NV-16A (U1 NV Supply to 1D NC Loop Isol).	
	BOP	• Check 1NV-21A (U1 NV Spray to U1 Aux PZR Spray Isol) – CLOSED.	
	BOP	• Open the following valves:	
		• 1NV-244A (Charging Hdr Cont Outside Isol)	
		• 1NV-245B (Charging Hdr Cont Outside Isol).	
		• WHEN controlling NV flow in subsequent steps, THEN maintain flow within the following limits while THROTTLING charging and seal injection control valves:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Charging flow – LESS THAN 200 GPM.	
		• Seal injection flow to each NC pump – 6-10 GPM.	
	BOP	(Step 31) Control charging flow as follows:	
		• Control charging flow as required to maintain Pzr level stable.	
		• Check Pzr level – STABLE OR GOING UP.	

Op Test No.: N20-1	Scenario # 1	Event # 6-7	Page 55 of 59

Event Description: **Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 32) Reset the following:	
		• Phase A Isolation	
		• Phase B Isolation.	
	BOP	(Step 33) Establish VI to containment as follows:	
		• OPEN the following valves:	
		• 1VI-129B (VI Supply to A Cont Ess VI Hdr Outside Isol).	
		• 1VI-160B (VI Supply to B Cont Ess VI Hdr Outside Isol).	
		• 1VI-150B (Lwr Cont Non-Ess Cont Outside Isol).	
		• Check VI header pressure – GREATER THAN 85 PSIG.	
	CRS	(Step 34) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	**NOTE:** The CRS will direct the STA to implement this action. **Floor Instructor:** As STA, acknowledge.
			Examiner NOTE: A Red path will exist on the Subcriticality Critical Safety Function Status Tree because of the previously failed N42.
	CRS	(Step 35) WHEN EP/1/A/5000/ES-1.1 (Safety Injection Termination) is implemented in next step, THEN monitor its Foldout page.	
	CRS	(Step 35) GO TO Step 9 of EP/1/A/5000/ES-1.1 (Safety Injection Termination).	**NOTE:** The CRS will transition to ES-1.1 Step 9.
ES-1.1, SAFETY INJECTION TERMINATION			

Op Test No.:	N20-1	Scenario #	1	Event #	6-7	Page	56 of 59

Event Description: **Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	Foldout Page	**NOTE:** None of the Foldout Page Criteria are expected to apply.
		• S/I Reinitiation Criteria (applies after Step 10 in body of this procedure)	
		• Secondary Integrity Criteria:	
		• Cold Leg Recirc Switchover Criteria:	
		• CA Suction Sources:	
	BOP	(Step 9) Check if NI pumps should be stopped:	**Examiner NOTE:** After transition to ES-1.1, terminate Exam at Lead Examiner discretion.
		• Check NC pressure -	
		• STABLE OR GOING UP.	
		• GREATER THAN 1600 PSIG.	
	BOP	• Stop NI pumps.	**NOTE:** The BOP will stop both NI Pumps.
	CRS	• GO TO Step 10.	
	BOP	(Step 10) Check if ND pumps should be stopped:	
		• Check any ND pump – ON.	
		• Check running ND pumps suction – ALIGNED TO FWST.	
		• Stop ND pumps.	**NOTE:** The BOP will stop both ND Pumps.
	RO	(Step 11) Check S/I flow not required:	
		• NC subcooling based on core exit T/Cs – GREATER THAN 0°F.	**NOTE:** NC System Subcooling will be ≈65-85°F.
	BOP	• Pzr level – GREATER THAN 11% (29% ACC).	**NOTE:** Pzr Level will be 60-90%.

Op Test No.: N20-1	Scenario # 1	Event # 6-7	Page 57 of 59				
Event Description:	**Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 12) Check steam dumps:	
		• Check condenser available as follows:	
		• “C-9 COND AVAILABLE FOR STEAM DUMP” status light (1SI-18) – LIT.	
		• MSIVs on intact S/Gs – OPEN.	
	RO	• Using “STEAM DUMP SELECT” switch, place steam dumps in steam pressure mode.	
		• Check “P-12 LO-LO TAVG” status light (1SI-18) – DARK.	
		• Ensure steam dumps maintain NC T-Hots stable using auto or manual control.	
	CRS	• GO TO Step 13.	
	RO	(Step 13) Check NC T-Hots – STABLE.	
	RO/ BOP	(Step 14) Check if letdown can be established:	
		• Pzr level – GREATER THAN 25%	
		• Check ND pumps – OFF.	
	BOP	• OPEN the following valves:	
		• 1KC-1A (Trn A Aux Bldg Non Ess Ret Isol).	
		• 1KC-2B (Trn B Aux Bldg Non Ess Ret Isol).	
		• Monitor the following while aligning KC to aux bldg non essential header:	
		• KC surge tank levels	
		• KC System flow.	
	BOP	• Place the following in “AUTO” for the operating KC train(s):	
		• 1KC-54B (Train B Recirc Isol).	
		• Check 1KC-1A – OPEN.	

Op Test No.:	N20-1	Scenario #	1	Event #	6-7	Page	58 of 59

Event Description: **Loss of VIAC 1EKVC/Inadvertent SI Actuation/ Failure of the Turbine to Trip in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	• Perform the following concurrently:	
		• CLOSE 1KC-56A (1A ND Hx KC Inlet Isol)	
		• As flow goes down, OPEN 1KC-50A (Trn A Aux Bldg Non Ess Sup Isol).	
		• Check 1KC-2B – OPEN.	
	BOP	• Perform the following concurrently:	
		• CLOSE 1KC-81B (1B ND Hx KC Inlet Isol)	
		• As flow goes down, OPEN 1KC-53B (Trn B Aux Bldg Non Ess Sup Isol).	
NOTE Resetting modulating valves establishes control of RN to KC Hx control.			
		• Reset modulating valves using reset buttons on RN control board.	
		• Check the following:	
		• 1EMF-51A (Containment Train A (Hi Range)) – LESS THAN 25 R/HR	
		• 1EMF-51B (Containment Train B (Hi Range)) – LESS THAN 25 R/HR.	
		• Establish letdown PER EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 1 (Establishing Normal Letdown) while continuing in procedure.	
At the discretion of the Lead Examiner terminate the exam.			

UNIT 1 STATUS:

Power Level: 100% NCS [B] 85 ppm Pzr [B]: 85 ppm Xe: Per OAC

Power History: At this power level for 357 days Core Burnup: 471.1 EFPDs

UNIT 2 STATUS:

Power Level: 100%

CONTROLLING PROCEDURE:

- OP/1/A/6100/003 (Controlling Procedure for Unit Operation)

OTHER INFORMATION NEEDED TO ASSUME THE SHIFT:

- The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.

The following equipment is Out-Of-Service:

- The 1A NS Pump is OOS for preventive maintenance. ACTION has been taken in accordance with Technical Specification LCO 3.6.6 ACTION A.
- 1NCPT-5150, Pzr Pressure Channel 2, has failed and has been removed from service in accordance with plant procedures. ACTION has been taken in accordance with Technical Specification LCO 3.3.1 and 3.3.2.
- MCB Annunciator 1AD-12, F-5, “FWST EMERGENCY LO TEMP,” has alarmed spuriously several times over the last hour and has currently failed ON (IAE has verified that the issue is limited to an annunciator card issue).

Crew Directions:

- Maintain Steady-State operations.

Work Control SRO **Jim**

Field SRO **Joe (FB)**

AO's AVAILABLE

Unit 1	**Unit 2**
Aux Bldg. John	**Aux Bldg. Chris**
Turb Bldg. Bob (FB)	**Turb Bldg. Mike (FB)**

Extra(s) Bill (FB) Ed (FB) Gus (RW) Carol

Facility: **McGuire**	Scenario No.: **2**	Op Test No.: **N20-1**	
Examiners: ________	Operators:	________ (SRO)	
________		________ (RO)	
________		________ (BOP)	

Initial Conditions:	The plant is at 75% power (MOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.
Turnover:	The following equipment is Out-Of-Service: The 1D S/G PORV is isolated and its actuator is currently removed for maintenance. 1KFP-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-11, L-1, "ETA DEGRADED VOLTAGE," has alarmed spuriously several times over the last hour, and has currently failed ON (IAE has verified that the issue is limited to an annunciator card issue). The crew will raise power to 100% after taking the shift.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	R-RO N-BOP N-SRO	Power Increase w/Simple Dilute
2	MAL DCS1288	C-RO C-SRO	Uncontrolled outward Rod Motion in AUTO
3	MAL DCS1762 DCS1763	C-BOP C(TS)-SRO	Pzr Spray Valve (1NC-27) Controller fails OPEN
4	REM RN0018B	C-BOP C(TS)-SRO	1B RN Pump Suction Valve inadvertently CLOSES
5	MAL LF003B IRE009 SG001C	C-RO C-BOP C-SRO	1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual
6	REM SM003AB MAL IPE001A/B IPE002A/B SG001C SM004C1	M-RO M-BOP M-SRO	1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR
7	MAL CA004A CA004B CA005	C-BOP C-SRO	TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2020 NRC Scenario #2

The plant is at 75% power (MOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.

The 1D S/G PORV is isolated and its actuator is currently removed for maintenance. 1KFP-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-11, L-1, "ETA DEGRADED VOLTAGE," has alarmed spuriously several times over the last hour, and has currently failed ON (IAE has verified that the issue is limited to an annunciator card issue). The crew will raise power to 100% after taking the shift.

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.37.11 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation." The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.19, "Simple Dilution," of OP/1/A/6150/009, "Boron Concentration Control," and raise Turbine load in accordance with OP/1/A/6300/001 A, "Turbine-Generator Load Change."

After the load increase is started, the Control Rods will fail such that rods are moving outward in AUTO. The operator will enter AP/1/A/5500/14, "Rod Control Malfunction." The control rods will subsequently remain in MANUAL.

After this, the Pzr Spray Valve Controller, 1NC-27C A Spray, demand will fail to full output. The operator will enter AP/1/A/5500/11, "Pressurizer Pressure Anomalies." The operator will address Technical Specification LCO 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits."

Next, the 1B RN Pump Suction Isolation valve will inadvertently CLOSE. The operator will respond using one or more Annunciator Response Procedures and ultimately enter AP/1/A/5500/20, "Loss of RN," to place the standby train in service. The operator will address Technical Specification LCO 3.7.7, "Nuclear Service Water System (NSWS)," Technical Specification LCO 3.8.1, "AC Sources-Operating," and SLC 16.9.9, "Boration Systems – Flow Path (Operating)."

Subsequently, the 1B CF Pump will trip causing the turbine to automatically runback to 55%. Simultaneously, a 40 gpm Steam Generator Tube Leak (SGTL) will occur in the 1C Steam Generator. The operator will implement AP/1/A/5500/03, "Load Rejection." During the runback the operator will need to drive rods in manually.

When the plant is stabilized or AP/1/A/5500/10 is entered to mitigate the SGTL, the 1C MSIV will inadvertently CLOSE, and the Reactor will fail to trip automatically and manually. Additionally, the low set Safety Valve on the 1C Steam Generator will lift and stick fully OPEN. Additionally, the TD CA Pump will trip on overspeed on auto start, and both MDCA Pumps will fail to start automatically. The operator will enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," and then transition to EP/1/A/5000/FR-S.1, "Response to Nuclear Power Generation/ATWS." During the performance of FR-S.1, the operator will continuously drive rods in manually, successfully trip the Reactor locally, and manually start the MDCA Pumps and establish 450 gpm of flow the Steam Generators.

The SGTL will degrade to a tube rupture in the 1C Steam Generator when the reactor is locally tripped.

After completion of FR-S.1, the operator will transition back to E-0, and then to EP/1/A/5000/E-2, "Faulted Steam Generator Isolation." After the 1C Steam Generator is isolated, the operator will transition to EP/1/A/5000/E-3, "Steam Generator Tube Rupture."

The scenario will terminate at Step 6 of E-3 after the operator has transitioned to EP/1/A/5000/ECA-3.1, “SGTR with Subcooled Recovery Desired,” or at Step 9 of E-3 upon initiating an NCS cooldown.

Critical Tasks:

Manually close the Failed OPEN Pzr Spray Valve before the Pressurizer pressure drops to ≤ 1945 psig.

Safety Significance: failure to close the Spray Valve and stop the pressure transient, under the postulated plant conditions, results in an unnecessary transient to the plant and challenge to the Reactor Protection System. Performance of the critical task would stabilize the pressure transient. A failure to stabilize the pressure transient, when able to do so, constitutes a mis-operation or incorrect crew performance which leads to incorrect NCS pressure control.

Manually drive rods inward during the ATWS before the local trip of the reactor to ensure that the 1C Steam Generator PORV closes.

Safety Significance: failure to insert negative reactivity, under the postulated plant conditions, results in an unnecessary situation in which remains higher than it otherwise would keeping the Steam Generator PORV open longer than necessary when a ruptured steam generator is in progress. A failure to insert negative reactivity and lower NCS temperature unnecessarily prolongs a radiation release to the environment.

Start one or more MD CA Pumps before a valid Red Path exists the Heat Sink Critical Safety Function Status Tree.

Safety Significance: Failure to establish a Secondary Heat Sink through the initiation of CA flow unnecessarily challenges both the HEAT SINK and the CORE COOLING Critical Safety Functions. Additionally, the FSAR Safety Analysis results are predicated on the assumption that at least one train of safeguards actuates and delivers a minimum amount of AFW flow to the Steam Generators. Failure to perform this task, when the ability to do so exists, results in a violation of the Facility License Condition and places the plant in an unanalyzed condition.

PROGRAM: McGuire Operations Training

MODULE: Initial License Operator Training Class ILT 20-1

TOPIC: NRC Simulator Exam

Scenario N20-1-2

REFERENCES:

1. OP/1/A/6100/003, “Controlling Procedure for Unit Operation” (Rev 212)
2. OP/1/A/6150/009, “Boron Concentration Control” (Rev 138)
3. OP/1/A/6300/001 A, “Turbine-Generator Load Change” (Rev 13)
4. AP/1/A/5500/14, “Rod Control Malfunction” (Rev 16)
5. AP/1/A/5500/11, “Pressurizer Pressure Anomalies” (Rev 12)
6. Technical Specification LCO 3.4.1, “RCS Pressure, Temperature and Flow Departure From Nucleate Boiling (DNB) Limits” (Amendment 219/201)
7. MCEI -0400-379, “McGuire 1 Cycle 27 Core Operating Limits Report” (Rev 1)
8. AP/1/A/5500/20, “Loss of RN” (Rev 38)
9. Technical Specification LCO 3.7.7, “Nuclear Service Water System (NSWS)” (Amendment 308/287)
10. Technical Specification LCO 3.8.1, “AC Sources - Operating” (Amendment 314/293)
11. SLC 16.9.9, “Boration Systems – Flow Path (Operating)” (Rev 180)
12. AP/1/A/5500/03, “Load Rejection” (Rev 34)
13. EP/1/A/5000/E-0, “Reactor Trip or Safety Injection” (Rev 36)
14. EP/1/A/5000/E-2, “Faulted Steam Generator Isolation” (Rev 10)
15. EP/1/A/5000/E-3, “Steam Generator Tube Rupture” (Rev 27)
16. EP/1/A/5000/ECA-3.1, “SGTR With Loss of Reactor Coolant- Subcooled Recovery Desired” (Rev 20)
17. EP/1/A/5000/FR-S.1, “Response To Nuclear Power Generation/ATWS” (Rev 17)

Validation Time: 111 minutes

Author: David Lazarony, Essential Training & Consulting, LLC

Facility Review: ____________________

Rev. 101419

McGuire 2020 NRC Scenario #2 Objectives:

Given the simulator at an initial condition of 75% power with a normal power increase planned evaluate:

1. the SRO's ability to supervise the control room team during the normal, abnormal, and emergency situations that arise, including compliance with all facility procedures, Technical Specifications, and other commitments.
2. each crew member's ability to effectively communicate as part of a control room team during the normal, abnormal, and emergency situations that arise.
3. the RO and BOP's ability to effectively raise power in accordance with Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation," and the Simple Dilution process.
4. each crew member's ability to effectively diagnose an uncontrolled withdrawal of the Control Rods when operating in AUTO, and the RO's ability to respond to such an event in accordance with AP/1/A/5500/14, "Rod Control Malfunction."
5. each crew member's ability to effectively diagnose a failure of a Pressurizer Spray Valve controller when operating in AUTO, and the BOP's ability to respond to such an event in accordance with AP/1/A/5500/11, "Pressurizer Pressure Anomalies."
6. each crew member's ability to effectively diagnose an inadvertent closure of an RN Pump Suction Valve, and the BOP's ability to respond to such an event in accordance with AP/1/A/5500/20, "Loss of RN."
7. each crew member's ability to effectively diagnose a trip of a CF Pump, and their ability to respond to such an event in accordance with AP/1/A/5500/03, "Load Rejection," including RO's ability to control rods in MANUAL during a downpower.
8. each crew member's ability to effectively diagnose a Steam Generator Tube Leak in accordance with AP/1/A/5500/10, "NC System Leakage within Capacity of Both NV Pumps."
9. each crew member's ability to effectively diagnose an ATWS event and the RO and BOP's ability to respond to such an event in accordance with EP/1/A/5000/FR-S.1, "Response to Nuclear Power Generation/ATWS."
10. each crew member's ability to effectively diagnose a ruptured-faulted Steam Generator and the RO and BOP's ability to respond to such an event in accordance with EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," EP/1/A/5000/E-2, "Faulted Steam Generator Isolation," EP/1/A/5000/E-3, "Steam Generator Tube Rupture," and EP/1/A/5000/ECA-3.1, "SGTR with Subcooled Recovery Desired."

Facility:	**McGuire**	Scenario No.: **2**	Op Test No.: **N20-1**
Examiners:		Operators:	(SRO)
			(RO)
			(BOP)

Initial Conditions:	The plant is at 75% power (MOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.
Turnover:	The following equipment is Out-Of-Service: The 1D S/G PORV is isolated and its actuator is currently removed for maintenance. 1KFP-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-11, L-1, "ETA DEGRADED VOLTAGE," has alarmed spuriously several times over the last hour, and has currently failed ON (IAE has verified that the issue is limited to an annunciator card issue). The crew will raise power to 100% after taking the shift.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	R-RO N-BOP N-SRO	Power Increase w/Simple Dilute
2	MAL DCS1288	C-RO C-SRO	Uncontrolled outward Rod Motion in AUTO
3	MAL DCS1762 DCS1763	C-BOP C(TS)-SRO	Pzr Spray Valve (1NC-27) Controller fails OPEN
4	REM RN0018B	C-BOP C(TS)-SRO	1B RN Pump Suction Valve inadvertently CLOSES
5	MAL LF003B IRE009 SG001C	C-RO C-BOP C-SRO	1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual
6	REM SM003AB MAL IPE001A/B IPE002A/B SG001C SM004C1	M-RO M-BOP M-SRO	1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR
7	MAL CA004A CA004B CA005	C-BOP C-SRO	TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2020 NRC Scenario #2

The plant is at 75% power (MOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.

The 1D S/G PORV is isolated and its actuator is currently removed for maintenance. 1KFP-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-11, L-1, “ETA DEGRADED VOLTAGE,” has alarmed spuriously several times over the last hour, and has currently failed ON (IAE has verified that the issue is limited to an annunciator card issue). The crew will raise power to 100% after taking the shift.

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.37.11 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, “Controlling Procedure for Unit Operation.” The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.19, “Simple Dilution,” of OP/1/A/6150/009, “Boron Concentration Control,” and raise Turbine load in accordance with OP/1/A/6300/001 A, “Turbine-Generator Load Change.”

After the load increase is started, the Control Rods will fail such that rods are moving outward in AUTO. The operator will enter AP/1/A/5500/14, “Rod Control Malfunction.” The control rods will subsequently remain in MANUAL.

After this, the Pzr Spray Valve Controller, 1NC-27C A Spray, demand will fail to full output. The operator will enter AP/1/A/5500/11, “Pressurizer Pressure Anomalies.” The operator will address Technical Specification LCO 3.4.1, “RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits.”

Next, the 1B RN Pump Suction Isolation valve will inadvertently CLOSE. The operator will respond using one or more Annunciator Response Procedures and ultimately enter AP/1/A/5500/20, “Loss of RN,” to place the standby train in service. The operator will address Technical Specification LCO 3.7.7, “Nuclear Service Water System (NSWS),” Technical Specification LCO 3.8.1, “AC Sources-Operating,” and SLC 16.9.9, “Boration Systems – Flow Path (Operating).”

Subsequently, the 1B CF Pump will trip causing the turbine to automatically runback to 55%. Simultaneously, a 40 gpm Steam Generator Tube Leak (SGTL) will occur in the 1C Steam Generator. The operator will implement AP/1/A/5500/03, “Load Rejection.” During the runback the operator will need to drive rods in manually.

When the plant is stabilized or AP/1/A/5500/10 is entered to mitigate the SGTL, the 1C MSIV will inadvertently CLOSE, and the Reactor will fail to trip automatically and manually. Additionally, the low set Safety Valve on the 1C Steam Generator will lift and stick fully OPEN. Additionally, the TD CA Pump will trip on overspeed on auto start, and both MDCA Pumps will fail to start automatically. The operator will enter EP/1/A/5000/E-0, “Reactor Trip or Safety Injection,” and then transition to EP/1/A/5000/FR-S.1, “Response to Nuclear Power Generation/ATWS.” During the performance of FR-S.1, the operator will continuously drive rods in manually, successfully trip the Reactor locally, and manually start the MDCA Pumps and establish 450 gpm of flow the Steam Generators.

The SGTL will degrade to a tube rupture in the 1C Steam Generator when the reactor is locally tripped.

After completion of FR-S.1, the operator will transition back to E-0, and then to EP/1/A/5000/E-2, “Faulted Steam Generator Isolation.” After the 1C Steam Generator is isolated, the operator will transition to EP/1/A/5000/E-3, “Steam Generator Tube Rupture.”

The scenario will terminate at Step 6 of E-3 after the operator has transitioned to EP/1/A/5000/ECA-3.1, “SGTR with Subcooled Recovery Desired,” or at Step 9 of E-3 upon initiating an NCS cooldown.

Critical Tasks:

Manually close the Failed OPEN Pzr Spray Valve before the Pressurizer pressure drops to ≤ 1945 psig.

Safety Significance: failure to close the Spray Valve and stop the pressure transient, under the postulated plant conditions, results in an unnecessary transient to the plant and challenge to the Reactor Protection System. Performance of the critical task would stabilize the pressure transient. A failure to stabilize the pressure transient, when able to do so, constitutes a mis-operation or incorrect crew performance which leads to incorrect NCS pressure control.

Manually drive rods inward during the ATWS before the local trip of the reactor to ensure that the 1C Steam Generator PORV closes.

Safety Significance: failure to insert negative reactivity, under the postulated plant conditions, results in an unnecessary situation in which remains higher than it otherwise would keeping the Steam Generator PORV open longer than necessary when a ruptured steam generator is in progress. A failure to insert negative reactivity and lower NCS temperature unnecessarily prolongs a radiation release to the environment.

Start one or more MD CA Pumps before a valid Red Path exists the Heat Sink Critical Safety Function Status Tree.

Safety Significance: Failure to establish a Secondary Heat Sink through the initiation of CA flow unnecessarily challenges both the HEAT SINK and the CORE COOLING Critical Safety Functions. Additionally, the FSAR Safety Analysis results are predicated on the assumption that at least one train of safeguards actuates and delivers a minimum amount of AFW flow to the Steam Generators. Failure to perform this task, when the ability to do so exists, results in a violation of the Facility License Condition and places the plant in an unanalyzed condition.

SIMULATOR OPERATOR INSTRUCTIONS

	Bench Mark	ACTIVITY	DESCRIPTION
☐		**Reset to Temp IC 231** **(Base IC-37 [75% MOL])**	**T = 0 Malfunctions:** **Insert REM_SV0025 = 0 (Close 1SV-25 [1D S/G PORV Isolation])** **Insert LOA_SV004= Racked_Out (SG PORV Breaker Racked Out)** **H_X02_098_3 = 0 (1D PORV Controller LEFT lamp)** **H_X02_098_4 = 0 (1D PORV Controller RIGHT lamp)** **Insert LOA_SV020=0 (SM PORV D LOCAL OPERATION)** **insert XMT_KFTT5130 = 0 (Spent Fuel Pool Temperature Failure)** **insert OVR_1AD11_L01 = ON (MCB Annunciator 1AD11/L1)** **Insert MAL_IPE001A = TRUE (ATWS)** **Insert MAL_IPE001B = TRUE (ATWS)** **Insert MAL_IPE002A = TRUE (ATWS)** **Insert MAL_IPE002B = TRUE (ATWS)** **insert MAL_CA004A = AUTO (1BA MDCA Pump Start Failure [auto])** **insert MAL_CA004B = AUTO (1B MDCA Pump Start Failure [auto])** **insert MAL_CA005 TRIP** **insert MAL_SM004C1 = 100 cd='H_X02_078_3 EQ 1' delay=0 (Safety Valve on 1C SG sticks OPEN on C MSIV CLOSE Indicating Light)** **insert MAL_SG001C = 300 cd='H_X01_094_2 EQ 1' delay=0 (300 gpm SGTR occurs on 1C SG on Reactor Trip Breaker Open Indicating Light)**
☐		**RUN** **Reset all SLIMs**	**Place Tagout/O-Stick on:** • **1SV-25 (Tagout)** • **1KFP-5130 (O-Stick)** • **MCB Annunciator 1AD-11, L-1 (O-stick)**
☐		**Update** Status Board, **Setup OAC**	**NOTE:** RMWST DO = >1000 ppb.

	Bench Mark	ACTIVITY	DESCRIPTION
☐		**Freeze.**	
☐		**Update Fresh Tech. Spec. Log.**	
☐		**Fill out the AO's Available section of Shift Turnover Info.**	
☐	Prior to Crew Briefing	**RUN**	
☐	**Crew Briefing** 1. Assign Crew Positions based on evaluation requirements 2. Review the Shift Turnover Information with the crew. 3. Provide Enclosure 4.1 of OP/1/A/6100/003 marked up as required. 4. Provide the crew with OP/1/A/6150/009 (Boron Concentration Control) and OP/1/A/6300/1 A (Turbine-Generator Load Change). 5. Direct the crew to Review the Control Boards taking note of present conditions, alarms.		
☐	T-0	Begin Familiarization Period	
☐	At direction of examiner	**Execute Simulator Scenario N20-1-2.**	
☐	At direction of examiner	**Event 1** **NA**	Power Increase w/Simple Dilute
☐	After 15-30 MWe rise on the Turbine	**Event 2** **insert MAL_DCS1288 = TRUE**	Uncontrolled outward Rod Motion in AUTO

	Bench Mark	ACTIVITY	DESCRIPTION
☐	At direction of examiner	**Event 3** **Insert MAL_DCS1762 = PRESSED** **Insert MAL_DCS1763 = PRESSED** **10 Second Delay = MAL_DCS1763 = NORMAL**	Pzr Spray Valve (1NC-27) Controller fails OPEN
☐	At direction of examiner	**Event 4** **insert REM_RN0018B_1=0, Ramp = 30 seconds**	1B RN Pump Suction Valve inadvertently CLOSES
☐	At direction of examiner	**Event 5** **Insert:** **insert MAL_LF003B = TRUE** **insert MAL_IRE009 = FAIL_OF_AUTO** **insert MAL_SG001C = 40, Ramp = 600 seconds**	1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual
☐	At direction of examiner	**Event 6** **insert REM_SM003AB =0.0 Ramp = 10 seconds** **insert:** **MAL_IPE001A** **MAL_IPE001B** **MAL_IPE002A** **MAL_IPE002B** **insert MAL_SM004C1 = 100** **Insert MAL_SG001C = 300**	1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR **Note: Malfunctions inserted at T = 0.**

	Bench Mark	ACTIVITY	DESCRIPTION
☐	Post-Rx Trip	**Event 7** **Insert:** **MAL_CA004A = Auto** **MAL_CA004B = Auto** **MAL_CA005**	TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO **Note: Malfunctions inserted at T = 0.**
☐	**Terminate the scenario upon direction of Lead Examiner**		

Op Test No.:	N20-1	Scenario #	2	Event #	1	Page	10 of 72
Event Description:	**Power Increase w/Simple Dilute**						

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.37.11 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation." The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.19, "Simple Dilution," of OP/1/A/6150/009, "Boron Concentration Control," and raise Turbine load in accordance with OP/1/A/6300/001 A, "Turbine-Generator Load Change."
Booth Operator Instructions: **NA**
Indications Available: **NA**

Time	Pos.	Expected Actions/Behavior	Comments
		OP/1/A/6100/003, CONTROLLING PROCEDURE FOR UNIT OPERATIONS ENCLOSURE 4.1, POWER INCREASE	
	CRS	(Step 3.37.11) Prior to increasing to greater than 75% RTP, check all Main Turbine governor valves open.	**NOTE:** The power increase will be at 3 MWe/minute.
	RO/ BOP	(Step 3.37.12) WHEN 77-80% RTP, enable, OTDT DCS alarming as follows:	**NOTE:** Based on the extent of the power increase, this action may or may not be taken.
		• On DCS graphics, select "MAINTENANCE MENU".	
		• Select "TAVG, DELTA T INPUTS & ALARM CHECKING" graphic.	
		• Select "ON" for the following:	
		• NCAA 5422	
		• NCAA 5462	
		• NCAA 5502	
		• NCAA 5542	
		• OTDELTAT-FAIL	
	CRS	(Step 3.37.13) IF startup from refueling outage…..	

Op Test No.:	N20-1	Scenario #	2	Event #	1	Page	11 of 72
Event Description:	**Power Increase w/Simple Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
		(Step 3.37.14) IF performing Generator/Automatic Voltage Regulator (AVR) testing at 78% RTP…	
OP/1/A/6150/009, BORON CONCENTRATION CONTROL ENCLOSURE 4.19, SIMPLE DILUTION			
	BOP	(Step 3.1) Evaluate all outstanding Clearances that may impact performance of this procedure.	**NOTE:** The BOP may repeat this task as needed during the power increase.
	BOP	(Step 3.2) Determine current blender contents AND evaluate any potential Reactivity effects prior to performing this enclosure:	**NOTE:** The BOP will recognize from the Turnover that the Blender is filled with Rx Makeup Water.
		• Rx Makeup Water	
		• Blend	
		• Boron	
	BOP	(Step 3.3) Evaluate energizing additional pressurizer heaters per OP/1/A/6100/003 (Controlling Procedure For Unit Operation) to enhance system mixing when changing NC System boron concentration. (R.M.)	
	BOP	(Step 3.4) Determine amount of reactor makeup water needed to obtain desired boron concentration using McGuire Data Book, OAC, Reactor Group Guidance, or plant parameters (T-Ave, Steam Pressure, Xenon worth, etc.). (R.M.)	**NOTE:** The BOP will add 400 gallons of Rx Makeup Water as recommended by RE.
		Total Reactor Makeup Water:	
	BOP	(Step 3.5) Ensure the following reset to zero: (R.M.)	
		• Total Make Up Flow Counter	
		• Boric Acid Flow Counter	

Op Test No.:	N20-1	Scenario #	2	Event #	1	Page	12 of 72
Event Description:	**Power Increase w/Simple Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.6) Set Total Make Up Flow Counter to value determined in Step 3.4. (R.M.)	
	BOP	(Step 3.7) Select “DILUTE” on “NC Sys M/U Controller”.	
	BOP	(Step 3.8) IF AT ANY TIME it is desired to lower VCT level, perform the following:	
		(Step 3.8.1) Monitor Letdown Pressure.	
NOTE An increase in Letdown Pressure greater than 20 psig during diverts may be indicative of excessive NB Feed Filter DP. {NCR 01597088}			
		(Step 3.8.2) Select “HUT” on 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Contrl).	**NOTE:** The BOP may do this at any time to lower VCT level.
		(Step 3.8.3) IF Letdown Pressure increases greater than 20 psig, notify CRS.	
		(Step 3.8.4) WHEN desired level achieved, THEN select “AUTO” on 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Cntrl).	
NOTE Steps 3.9 - 3.17 may be completed and then checked off as time allows.			
	BOP	(Step 3.9) IF AT ANY TIME plant parameters require termination of dilution, perform the following:	
		(Step 3.9.1) Place “NC System Make Up” to “STOP”. (R.M.)	
		(Step 3.9.2) IF 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Cntrl) was placed to HUT, place to “AUTO”.	

Op Test No.: N20-1	Scenario # 2	Event # 1	Page 13 of 72
Event Description:	**Power Increase w/Simple Dilute**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.10) Momentarily select "START" on "NC System Make Up". (R.M.)	
	BOP	(Step 3.11) Check "NC System Make Up" red light lit.	
	BOP	(Step 3.12) Check 1NV-171A (U1 Boric Acid Blender To VCT Inlet Control) open.	
	BOP	(Step 3.13) Check 1NV-252A (Rx M/U Water Supply To U1 BA Blender Cntrl) open or throttled as required.	
	BOP	(Step 3.14) Check Rx M/U Water Pump starts.	
	BOP	(Step 3.15) Monitor Total Make Up Flow Counter. (R.M.)	
	BOP	(Step 3.16) HOLD until one of the following occurs:	
		• Amount of reactor makeup water recorded per Step 3.4 added	
		OR	
		• Reactor makeup water addition manually terminated	
	BOP	(Step 3.17) Ensure dilution terminated as follows: (R.M.)	
		(Step 3.17.1) IF in "AUTO", ensure the following off:	
		• 1A Rx M/U Water Pump	
		• 1B Rx M/U Water Pump	
	BOP	(Step 3.17.2) Ensure the following closed:	

Op Test No.:	N20-1	Scenario #	2	Event #	1	Page	14	of 72
Event Description:		Power Increase w/Simple Dilute						

Time	Pos.	Expected Actions/Behavior	Comments
		• 1NV-171A (U1 Boric Acid Blender To VCT Inlet Control)	
		• 1NV-252A (RX M/U Water Supply To U1 BA Blender Cntrl)	
	BOP	(Step 3.18) Ensure 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Cntrl) in “AUTO”.	
NOTE CRS concurrence required if flush of blender not performed.			
	BOP	(Step 3.19) IF desired to flush blender….	**NOTE:** It is NOT desired to flush the blender.
	BOP	(Step 3.20) Select “AUTO” for “NC Sys M/U Controller”.	
	BOP	(Step 3.21) Momentarily select “START” on “NC System Make Up”.	
	BOP	(Step 3.22) Check “NC System Make Up” red light lit.	
	BOP	(Step 3.23) Ensure the following reset to zero: (R.M.)	
		• Total Make Up Flow Counter	
		• Boric Acid Flow Counter	
	BOP	(Step 3.24) Record in Narrative Log that final blender content is Rx Makeup Water.	
OP/1/A/6300/001A, TURBINE-GENERATOR STARTUP/SHUTDOWN ENCLOSURE 4.1, TURBINE-GENERATOR LOAD CHANGE			

Op Test No.: N20-1	Scenario # 2	Event # 1	Page 15 of 72
Event Description:	**Power Increase w/Simple Dilute**		

Time	Pos.	Expected Actions/Behavior	Comments
NOTE If reducing power to a level greater than 50%, it is preferable to reduce power at a rate less than 12% per hour in order to minimize sodium peaks. [NCR01574291]			
	RO	(Step 3.4.1) IF Turbine in "OPERATOR AUTO", perform the following:	
		(Step 3.4.1.1) Ensure desired change within "Calculated Capability Curve".	
		(Step 3.4.1.2) IF turbine load will raise or lower more than 10 MWs, notify Dispatcher of expected load change.	
		(Step 3.4.1.3) IF desired to change load rate, THEN perform the following:	
		• Depress "LOAD RATE".	
		• Enter desired load rate in "VARIABLE DISPLAY".	**NOTE:** the RO will select 2 MWe/Min loading rate.
		• Depress "ENTER".	
		(Step 3.4.1.4) IF desired to change desired load, THEN perform the following:	
		• Depress "REFERENCE".	
		• Enter desired load in "VARIABLE DISPLAY".	
		• Depress "ENTER".	
		• Depress "GO"	
		• Check load changes at selected rate.	
OP/1/A/6100/003, CONTROLLING PROCEDURE FOR UNIT OPERATIONS ENCLOSURE 4.1, POWER INCREASE			
	CRS	(Step 3.37.13) Continue power increase to 95% RTP.	**NOTE:** The power increase will be at 3 MWe/minute.
When Turbine Load has been raised by 20-40 MWe move to Event #2.			

Op Test No.:	N20-1	Scenario #	2	Event #	2	Page	16 of 72
Event Description:	**Uncontrolled outward Rod Motion in AUTO**						

After the load increase is started, the Control Rods will fail such that rods are moving outward in AUTO. The operator will enter AP/1/A/5500/14, "Rod Control Malfunction." The control rods will subsequently remain in MANUAL.

Booth Operator Instructions: **insert MAL_DCS1288 = TRUE (Rods Out Demand)**

Indications Available:

- Rods stepping out continuously with no demand.
- WHITE "Rods Out" light is LIT

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: When the malfunction is diagnosed the CRS may go to HOLD on the Turbine.
		AP/1/A/5500/14, ROD CONTROL MALFUNCTION	
	RO	(Step 1) IF two or more rods are either dropped or misaligned by greater than 24 steps, THEN…..	**Immediate Action** **NOTE:** No control rods dropped during this event.
	RO	(Step 2) Place control rods in manual.	**Immediate Action**
	RO	(Step 3) Check rod movement – STOPPED.	**Immediate Action** **NOTE:** There was no rod motion when the Rods were taken to Manual.
	RO	(Step 4) Check all rods – ALIGNED WITH ASSOCIATED BANK.	
	RO	(Step 5) Check "ROD CONTROL URGENT FAILURE" alarm (1AD-2, A-10) – DARK.	
	RO	(Step 6) Check "T-AVG/T-REF FAILURE ROD STOP" alarm (1AD-2, B-7) – DARK.	

Op Test No.:	N20-1	Scenario #	2	Event #	2	Page	17 of	72
Event Description:	**Uncontrolled outward Rod Motion in AUTO**							

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step7) IF this AP entered due to unwarranted rod insertion or withdrawal, THEN GO TO Enclosure 3 (Response to Continuous Rod Movement).	**NOTE:** The SRO will transition to AP-14, Enclosure 3.
AP/1/A/5500/14, ROD CONTROL MALFUNCTION ENCLOSURE 3, RESPONSE TO CONTINUOUS ROD MOVEMENT			
	CRS	(Step 1) Announce occurrence on paging system.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	CRS	(Step 2) Notify IAE to investigate problem.	**NOTE:** The CRS may call WCC/IAE to address the Rod Control malfunction. If so, **Booth Instructor** acknowledge as WCC.
	RO	(Step 3) Evaluate the following prior to any control rod withdrawal:	
		• Ensure no inadvertent mode change will occur	
		• Ensure control rods are withdrawn in a deliberate manner, while closely monitoring the reactor's response.	
	RO	(Step 4) Check T-Ref indication – NORMAL.	
	RO	(Step 5) Do not move rods until IAE determines rod motion is permissible.	
	RO	(Step 6) Maintain T-Avg within 1°F of programmed T-Ref as follows:	

Op Test No.:	N20-1	Scenario #	2	Event #	2	Page	18 of 72
Event Description:	**Uncontrolled outward Rod Motion in AUTO**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Adjust Turbine load	**NOTE:** The RO will adjust Turbine Load as needed to maintain T-avg.
		OR	
		• Borate/dilute NC System.	
	RO	(Step 7) IF AT ANY TIME a runback occurs while in this procedure, THEN observe the following guidance:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• IF IAE has determined that it is permissible to move rods, THEN respond to the runback PER AP/1/A/5500/03 (Load Rejection).	**NOTE:** The CRS may call WCC/IAE to address. If so, **Booth Instructor** acknowledge as WCC. **After 5 minutes**, report that the **Control Rods must be kept in MANUAL, and that they can move rods in MANUAL as needed**.
		• For all other circumstances, assume rod control is not available and respond to the runback as follows:	
		• Trip Reactor.	
		• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	
	RO	(Step 8) IF AT ANY TIME while in this procedure a unit shutdown is required AND rods cannot be moved, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Borate as required during shutdown to maintain T-Avg at T-Ref.	
		• Monitor AFD during load reduction.	
		• IF AT ANY TIME AFD reaches Tech Spec limit AND reactor power is greater than 50%, THEN perform the following:	
		• Trip Reactor.	

Op Test No.: N20-1	Scenario # 2	Event # 2		Page 19 of 72	
Event Description:	**Uncontrolled outward Rod Motion in AUTO**				

Time	Pos.	Expected Actions/Behavior	Comments
		• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	
			NOTE: The CRS may call WCC/IAE to address. If so, **Booth Instructor** acknowledge as WCC. **After 5 minutes**, report that the **Control Rods must be kept in MANUAL, and that they can move rods in MANUAL as needed**.
	RO	(Step 9) WHEN problem is repaired, THEN perform the following:	**NOTE:** The CRS will likely conduct a Focus Brief.
At the discretion of the Lead Examiner move to Event #3.			

Op Test No.: N20-1	Scenario # 2	Event # 3	Page 20 of 72
Event Description:	**Pzr Spray Valve (1NC-27) Controller fails OPEN**		

After this, the Pzr Spray Valve Controller, 1NC-27C A Spray, demand will fail to full output. The operator will enter AP/1/A/5500/11, "Pressurizer Pressure Anomalies." The operator will address Technical Specification LCO 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits."

Booth Operator Instructions:

Insert MAL_DCS1762 = PRESSED

Insert MAL_DCS1763 = PRESSED

10 Second Delay = MAL_DCS1763 = NORMAL

Indications Available:

- NCS/Pzr pressure lowers
- OAC Alarm: U1 PZR PRESS I through IV
- 1NC-27C SLIMs LS indication 50 or 100%
- MCB Annunciator 1AD6/C-6 PZR LO PRESS CONTROL

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The BOP may take all the necessary actions in the Immediate Actions, before CRS reads AOP.
		AP/1/A/5500/11, PRESSURIZER PRESSURE ANOMALIES	
	BOP	(Step 1) Check Pzr pressure – HAS GONE DOWN.	**Immediate Action**
	BOP	(Step 2) Check Pzr PORVs – CLOSED.	**Immediate Action**
	BOP	(Step 3) Check Pzr spray valves - CLOSED	**Immediate Action** **NOTE:** 1NC-27C is OPEN.
	BOP	(Step 3 RNO) CLOSE Pzr spray valve(s).	**NOTE:** The BOP will close 1NC-27C using the SLIMS or the Emergency Close Switch.

Op Test No.: N20-1	Scenario # 2	Event # 3	Page 21 of 72
Event Description:	**Pzr Spray Valve (1NC-27) Controller fails OPEN**		

Time	Pos.	Expected Actions/Behavior	Comments
<u>Critical Task:</u> **Manually close the Failed OPEN Pzr Spray Valve before the Pressurizer pressure drops to ≤ 1945 psig.** Safety Significance: failure to close the Spray Valve and stop the pressure transient, under the postulated plant conditions, results in an unnecessary transient to the plant and challenge to the Reactor Protection System. Performance of the critical task would stabilize the pressure transient. A failure to stabilize the pressure transient, when able to do so, constitutes a mis-operation or incorrect crew performance which leads to incorrect NCS pressure control.			
	BOP	(Step 4) Check Pzr PORVs – CLOSED.	
	BOP	(Step 5) Check Pzr spray valves – CLOSED.	**NOTE:** IF the BOP has already used the EMERG SWITCH, the CRS may answer YES, and continue to Step 6. If NOT, the Step 5 RNO will be performed.
	BOP	(Step 5 RNO) IF NC pressure below desired pressure, THEN perform the following:	
		• Ensure Pzr spray emergency close switch on 1MC-10 is in the "CLOSE" position for failed spray valve.	
		• IF Pzr spray valve closed, THEN GO TO Step 6.	
	CRS	(Step 6) Announce occurrence on page.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	BOP	(Step 7) Check 1NV-21A (NV Spray to PZR Isol) – CLOSED.	
	BOP	(Step 8) Check the following Pzr heaters – ON:	

Op Test No.:	N20-1	Scenario #	2	Event #	3	Page 22 of 72
Event Description:		Pzr Spray Valve (1NC-27) Controller fails OPEN				

Time	Pos.	Expected Actions/Behavior	Comments
		• 1A	
		• 1B	
		• 1D	
	BOP	(Step 9) Check 1C Pzr heaters – ON.	
	BOP	(Step 10) Check "PZR PRESS MASTER" – IN AUTO.	
	BOP	(Step 11) Check "1NC-27 PRESSURIZER SPRAY EMERGENCY CLOSE" switch – SELECTED TO "NORMAL".	**NOTE:** In order to close the malfunctioning Spray Valve, the BOP likely had to take the EMERG SWITCH to CLOSE.
	CRS	(Step 11 RNO) Notify station management to ensure switch restored to "NORMAL" once spray valve is repaired.	**NOTE:** The CRS may call WCC/Station Management to address the switch position. If so, **Booth Instructor** acknowledge as WCC.
	BOP	(Step 12) Check "1NC-29 PRESSURIZER SPRAY EMERGENCY CLOSE" switch – SELECTED TO "NORMAL".	
	BOP	(Step 13) Check Pzr pressure – GOING UP TO DESIRED PRESSURE.	
	CRS	(Step 14) Exit this procedure.	**NOTE:** The CRS may call WCC/IAE to address the valve failure. If so, **Booth Instructor** acknowledge as WCC.
			NOTE: The CRS will likely conduct a Focus Brief.
TECHNICAL SPECIFICATION 3.4.1, RCS PRESSURE, TEMPERATURE, AND FLOW DEPARTURE FROM NUCLEATE BOILING (DNB) LIMITS			

Op Test No.: N20-1	Scenario # 2	Event # 3	Page 23 of 72
Event Description:	**Pzr Spray Valve (1NC-27) Controller fails OPEN**		

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	LCO 3.4.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be within the limits specified in Table 3.4.1-1.	**NOTE:** According to Table 3.4.1-1, Parameter 2, indicated Pressurizer Pressure will be ≥ The limit specified in the COLR.
	CRS	APPLICABILITY: MODE 1.	**NOTE:** According to Table 4 of the COLR, indicated Pressurizer Pressure (with four channels available) must be ≥ 2212.3 psig via the meter indication and ≥ 2209.1 psig via the OAC. During this failure Pressurizer Pressure will lower below these values.
	CRS	ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressurizer pressure or RCS average temperature DNB parameters not within limits.	A.1 Restore DNB parameter(s) to within limit.	2 hours

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: When Pressurizer Pressure drops to < 2209.1 psig (OAC) on the failure, the CRS will determine that Condition A is required and that ACTION A.1 must be taken.

At the discretion of the Lead Examiner, move to Event #4.

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	24 of 72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**						

Next, the 1B RN Pump Suction Isolation valve will inadvertently CLOSE. The operator will respond using one or more Annunciator Response Procedures and ultimately enter AP/1/A/5500/20, "Loss of RN," to place the standby train in service. The operator will address Technical Specification LCO 3.7.7, "Nuclear Service Water System (NSWS)," Technical Specification LCO 3.8.1, "AC Sources-Operating," and SLC 16.9.9, "Boration Systems – Flow Path (Operating)."

Booth Operator Instructions: **insert REM_RN0018B_1 = 0, Ramped = 30 seconds**

Indications Available:

- OAC Alarm M1Q0180, 1RN18B RN PUMP SUCTION ISOL, alarms.
- Numerous MCB Annunciator 1AD12 alarms associated with RN.
- 1RN-18B Green status light is LIT.
- Low flow in RN header.

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: If the load increase has been restarted, the RO will likely stop the load increase.
		AP/1/A/5500/20, LOSS OF RN CASE I, LOSS OF OPERATING RN TRAIN	
	BOP	(Step 1) Check both D/Gs - OFF.	
	BOP	(Step 2) Check for potential loss of LLI as follows:	
		• Check Unit 2 RN pump(s) that are aligned to LLI – OPERATING PROPERLY.	**Floor Instructor:** If asked, As **U2 RO** report "2A RN Pump is running properly."
		• Check suction flowpath – AVAILABLE.	**NOTE:** The crew should recognize that the LLI flowpath is available, but that the Suction Valve to the 1B RN Pump has closed and continue to Step 3.

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	25 of 72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 3) Announce occurrence on page.	**NOTE:** CRS may ask U2 RO to make Plant Announcement that AP-20 has been entered. If so, **Floor Instructor** acknowledge as U2 RO.
	BOP	(Step 4) Check Any RN pump – ON.	**NOTE:** The crew should recognize that the 1B RN Pump is operating with its suction valve closed and stop the pump. This will result in both RN pumps being OFF.
	BOP	(Step 5) Check VI header pressure – GREATER THAN 60 PSIG.	
	BOP	(Step 6) Check the following annunciators - DARK:	
		• "RN STRNR A HI D/P" (1AD-12, D-2)	
		• "RN STRNR B HI D/P" (1AD-12, D-3).	
	BOP	(Step 6 RNO) Perform the following:	
		• IF discharge pressure on running RN pump(s) is less than 50 PSIG, THEN reduce RN flow to raise discharge pressure.	
		• REFER TO appropriate annunciator response.	
	CRS	• IF adequate RN flow cannot be maintained to RN cooled components OR it is desired to place idle RN train in service, THEN GO TO Step 7.	
	BOP	(Step 7) Place RN train in service as follows:	
		• Check both RN pumps - OFF.	
	BOP	(Step 7.A RNO) IF one train of RN is operating properly, THEN….	**NOTE:** There is no Train of RN that is operating properly.

Op Test No.:	N20-1	Scenario # 2	Event #	4	Page	26 of 72
Event Description:		**1B RN Pump Suction Valve inadvertently CLOSES**				

Time	Pos.	Expected Actions/Behavior	Comments
		• (Step 7.B) Check RN train – AVAILABLE TO START.	**NOTE:** The CRS may dispatch an AO. If so, **Booth Instructor** acknowledge as the AO.
	BOP	• Start one train of RN as follows:	
		• To start 1A RN pump perform the following:	
		• Ensure flowpath available.	
	BOP	• Place manual loader for 1RN-89A (RN to A KC Hx Control) to 10% OPEN.	
	BOP	• Start 1A RN pump.	**NOTE:** The BOP will start the 1A RN Pump.
		• Ensure the following valve for train being started – OPEN.	
		• 1RN-86A (A KC Hx Inlet Isol).	
		• Check the following cross-tie valves – OPEN:	
		• 1RN-40A (Train A To Non Ess Hdr Isol)	
		• 1RN-41B (Train B TO Non Ess Hdr Isol)	
		• 1RN-43A (Train B To Non Ess Hdr Isol).	
	BOP	• Ensure malfunctioning RN pump is off.	**NOTE:** The BOP will stop the 1B RN if not done already.
	BOP	• Check if local venting of RN pump has been performed PER one of the following:	**NOTE:** Local venting of RN pump has NOT been performed.
		• Enclosure 5 (1A RN Pump Venting)	
		OR	

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	27	of 72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**							

Time	Pos.	Expected Actions/Behavior	Comments
		• Enclosure 6 (1B RN Pump Venting).	
	CRS	(Step 7.G RNO) GO TO Step 7.I.	
	BOP	• (Step 7.I) Check Enclosure 7 (NV Pump Cooling Via Gravity Drain To Sump) – HAS BEEN PERFORMED.	**NOTE:** Enclosure 7 has NOT been performed.
	CRS	(Step 7.I RNO) GO TO Sep 7.K	
	BOP	• Check Case II (Loss of Low Level or RC Supply Crossover) – HAS BEEN IMPLEMENTED.	**NOTE:** Case II has NOT been performed.
	CRS	(Step 7.K RNO) GO TO Step 8.	
	BOP	(Step 8) Ensure cooling to KC as follows:	
	BOP	• Check 1A KC pump(s) – RUNNING.	**NOTE:** The B Train of KC is operating.
	CRS	(Step 8.A RNO) GO TO Step 8.H.	
	BOP	• Check 1B KC pump(s) – RUNNING.	
	BOP	• Ensure 1B KC pumps aligned to reactor bldg non essential header as follows:	
		• OPEN the following valves:	
		• 1KC-18B (Trn B Rx Bldg Non Ess Ret Isol).	
		• 1KC-228B (Trn B Rx Bldg Non Ess Sup Isol).	
		• CLOSE the following valves:	

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	28	of	72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**								

Time	Pos.	Expected Actions/Behavior	Comments
		• 1KC-230A (Trn A Rx Bldg Non Ess Sup Isol).	
		• 1KC-3A (Trn A Rx bldg Non Ess Ret Isol).	
	BOP	• Check 1B RN pump – OFF.	
	BOP	• Check 1RN-187B (B KC Hx Inlet Isol) – LOCALLY THROTTLED DURING THIS PROCEDURE.	**NOTE:** 1RN-187B has NOT been locally throttled.
	BOP	(Step 8.K RNO) Perform the following:	
		• IF VI header pressure is less than 60 PSIG, THEN….	
	BOP	• Place 1RN-187B “MODE SELECT” switch to manual.	
	BOP	• OPEN 1RN-187B (B KC Hx Inlet Isol).	
	BOP	• THROTTLE 1RN-89A (RN to A KC Hx Control) to maintain 1A RN pump discharge pressure greater than 50 PSIG.	
		• IF 1A RN pump discharge pressure is greater than 50 PSIG, THEN GO TO Step 9.	
	BOP	(Step 9) Maintain RN flow within operating limits as follows:	
		• Check VI header pressure - GREATER THAN 60 PSIG.	
		• Check 1A RN pump - RUNNING	
		• THROTTLE 1RN-89A (RN to A KC Hx Control) to maintain 1A RN pump discharge pressure greater than 50 PSIG.	
		• Check 1A RN pump flow - LESS THAN 14,000 GPM.	
		• Check 1B RN pump - RUNNING.	**NOTE:** 1B RN Pump is OFF.
	BOP	(Step 9.E RNO) GO TO Step 10.	

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	29 of 72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP/ CRS	(Step 10) Investigate reason for loss of RN train as follows:	**NOTE:** The CRS may dispatch an AO. If so, **Floor/Booth Instructor** acknowledge as the AO.
		• Dispatch operator to check RN pump.	
		• Dispatch operator to check RN pump breaker.	
		• Check suction flowpath alignment.	
		• Check discharge flowpath alignment.	**NOTE:** The CRS may call WCC/IAE to address the Pump malfunction, and request that the 1B RN Pump Breaker be racked out. If so, **Booth Instructor** acknowledge as **WCC**, and indicate that the **1B RN Pump Breaker will be Racked Out**. Use: **LOA_RN006 = Racked_Out (1B RN Pump BKR)** **LOA_RN006A = Racked_Out (1B RN Pump Cntrl Pwr)**
	CRS	(Step 11) Ensure Control Room Area Chiller in service PER Enclosure 2 (VC/YC Operation).	**NOTE:** The CRS may assign the **RO** to perform this action, or have the **BOP** perform these actions prior to continuing with Step 12. If actions are performed in parallel, **Appropriate Examiner** follow actions of Enclosure 2. **Other Examiners** follow **AP-20** Actions, **Step 12**, on **Page 30**.

AP/1/A/5500/20, LOSS OF RN
ENCLOSURE 2, VC/YC OPERATION

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	30 of	72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**							

Time	Pos.	Expected Actions/Behavior	Comments
			Examiner NOTE: Follow the actions associated with Enclosure 3 if RO is assigned by CRS to perform.
	RO/ BOP	(Step 1) Check train selected Control Room Area Chiller – ON.	**NOTE:** The Chiller is expected to be ON. If not, the RO/BOP will take action per the RNO to restart the Chiller.
AP/1/A/5500/20, LOSS OF RN CASE I, LOSS OF OPERATING RN TRAIN			
			Examiner NOTE: Examiners following the **CRS/BOP** continue **HERE**.
	BOP	(Step 12) Align operating train of equipment with running RN pump as follows:	
		• Check 1A RN pump – ON.	
		• Check the following equipment – ON:	
		• 1A1 and 1A2 KC pumps - ON	
	CRS	(Step 12.B RNO) GO TO Step 12.I.	
	BOP	(Step 12.I) Perform one of the following as necessary to align operating RN train with train of equipment cooled by RN:	
		• Swap operating equipment to opposite train as follows:	
		• IF desired to swap KC trains, THEN perform Enclosure 1 (Shifting KC Trains).	
			NOTE: The CRS will transition to Enclosure 1.
AP/1/A/5500/20, LOSS OF RN ENCLOSURE 1, SHIFTING KC TRAINS			

Op Test No.: N20-1	Scenario # 2	Event # 4	Page 31 of 72
Event Description:	1B RN Pump Suction Valve inadvertently CLOSES		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 1) Limit KC flow to 4000 GPM per operating KC pump in subsequent steps.	
	BOP	(Step 2) Check the following:	
		• 1RN-40A (Train A To Non Ess Hdr Isol) - OPEN	
		• 1RN-41B (Train B To Non Ess Hdr Isol) - OPEN	
		• 1RN-43A (Train B To Non Ess Hdr Isol) - OPEN	
		• Any KC pump – RUNNING.	**NOTE:** The B Train KC Pumps are operating.
	CRS	(Step 3) GO TO Step 5.	
	BOP	(Step 5) Check both ND pumps – OFF.	
	CRS	(Step 6) Perform the following:	
		• IF shifting from 1A KC Train to 1B KC Train,…	**NOTE:** The crew will be shifting from 1B KC Train to 1A KC Train.
		OR	
		• IF shifting from 1B KC Train to 1A KC Train, THEN GO TO Step 22.	
	BOP	(Step 22) THROTTLE OPEN 1RN-89A (RN to A KC Hx Control) to establish desired flow to 1A KC Hx, while maintaining 1A RN pump discharge pressure greater than 50 psig.	
	BOP	(Step 23) Place control switch for 1KC-51A (Train A Recirc Isol) in the "AUTO" position.	
	BOP	(Step 24) Ensure 1KC-51A OPENS.	

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	32 of 72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 25) Start 1A1 KC pump.	**NOTE:** The CRS may contact the AO to start the pumps. If so, **Booth Instructor** acknowledge as the AO.
	BOP	(Step 26) Start 1A2 KC pump.	
	BOP	(Step 27) Align Reactor Bldg header to 1A Train as follows:	
		• OPEN the following valves:	
		• 1KC-3A (Trn A Rx Bldg Non Ess Ret Isol)	
		• 1KC-230A (Trn A Rx Bldg Non Ess Sup Isol).	
		• CLOSE the following valves:	
		• 1KC-228B (Trn B Rx Bldg non Ess Sup Isol)	
		• 1KC-18B (Trn B Rx Bldg Non Ess Ret Isol).	
	BOP	(Step 28) Check both ND pumps – OFF.	
	BOP	(Step 29) Place 1RN-187B “MODE SELECT” switch to auto.	
	BOP	(Step 30) Check 1RN-187B (B KC Hx Inlet Isol) – CLOSED.	
	BOP	(Step 31) WHEN RN flow through the 1B KC Hx begins to go down, THEN THROTTLE OPEN 1RN-89A (RN to A KC Hx Control) to achieve desired flow rate while maintaining the following:	
		• 1A RN pump discharge pressure - GREATER THAN 50 PSIG	

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	33 of 72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**						

Time	Pos.	Expected Actions/Behavior	Comments
		• 1A RN pump flow - LESS THAN 14,000 GPM.	
	BOP	(Step 32) Place 1KC-54B (Train B Recirc Isol) in “CLOSE”.	
	BOP	(Step 33) Ensure 1KC-54B is CLOSED.	
	BOP	(Step 34) Stop the following pumps:	
		• 1B1 KC pump	
		• 1B2 KC pump.	
	BOP	(Step 35) Ensure NC pump thermal barrier isolation valves are OPEN.	
	BOP	(Step 36) RETURN TO step in effect in body of this procedure.	
			NOTE: The CRS will return to the main body of AP-20. **Examiner NOTE:** Because there are still AP-related actions to take with this procedure, the CRS may NOT address the TS at the time. Consequently, it may be necessary to move to next event, and address the TS after the scenario.
TECHNICAL SPECIFICATION 3.7.7, NUCLEAR SERVICE WATER SYSTEM			
	CRS	LCO 3.7.7 Two NSWS trains shall be OPERABLE.	
	CRS	APPLICABILITY: MODES 1, 2, 3, and 4.	
	CRS	ACTIONS	

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	34	of 72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**							

Time	Pos.	Expected Actions/Behavior	Comments
CONDITION	REQUIRED ACTION		COMPLETION TIME
A.One NSWS train inoperable.	A.1 Restore NSWS train to OPERABLE status.		72 hours
			NOTE: The CRS will determine that condition A is required and ACTION A.1 must be taken.
TECHNICAL SPECIFICATION 3.8.1, AC SOURCES - OPERATING			
	CRS	LCO 3.8.1 The following AC electrical sources shall be OPERABLE:	
		• Two qualified circuits between the offsite transmission network and the Onsite Essential Auxiliary Power System; and • Two diesel generators (DGs) capable of supplying the Onsite Essential Auxiliary Power Systems; and • The qualified circuit(s) between the offsite transmission network and the opposite unit's Onsite Essential Auxiliary Power System necessary to supply power to the Nuclear Service Water System (NSWS), Control Room Area Ventilation System (CRAVS), Control Room Area Chilled Water System (CRACWS) and Auxiliary Building Filtered Ventilation Exhaust System (ABFVES); and • The DG(s) from the opposite unit necessary to supply power to the NSWS, CRAVS, CRACWS and ABFVES;	
		AND	
		The automatic load sequencers for Train A and Train B shall be OPERABLE.	
	CRS	APPLICABILITY: MODES 1, 2, 3, and 4.	

Event Description: **1B RN Pump Suction Valve inadvertently CLOSES**

Time	Pos.	Expected Actions/Behavior	Comments
		NOTE: The opposite unit electrical power sources in LCO 3.8.1.c and LCO 3.8.1.d are not required to be OPERABLE when the associated shared systems are inoperable.	
	CRS	ACTIONS	
		NOTE: LCO 3.0.4.b is not applicable to DGs.	

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	36	of 72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**							

Time	Pos.	Expected Actions/Behavior	Comments

CONDITION	REQUIRED ACTION	COMPLETION TIME
B.One LCO 3.8.1.bDG inoperable.	B.1 Verify LCO 3.8.1.d DG(s) OPERABLE. AND	1 hour AND Once per 12 hours thereafter
	B.2 Perform SR 3.8.1.1 for the offsite circuit(s). AND	1 hour AND Once per 8 hours thereafter
	B.3Declare required feature(s) supported by the inoperable DG inoperable when its required redundant feature(s) is inoperable. AND	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
	B.4.1 Determine OPERABLE DG is not inoperable due to common cause failure. OR	24 hours
	B.4.2 Perform SR 3.8.1.2 for OPERABLE DG. AND	24 hours
	B.5 Evaluate availability of Emergency Supplemental Power Source (ESPS) AND	1 hour AND Once per 12 hours thereafter
	B.6 Restore DG to OPERABLE status.	72 hours from discovery of unavailable ESPS ** AND 24 hours from discovery of Condition B entry ≥ 48 hours concurrent with unavailability of ESPS AND 14 days AND 17 days from discovery of failure to meet LCO 3.8.1.a or LCO 3.8.1.b

Op Test No.:	N20-1	Scenario #	2	Event #	4	Page	37	of 72
Event Description:	**1B RN Pump Suction Valve inadvertently CLOSES**							

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will determine that condition B is required and ACTION B.1, B.2, B3.1 or B.3.2, B.4, B.5 and B.6 must be taken.
At the discretion of the Lead Examiner, move to Event #5.			

Op Test No.: N20-1	Scenario # 2	Event # 5	Page 38 of 72
Event Description:	**1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual**		

Subsequently, the 1B CF Pump will trip causing the turbine to automatically runback to 55%. Simultaneously, a 40 gpm Steam Generator Tube Leak (SGTL) will occur in the 1C Steam Generator. The operator will implement AP/1/A/5500/03, "Load Rejection." During the runback the operator will need to drive rods in manually.	
Booth Operator Instructions:	**Insert MAL_LF003B = TRUE** **Insert MAL_IRE009 = FAIL_OF_AUTO** **Insert MAL_SG001C = 40**
Indications Available: • 1B CF Pump Trips. • MCB Annunciator 1AD-1, D6, DEH TURBINE RUNBACK, alarms. • Turbine Generator MWe lowering. • MCB Annunciator 1RAD-1, C-1, 1EMF 71 S/G A LEAKAGE HI RAD • MCB Annunciator 1RAD-1, D-1, 1EMF 72 S/G B LEAKAGE HI RAD • MCB Annunciator 1RAD-1, D-2, 1EMF 73 S/G C LEAKAGE HI RAD • MCB Annunciator 1RAD-1, D-3, 1EMF 74 S/G D LEAKAGE HI RAD	

Time	Pos.	Expected Actions/Behavior	Comments
		AP/1/A/5500/03, LOAD REJECTION	
	RO	(Step 1) Ensure control rods in auto.	**Immediate Action** **NOTE:** Rods are in MANUAL from a previous malfunction and will NOT work in AUTO.
	RO	(Step 2) Check Turbine Generator response as follows:	
		• Check Generator – TIED TO GRID.	
		• Check Generator output – GOING DOWN AS REQUIRED.	
	RO	(Step 3) Check control rod response as follows:	
		• Check control banks – MOVING IN AS REQUIRED.	**NOTE:** Rods are in MANUAL from a previous malfunction and will NOT work in AUTO.

Op Test No.:	N20-1	Scenario #	2	Event #	5	Page	39	of	72
Event Description:	**1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual**								

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 3a RNO) IF no rods will move in auto; THEN perform the following:	
		• Place Control Rods in manual.	
		• Insert rods to reduce T-avg equal to programmed T-Ref.	
		• If no rods will move, THEN…..	**NOTE:** The Control Rods will move in MANUAL.
	RO	• Check all rods – ALIGNED WITH ASSOCIATED BANK.	
	BOP	(Step 4) Check CM system response as follows:	
		• Standby Hotwell and Condensate Booster pumps – RUNNING.	
		• 1CM-420 (Unit 1 Generator Load Rejection Bypass control) – OPEN.	
	RO	(Step 5) IF runback to 55% power in effect, THEN ensure turbine inlet pressure going down to less than or equal to 500 PSIG.	
	CRS	(Step 6) Announce: “UNIT 1 LOAD REJECTION, NON-ESSENTIAL PERSONNEL STAY OUT OF UNIT 1 TURBINE BLDG”.	**NOTE:** CRS may ask U2 RO to make Plant Announcement that AP-3 has been entered. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 7) Check P/R meters – LESS THAN 20%.	
	CRS / RO	(Step 7 RNO) Perform the following:	

Op Test No.:	N20-1	Scenario #	2	Event #	5	Page	40	of	72
Event Description:	**1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual**								

Time	Pos.	Expected Actions/Behavior	Comments
		• Designate an operator to continuously monitor reactor power.	
		• IF AT ANY TIME reactor power is less than 20%, THEN perform Step 8 to stabilize reactor power.	**NOTE:** This is a Continuous Action. The CRS will designate the RO to observe this action.
	CRS	• GO TO Step 9.	
	RO	(Step 9) Check condenser dump valves – MODULATING OPEN.	
	BOP	(Step 10) Check "IPB AIR FLOW TROUBLE" alarm (1AD-11, J-5) – DARK.	
	BOP	(Step 11) Check Pzr pressure control response as follows:	
		• Ensure Pzr heaters are in auto.	
		• Ensure Pzr spray control valves are in auto.	**NOTE:** 1NC-27C is NOT in AUTO due to a previous malfunction.
		• Check Pzr PORVs – CLOSED.	
		• Check Pzr spray control valves - CLOSED	
	RO	(Step 12) Check load rejection – DUE TO LOSS OF CF PUMP.	**NOTE:** The load rejection was due to a Loss of CF Pump.
	CRS	(Step 13) Dispatch operator as necessary to determine cause of CF pump trip.	**NOTE:** The CRS may dispatch an AO. If so, **Booth Instructor** acknowledge as the AO.

CAUTION

The CF pump high discharge pressure trip setpoint is 1435 PSIG.

Op Test No.:	N20-1	Scenario #	2	Event #	5	Page	41	of	72
Event Description:	**1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual**								

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 14) Ensure in service CF pump properly responds in auto as follows:	
		• Monitor in service CF pump discharge pressure.	
		• "1A CF PUMP DISCHARGE PRESS" (OAC point M1A1108).	
		OR	
		• "1B CF PUMP DISCHARGE PRESS" (OAC point M1A1114).	
		• Monitor S/G N/R Levels.	
		• IF AT ANY TIME any of the following occurs:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• "CF PUMP DISCHARGE HI PRESS" 1AD-8, A-4 alarms (Setpoint at 1335 PSIG),	
		OR	
		• S/G N/R level approaches Hi Hi level (83%),	
		OR	
		• S/G N/R level approaches Lo Lo level (17%).	
		• THEN take manual control of in service CF pump as follows:	
		• Place low pressure governor control in manual.	
		• Place high pressure governor control in manual	
		• Adjust CF pump speed to maintain CF header pressure 100-120 PSIG above steam header pressure.	
		• Do not continue until the following are satisfied:	
		• In service CF pump discharge pressure is stable.	
		• S/G levels are at setpoint.	
	RO	(Step 15) Check turbine inlet pressure – LESS THAN 340 PSIG.	

Op Test No.:	N20-1	Scenario #	2	Event #	5	Page	42 of 72
Event Description:	1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 15 RNO) Perform the following:	
		• IF AT ANY TIME turbine inlet pressure drops to less than 340 PSIG, THEN GO TO Step 16.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	• GO TO Step 19.	
	RO	(Step 19) Check Main Generator as follows:	
		• Check Generator Breakers – EITHER GENERATOR BREAKERS CLOSED.	
		• Check Generator – TIED TO GRID.	
		• Check generator power factor – 0.9 TO 1.0 LAGGING.	
	CRS	• GO TO Step 20.	
	CRS	(Step 20) Ensure the following have been implemented:	**NOTE:** The CRS may ask SM to address. If so, **Floor Instructor** acknowledge as SM.
		• RP/0/A/5700/000 (Classification of Emergency)	
		• RP/0/A/5700/010 (NRC Immediate Notification Requirements).	
	RO/ BOP	(Step 21) WHEN transient is over, THEN perform the following:	**Examiner NOTE:** The CRS may enter AP10 to address the SGTL at any point once it is determined that the transient is over. If so, move to Events 6-7.
		• Determine if one CF pump should be shutdown as follows:	
		• Check two CF pumps - RUNNING.	**NOTE:** the 1A CF is the only Main Feedwater Pump running.

Op Test No.:	N20-1	Scenario #	2	Event #	5	Page	43 of 72
Event Description:	1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual						

Time	Pos.	Expected Actions/Behavior	Comments
		(Step 21.A RNO) GO TO Step 21.B	
		• (Step 21.B) Check the following on in service CF pump(s):	
		• Low pressure governor control – IN AUTO	
		• High pressure governor control – IN AUTO.	
		• Check SM flow on all S/Gs – LESS THAN 75%.	**NOTE:** SM flow is ≈ 60%.
		• Check SM flow on all S/Gs – LESS THAN 25%.	**NOTE:** SM flow is ≈ 60%.
	RO	(Step 21.D RNO) Perform the following:	
		• Check the following CF control bypass valves – CLOSED:	
		• 1CF-104AB (1A S/G CF Control Bypass) - CLOSED	
		• 1CF-105AB (1B S/G CF Control Bypass) - CLOSED	
		• 1CF-106AB (1C S/G CF Control Bypass) - CLOSED	
		• 1CF-107AB (1D S/G CF Control Bypass) - CLOSED	
	RO	• IF any CF control bypass valve is open ot throttled…	**NOTE:** All CF control bypass valves are closed.
	CRS	• GO TO Step 21.F.	
	BOP	• Slowly CLOSE 1CM-420 (Unit 1 Generator Load Rejection Bypass Control) while monitoring Condensate Booster pump suction pressure.	**NOTE:** The BOP will close 1CM-420.

Op Test No.: N20-1	Scenario # 2	Event # 5	Page 44 of 72
Event Description:	1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual		

Time	Pos.	Expected Actions/Behavior	Comments
		• WHEN 1CM-420 is closed, THEN check load rejection signal reset (OAC turn on code "CM").	
	BOP	• Place 1CM-420 in auto.	
		• IF thermal power is greater than 15%, THEN within 4 hours of reaching stable conditions, ensure each power range channel is within 2% of heat balance.	
		• Check T-Avg – GREATER THAN 561°F.	
		• Check "CONTROL ROD BANK LO LO LIMIT" alarm (1AD-2, B-9) – DARK.	
		• Check "CONTROL ROD BANK LO LIMIT" alarm (1AD-2, A-9) – DARK.	**NOTE:** 1AD-2, A-9 may be LIT. If so, the operator will perform Step 21.I RNO.
	RO	(Step 21.I RNO) Ensure the "CONTROL ROD BANK LO LIMIT" alarm clears as Xenon builds in.	
	RO	(Step 22) Check load rejection – DUE TO LOSS OF CF PUMP.	**NOTE:** The load rejection was due to a Loss of CF Pump.
	RO/ BOP	(Step 23) Reset CF pump recirc valves as follows:	
		• CLOSE recirc valve manual loader for CF pump that is tripped:	
		• 1CF-76 (1A CF Pump Recirc Control)	
		OR	
		• 1CF-81 (1B CF Pump Recirc Control).	
		• Depress "1A OR 1B CF PUMP RECIRC VALVE CLOSURE CIRCUIT" "RESET" pushbutton and ensure red "ACTIVE" light goes out and yellow "RESET" light is lit.	
		• Check the following valves - OPEN:	
		• 1CM-266 (1A CF Pump Suction Isol)	
		• 1CM-272 (1B CF Pump Suction Isol).	

Op Test No.:	N20-1	Scenario #	2	Event #	5	Page	45	of	72
Event Description:	**1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual**								

Time	Pos.	Expected Actions/Behavior	Comments
		• Check main oil pump on tripped CF pump - RUNNING.	
		• Check if CF pump – TRIPPED AUTOMATICALLY.	
	RO/ BOP	• Slowly OPEN recirc valve on tripped CF pump while monitoring suction pressure on in service CF pump.	
	BOP	(Step 24) Shutdown unnecessary running plant equipment as follows:	
	BOP	• Excess Condensate Booster pumps and place in auto.	**NOTE:** The BOP may stop one Condensate Booster Pump.
		• Excess Hotwell pumps and place in auto.	**NOTE:** The BOP may stop one Hotwell Pump.
NOTE During normal load reductions, OP/1/A/6100/003 (Controlling Procedure For Unit Operation) secures G Heater Drain Tank pumps at 60% power and C Heater Drain Tank pumps at 50% power.			
		• IF desired to secure, THEN dispatch operator to shutdown PER OP/1/B/6250/004 (Feedwater Heater Vents, Drains and Bleed System) Enclosure 4.2 (System Shutdown) the following:	**NOTE:** The CRS may dispatch an AO. If so, **Booth Instructor** acknowledge as the AO.
		• Unit 1 C Heater Drain Tank pumps	
		• Unit 1 G Heater Drain Tank pumps.	
	CRS	(Step 25) IF power change greater than 15% in one hour, THEN notify Primary Chemistry to perform required Tech Spec sampling.	**NOTE:** The CRS may call Chemistry to address the power decrease. If so, **Booth Instructor** acknowledge as Chemistry.

Op Test No.:	N20-1	Scenario #	2	Event #	5	Page	46 of 72
Event Description:	**1B CF Pump Trip/SGTL/Turbine Runback w/rods in Manual**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 26) WHEN condenser dump valves closed AND no longer required for temperature control, THEN reset C-7A using "STEAM DUMP SELECT" switch.	
At the discretion of the Lead Examiner, move to Events #6-7.			

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	47 of 72
Event Description:	**1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**						

When the plant is stabilized or AP/1/A/5500/10 is entered to mitigate the SGTL, the 1C MSIV will inadvertently CLOSE, and the Reactor will fail to trip automatically and manually. Additionally, the low set Safety Valve on the 1C Steam Generator will lift and stick fully OPEN. Additionally, the TD CA Pump will trip on overspeed on auto start, and both MDCA Pumps will fail to start automatically. The operator will enter EP/1/A/5000/E-0, “Reactor Trip or Safety Injection,” and then transition to EP/1/A/5000/FR-S.1, “Response to Nuclear Power Generation/ATWS.” During the performance of FR-S.1, the operator will continuously drive rods in manually, successfully trip the Reactor locally, and manually start the MDCA Pumps and establish 450 gpm of flow the Steam Generators. The SGTL will degrade to a tube rupture in the 1C Steam Generator when the reactor is locally tripped. After completion of FR-S.1, the operator will transition back to E-0, and then to EP/1/A/5000/E-2, “Faulted Steam Generator Isolation.” After the 1C Steam Generator is isolated, the operator will transition to EP/1/A/5000/E-3, “Steam Generator Tube Rupture.” The scenario will terminate at Step 6 of E-3 after the operator has transitioned to EP/1/A/5000/ECA-3.1, “SGTR with Subcooled Recovery Desired,” or at Step 9 of E-3 upon initiating an NCS cooldown.

Booth Operator Instructions:

Insert REM_SM003AB (1C MSIV Closure)

Insert MAL_SM004C1 = 100 cd='H_X02_078_3 EQ 1' delay=0 (Safety Valve on 1C SG sticks OPEN on C MSIV CLOSE Indicating Light)

Insert MAL_SG001C = 300 cd='H_X01_094_2 EQ 1' delay=0 (300 gpm SGTR occurs on 1C SG on Reactor Trip Breaker Open Indicating Light)

Indications Available:

- 1SM3AB Green status light is LIT (MSIV Closed).
- 1C SG Steam Flow lowering.
- 1C SG Feedflow lowering.
- 1C SG Narrow Range Level is lowering.
- MCB Annunciator 1AD3, A-5, MAIN STEAM ISOLATION VLV CLOSED

Time	Pos.	Expected Actions/Behavior	Comments
EP/1/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION			

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	48	of	72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: At any time the CRS may dispatch an AO to close the steam supply valves to the TDCA Pump from the 1C S/G. **If so, Booth Instructor**: **Insert REM_SA0001 = 0** **Insert REM_SA0077 = 0** Within **3 minutes,** as **AO** report that **steam has been isolated to the TD CA Pump from the 1C SG.**
			NOTE: Crew will carry out Immediate Actions of E-0, prior to the CRS addressing the EP.
	RO/ BOP	(Step 1) Monitor Foldout page.	
		NC Pump Trip Criteria (Not Expected)	
		CA Suction Sources (CA storage tank (water tower) goes below 1.5 ft – Not expected)	
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	
		Ruptured S/G Aux Feedwater Isolation Criteria (IF both of the following conditions met, THEN stop CA flow to affected S/G(s): (1) Level going up in an uncontrolled manner or radiation level in that S/G is abnormal and (2) N/R level - GREATER THAN 11% (32% ACC).)	**NOTE:** The Crew is expected to meet this criterion.

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Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		Faulted S/G Aux Feedwater Isolation Criteria (IF all of the following conditions met, THEN stop CA flow to affected S/G: (1) S/G pressure going down in an uncontrolled manner or completely depressurized, (2) Only one S/G is diagnosed as faulted, and (3) Secondary heat sink: is available [NR level in one SG > 11% or > 450 gpm CA flow].)	**NOTE:** The Crew is expected to meet this criterion.
	RO	(Step 2) Check Reactor Trip:	**Immediate Action**
		• All rod bottom lights – LIT	
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 2 RNO) Perform the following:	**Immediate Action**
		• Trip reactor.	
	RO	• IF reactor will not trip, THEN perform the following:	**NOTE:** The CRS may dispatch an AO to locally trip the reactor. If so, **Booth Instructor** After **30 sec**onds **insert:** **LOA_IPE011=TRIP (Rx Trip Bkr 1A)** **LOA_IPE012=TRIP (Rx Trip Bkr 1B)** **As an Alternate Insert:** **LOA_IRE001A = OPEN (MG Set 1A Gen Output Bkr)** **LOA_IRE002A = OPEN (MG Set 1B Gen Output Bkr)**
		• Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	50 of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	• GO TO EP/1/A/5000/FR-S.1 (Response To Nuclear Power Generation/ATWS).	**NOTE:** The CRS will transition to FR-S.1.
EP/1/A/5000/FR-S.1, RESPONSE TO NUCLEAR POWER GENERATION/ATWS			
CAUTION NC pumps should not be tripped with Reactor power greater than 5%.			
	RO	(Step 1) Check Reactor Trip:	**Immediate Action**
		• All rod bottom lights - LIT	
		• Reactor trip and bypass breakers - OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 1 RNO) Perform the following:	**Immediate Action**
		• Trip the reactor.	
		• IF reactor will not trip, THEN ensure rod insertion in auto or manual.	**NOTE:** The RO will manually drive Rods inward.

Critical Task:

Manually drive rods inward during the ATWS before the local trip of the reactor to ensure that the 1C Steam Generator PORV closes.

Safety Significance: failure to insert negative reactivity, under the postulated plant conditions, results in an unnecessary situation in which remains higher than it otherwise would keeping the Steam Generator PORV open longer than necessary when a ruptured steam generator is in progress. A failure to insert negative reactivity and lower NCS temperature unnecessarily prolongs a radiation release to the environment.

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 2) Check Turbine Trip:	
		• All throttle valves – CLOSED.	

Op Test No.: N20-1	Scenario # 2	Event # 6-7	Page 51 of 72
Event Description:	**1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**		

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	(Step 3) Monitor Foldout page.	
		Cold Leg Recirc Switchover Criteria	
		CA Suction Sources	
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	
		IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	
		IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	
	BOP	(Step 4) Check proper CA pump status:	
		• MD CA pumps – ON.	**NOTE:** Both MDCA Pumps have failed to AUTO start.
	BOP	(Step 4.A RNO) Start pumps.	**NOTE:** The BOP will start one or both MDCA Pump.
	BOP	• Check N/R Level in at least 3 S/Gs – GREATER THAN 17%.	

Critical Task:

Start one or more MD CA Pumps before a valid Red Path exists the Heat Sink Critical Safety Function Status Tree.

Safety Significance: Failure to establish a Secondary Heat Sink through the initiation of CA flow unnecessarily challenges both the HEAT SINK and the CORE COOLING Critical Safety Functions. Additionally, the FSAR Safety Analysis results are predicated on the assumption that at least one train of safeguards actuates and delivers a minimum amount of AFW flow to the Steam Generators. Failure to perform this task, when the ability to do so exists, results in a violation of the Facility License Condition and places the plant in an unanalyzed condition.

Op Test No.: N20-1	Scenario # 2	Event # 6-7	Page 52 of 72
Event Description:	**1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 5) Initiate emergency boration of NC System as follows:	
		• Ensure one NV pump - ON	
		• Align boration flowpath as follows:	
		• Open 1NV-265B (Boric Acid To NV Pumps).	
		• Start both boric acid transfer pumps.	
		• Check emergency boration flow – GREATER THAN 30 GPM.	
		• Check if NV flowpath aligned to NC System:	
		• 1NV-244A (Charging Line Cont Outside Isol) – OPEN.	
		• 1NV-245B (Charging Line Cont Outside Isol) – OPEN.	
		• Ensure charging flow is greater than emergency Boration flow.	
		• Check Pzr pressure – LESS THAN 2335 PSIG.	
	BOP	(Step 6) Close the following VQ valves:	
		• CLOSE 1VQ-1A (U1 Cont Air Release Inside Isol)	
		• CLOSE 1VQ-6A (U1 Cont Air Addition Inside Isol)	
		• CLOSE 1VQ-2B (U1 Cont Air Release Outside Isol)	
		• CLOSE 1VQ-5B (U1 Cont Air Addition Outside Isol)	
	BOP	(Step 7) IF AT ANY TIME while in this procedure an S/I signal exists or occurs, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	53	of	72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		• Have another Licensed Operator check S/I equipment PER Enclosure 3 (Subsequent S/I Actions).	
	CRS	• Continue with this procedure.	
	RO	(Step 8) Check if the following trips have occurred:	
		• Reactor trip.	
		• Turbine trip.	
	RO	(Step 9) Check reactor subcritical:	
		• P/R channels – LESS THAN 5%	
		• I/R channels – LESS THAN 5%	
		• W/R Neutron Flux – LESS THAN 5%	
		• I/R SUR – NEGATIVE.	
	CRS	(Step 10) GO TO Step 17.	
	RO	(Step 17) Ensure adequate shutdown margin as follows:	
		• Obtain current NC boron concentration from Primary Chemistry.	**NOTE:** The CRS/RO may call Chemistry. If so, **Booth Instructor** acknowledge as Chemistry.
		• WHEN current NC boron concentration is obtained, THEN perform shutdown margin calculation PER OP/0/A/6100/006 (Reactivity Balance Calculation).	**NOTE:** The CRS may ask the U2 RO to perform this action. If so, **Floor Instructor** acknowledge as U2 RO.
		• WHEN following conditions satisfied, THEN NC System boration may be stopped:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Adequate shutdown margin is obtained.	

Op Test No.: N20-1	Scenario # 2	Event # 6-7		Page 54	of 72
Event Description:	**1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**				

Time	Pos.	Expected Actions/Behavior	Comments
		• Uncontrolled cooldown has been stopped.	
	CRS	(Step 18) Ensure the following have been implemented:	**NOTE:** The CRS may ask SM to address. If so, **Floor Instructor** acknowledge as SM.
		• RP/0/A/5700/000 (Classification of Emergency).	
		• RP/0/A/5700/010 (NRC Immediate Notification Requirements).	
	CRS	(Step 19) RETURN TO procedure and step in effect.	**NOTE:** The CRS will transition back to E-0.
EP/1/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION			
	RO/ BOP	(Step 1) Monitor Foldout page.	
		NC Pump Trip Criteria (Not Expected)	
		CA Suction Sources (CA storage tank (water tower) goes below 1.5 ft – Not expected)	
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	
		Ruptured S/G Aux Feedwater Isolation Criteria (IF both of the following conditions met, THEN stop CA flow to affected S/G(s): (1) Level going up in an uncontrolled manner or radiation level in that S/G is abnormal and (2) N/R level - GREATER THAN 11% (32% ACC).)	**NOTE:** The Crew is expected to meet this criterion.

Op Test No.:	N20-1	Scenario #	2	Event #	6-7
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Event Description:	**1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**				

Time	Pos.	Expected Actions/Behavior	Comments
		Faulted S/G Aux Feedwater Isolation Criteria (IF all of the following conditions met, THEN stop CA flow to affected S/G: (1) S/G pressure going down in an uncontrolled manner or completely depressurized, (2) Only one S/G is diagnosed as faulted, and (3) Secondary heat sink: is available [NR level in one SG > 11% or > 450 gpm CA flow].)	**NOTE:** The Crew is expected to meet this criterion.
	RO	(Step 2) Check Reactor Trip:	**Immediate Action**
		• All rod bottom lights – LIT	
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 3) Check Turbine Trip:	**Immediate Action**
		• All throttle valves – CLOSED.	
	BOP	(Step 4) Check 1ETA and 1ETB – ENERGIZED.	**Immediate Action**
	RO/ BOP	(Step 5) Check if S/I is actuated:	**Immediate Action**
		• "SAFETY INJECTION ACTUATED" status light (1SI-18) – LIT.	
		• Both LOCA Sequencer Actuated status lights (1SI-14) – LIT.	**Examiner NOTE:** SI will most likely NOT be actuated at this time, however, plant conditions will not permit SI to be avoided. If the crew transitions to ES-0.1, observe crew activities and continue with the script when SI is actuated. NOTE that upon return to E-0 from ES-0.1 the CRS will start at Step 1.

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	56 of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 6) Announce “Unit 1 Safety Injection”.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	BOP	(Step 7) Check all Feedwater Isolation status lights (1SI-4) – LIT.	
	BOP	(Step 8) Check Phase A “RESET” lights – DARK.	
	BOP	(Step 9) Check ESF Monitor Light Panel on Energized train(s):	
		• Groups 1, 2, 5 – DARK.	
		• Group 3 – LIT.	
		• Group 4 – LIT AS REQUIRED.	
		• Group 6 – LIT.	**NOTE:** Group 6 lights may NOT be LIT due to the previously failed RN Pump Suction Valve.
	CRS	(Step 6.d RNO) GO TO Step 9.f.	
	RO/ BOP	(Step 9.f) Check the following:	
		• OAC - IN SERVICE	
		• LOCA Sequencer Actuated status light (1SI-14) on energized train(s) - LIT.	
		• Perform the following on energized train(s):	
		• Check OAC Monitor Light Program ("MONL") for Group 6 windows that are dark.	
		• Align valves as required, while continuing in this EP.	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	57	of	72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 10) Check proper CA pump status:	
		• MD CA pumps – ON.	**NOTE:** Although both MDCA Pumps failed to auto start they should be running by now.
		• N/R level in at least 3 S/Gs – GREATER THAN 17%.	**NOTE:** Although NR level in 3 S/Gs may not exist the TDCA Pump has failed and cannot be started.
	BOP	(Step 11) Check all KC pumps – ON.	
	BOP	(Step 12) Check both RN pumps – ON.	**NOTE:** The 1B RN Pump may have been rendered inoperable due to a previous malfunction. If not, the CRS may contact the WCCS/dispatch an AO to stop the pump by opening the breaker. If so, **Booth Instructor** acknowledge as **WCC**, and indicate that the **1B RN Pump Breaker will be Racked Out**. Use: **LOA-RN006 = Racked_Out (1B RN Pump BKR)** **LOA-RN006A = Racked_Out (1B RN Pump Cntrl Pwr)**
	BOP	(Step 12 RNO) Perform the following:	
		• Start pump(s).	**NOTE:** the 1B RN Pump cannot be started.
		• IF 1A RN pump is off, THEN….	
		• IF affected train is deenergized, AND it's D/G is off, THEN……	**NOTE:** the 1B D/G is running.
		• Reset the following on affected train:	
		• S/I.	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	58	of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		• Sequencer.	
		• Dispatch operator to stop affected D/G using emergency stop pushbutton.	**NOTE:** The CRS may dispatch an AO. If so, **Booth Instructor** acknowledge as the **AO**, and use **LOA_DG004 = STOP_DG** to stop the 1B D/G.
		• Monitor affected RN cooled components and shut down as necessary.	
	CRS	(Step 13) Notify Unit 2 to perform the following:	**Floor Instructor:** As U2 RO report "2A RN Pump is running."
		• Start 2A RN pump.	
		• THROTTLE Unit 2 RN flow to minimum for existing plant condition.	**Booth Instructor:** **insert LOA_RN087 (Start 2A RN Pump)** **insert LOA_RN083 8050.000000 delay=0 ramp=10 (Unit 2 Train A Demand Flow)**
	RO	(Step 14) Check all S/G pressures – GREATER THAN 775 PSIG.	**NOTE:** 1C S/G is faulted and may be less than 775 psig (Crew may perform RNO. If NOT, proceed to Step 15).
	RO	(Step 14 RNO) Perform the following:	
		• Check the following valves closed:	
		• All MSIVs	
		• All MSIV Bypass Valves	
		• All SM PORVs.	
		• IF any valve open, THEN…..	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	59 of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 15) Check Containment Pressure – HAS REMAINED LESS THAN 3 PSIG.	**NOTE:** Containment Pressure is normal.
	BOP	(Step 16) Check S/I flow:	
		• Check "NV PMPS TO COLD LEG FLOW" gauge – INDICATING FLOW.	
		• Check NC pressure – LESS THAN 1600 PSIG.	
	BOP	(Step 16b RNO) Perform the following:	
		• Ensure ND pump miniflow valve on running pump(s) OPEN:	
		• 1ND-68A (1A ND Pump & Hx Mini Flow Isol)	
		• 1ND-67B (1B ND Pump & Hx Mini Flow Isol).	
	CRS	• IF valve(s) open on all running ND pumps, THEN GO TO Step 17.	
	CRS	(Step 17) Notify Shift Manager or other SRO to perform EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 22 (Shift Manager Actions Following an S/I) within 10 minutes.	**NOTE:** The CRS may ask SM to address. If so, **Floor Instructor** acknowledge as SM.
	RO/ BOP	(Step 18) Check CA flow:	**NOTE:** The CA flow to the 1C S/G should be isolated. E-0 Foldout Page items 4&5 are expected to be met by this time.
		• Total CA flow – GREATER THAN 450 GPM.	
	RO/ BOP	(Step 18.a RNO) Perform the following:	
		• IF N/R level in all S/Gs is less than 11% (32% ACC), THEN…..	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	60	of	72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		• IF N/R level in all S/Gs is less than 11% (32% ACC) AND feed flow greater than 450 GPM cannot be established, THEN….	
	BOP	• Check VI header pressure – GREATER THAN 60 PSIG.	
	RO/ BOP	• WHEN each S/G N/R level is greater than 11% (32% ACC), THEN control CA flow to maintain that S/G N/R level between 11% (32% ACC) and 50%.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	RO	(Step 19) Check NC temperatures:	
		• IF any NC pumps on…	
		OR	
		• IF all NC pumps off, THEN check NC T-Colds – STABLE OR TRENDING TO 557°F.	
		(Step 19 RNO) Perform the following based on plant conditions:	
		• IF temperature less than 557°F AND going down, THEN attempt to stop Cooldown PER Enclosure 3 (Uncontrolled NC System Cooldown).	**NOTE:** The CRS may assign the RO (BOP) to perform this action. If so, **RO (BOP) Examiner** follow actions of Enclosure 3. **Other Examiners** follow **E-0** Actions, **Step 20**, on **Page 62**.
EP/1/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION ENCLOSURE 3, UNCONTROLLED NC SYSTEM COOLDOWN			
	RO/ (BOP)	(Step 1) Check steam dump valves – CLOSED.	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	61 of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ (BOP)	(Step 2) Check all SM PORVs – CLOSED.	
	RO/ (BOP)	(Step 3) Check MSR "RESET" light - LIT	
	RO/ (BOP)	(Step 4) Check any NC pump – ON.	
	RO/ (BOP)	(Step 5) Check NC T-Avg - GOING DOWN.	
	RO/ (BOP)	(Step 6) Control feed flow as follows:	
		• IF S/G N/R level is less than 11% (32% ACC) in all S/Gs, THEN…	
		• WHEN N/R level is greater than 11% (32% ACC) in at least one S/G, THEN THROTTLE feed flow further to:	
		• Minimize cooldown	
		• Maintain at least one S/G N/R level greater than 11% (32%ACC).	
	RO/ (BOP)	(Step 7) Check MSIVs – ANY OPEN.	**NOTE:** All MSIVs are expected to be CLOSED.
	RO/ (BOP)	(Step 7 RNO) Perform the following:	
		• CLOSE MSIV Bypass Valves	
		• Exit this enclosure	
EP/1/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION			

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	62	of	72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP (RO)	(Step 20) Check Pzr PORV and spray valves:	**Examiner NOTE:** Examiners following the **CRS/RO(BOP)** continue **HERE**.
		• All Pzr PORVs – CLOSED.	
		• Normal Pzr spray valves – CLOSED.	**NOTE:** 1NC-27 is most likely closed using the Emergency CLOSE Switch.
		• At least one Pzr PORV isolation valve-OPEN.	
	BOP (RO)	(Step 21) Check NC subcooling based on core exit T/Cs – GREATER THAN 0°F.	
	BOP (RO)	(Step 22) Check if main steamlines intact:	
		• All S/G pressures – STABLE OR GOING UP	
		• All S/Gs – PRESSURIZED.	
	CRS	(Step 22 RNO) IF any S/G is faulted, THEN perform the following:	**NOTE:** The 1C S/G is faulted.
		• Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
		• GO TO EP/1/A/5000/E-2 (Faulted Steam Generator Isolation).	
			NOTE: The CRS will transition to E-2.
EP/1/A/5000/E-2, FAULTED STEAM GENERATOR ISOLATION			
	RO/ BOP	(Step 1) Monitor Foldout page.	
		Cold Leg Recirc Switchover Criteria	
		CA Suction Sources	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	63 of 72
Event Description:	**1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**						

Time	Pos.	Expected Actions/Behavior	Comments
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	
	CRS	(Step 2) Maintain any faulted S/G or secondary break isolated during subsequent recovery actions unless needed for NC System cooldown.	
	RO	(Step 3) Check the following – CLOSED:	
		• All MSIVs	
		• All MSIV bypass valves.	
	RO	(Step 4) Check at least one S/G pressure – STABLE OR GOING UP.	**NOTE:** Although all SG pressures may be decreasing slowly, the operator will report stable based on plant conditions (i.e. faulted SG). Otherwise a transition to ECA-2.1 will be made.
	RO/ BOP	(Step 5) Identify faulted S/G(s):	**NOTE:** The 1C SG is Faulted.
		• Any S/G pressure – GOING DOWN IN AN UNCONTROLLED MANNER	
		OR	
		• Any S/G – DEPRESSURIZED.	

Op Test No.: N20-1	Scenario # 2	Event # 6-7	Page 64 of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 6) Maintain at least one S/G available for NC System cooldown in subsequent steps.	
	RO	(Step 7) Check faulted S/G(s) SM PORV – CLOSED.	
	BOP	(Step 8) Reset CA modulating valves.	
	RO/ BOP	(Step 9) Isolate faulted S/G(s) as follows:	
	RO/ BOP	• For 1C S/G:	
		• Check "S/G C FDW ISOLATED" status light (1SI-4) – LIT.	
		• Close 1CA-50B (U1 TD CA Pump Disch To 1C S/G Isol).	
		• Close 1CA-46B (1B CA Pump Disch To 1C S/G Isol).	
		• Check at least one MD CA pump - RUNNING	
		• Dispatch operator to unlock and CLOSE the following valves:	**NOTE:** If not already done, the CRS will dispatch an AO to close these valves. **If so, Booth Instructor**: **Insert REM_SA0001 = 0** **Insert REM_SA0077 = 0** Within **3 minutes,** as **AO** report that **steam has been isolated to the TD CA Pump from the 1C SG.**
		• 1SA-1 (1C S/G SM Supply to Unit 1 TD CA Pump Turb Maint Isol) (Unit 1 interior doghouse, 767+10, FF-53, above ladder)	

Op Test No.: N20-1	Scenario # 2	Event # 6-7	Page 65 of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		• 1SA-77 (1C S/G SM Supply to Unit 1 TD CA Pump Turb Loop Seal Isol) (Unit 1 interior doghouse, 767+10, FF-53).	
		• Check BB valves – CLOSED:	
		• 1BB-3B (1C S/G Blowdown Cont Outside Isol Control)	
		• 1BB-7A (C S/G BB Cont Inside Isol).	
	BOP	• Close 1SM-95 (C SM Line Drain Isol).	
	RO	(Step 10) Close 1AS-12 (U1 SM To AS Hdr Control Inlet Isol).	
	RO/ BOP	(Step 11) Check S/G tubes intact as follows:	
		• Check the following EMF's – NORMAL:	**NOTE:** 1EMF-26 is likely in TRIP 1 or 2.
		• 1EMF-33 (Condenser Air Ejector Exhaust)	
		• 1EMF-24 (S/G A)	
		• 1EMF-25 (S/G B)	
		• 1EMF-26 (S/G C)	
		• 1EMF-27 (S/G D).	
	CRS	(Step 11.a RNO) GO TO EP/1/A/5000/E-3 (Steam Generator Tube Rupture)	
			NOTE: The CRS will transition to E-3.
EP/1/A/5000/E-3, STEAM GENERATOR TUBE RUPTURE			
	RO/ BOP	(Step 1) Monitor Foldout page.	

Op Test No.: N20-1	Scenario # 2	Event # 6-7	Page 66 of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		NC Pump Trip Criteria	
		S/I Reinitiation Criteria	
		Secondary Integrity Criteria	
		Cold Leg Switchover Criteria	
		CA Suction Sources	
		Multiple Tube Rupture Criteria:	
	BOP	(Step 2) Identify ruptured S/G(s):	
		• Any S/G N/R level – GOING UP IN AN UNCONTROLLED MANNER	
		OR	
		• Chemistry or RP has determined ruptured S/G.	**NOTE:** The CRS may contact Chemistry for sampling. **Booth Instructor:** Acknowledge as appropriate.
		OR	
		• Any of the following EMFs – ABOVE NORMAL:	**NOTE:** 1EMF-26 is likely in TRIP 1 or 2.
		• 1EMF-24 (S/G A)	
		• 1EMF-25 (S/G B)	
		• 1EMF-26 (S/G C)	
		• 1EMF-27 (S/G D)	
	RO	(Step 3) Check at least one S/G – AVAILABLE FOR NC SYSTEM COOLDOWN.	
	RO	(Step 4) Isolate flow from ruptured S/G(s) as follows:	
		• Check ruptured S/G(s) PORV – CLOSED.	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	67 of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		• Check S/Gs 1B and 1C – INTACT.	**NOTE:** The 1C SG is NOT Intact.
	RO/ BOP	(Step 4.B RNO) Isolate TD CA pump steam supply from ruptured S/G as follows:	
		• IF TD CA pump is the only source of feedwater, THEN……	
		• Ensure operators dispatched in next step immediately notify Control Room Supervisor when valves are closed.	
		For 1C S/G:	**NOTE:** If not already done, the CRS will dispatch an AO to close these valves. **If so, Booth Instructor**: **Insert REM_SA0001 = 0** **Insert REM_SA0077 = 0** Within **3 minutes,** as **AO** report that **steam has been isolated to the TD CA Pump from the 1C SG.**
		• 1SA-77 (1C S/G SM Supply to Unit 1 TD CA Pump Turb Loop Seal Isol) (Unit 1 interior doghouse, 767+10, FF-53)	
		• 1SA-1 (1C S/G SM Supply to Unit 1 TD CA Pump Turb Maint Isol) (Unit 1 interior doghouse, 767+10, FF-53, above ladder).	
		IF AT ANY TIME local closure of SA valves takes over 8 minutes,THEN isolate TD CA pump steam supply PER Enclosure 2 (Tripping TD CA Pump Stop Valve or Alternate Steam Isolation).	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	RO	• Check blowdown isolation valves on ruptured S/G/(s) – CLOSED.	
		• For 1C S/G:	
		• 1BB-3B (1C S/G Blowdown Cont Outside Isol Control)	
		• 1BB-7A (C S/G BB Cont Inside Isol).	
	BOP	• CLOSE steam drain on ruptured S/G(s)	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	68	of	72
Event Description:	**1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**								

Time	Pos.	Expected Actions/Behavior	Comments
		• 1SM-95 (C SM Line Drain Isol)	
	RO	• CLOSE the following valves on ruptured S/G(s):	
		• MSIV	
		• MSIV bypass valve.	
	RO	(Step 5) Control ruptured S/G(s) level as follows:	
		• Check ruptured S/G(s) N/R level – GREATER THAN 11% (32% ACC).	
	BOP	(Step 5.A) Perform the following:	
		• IF any ruptured S/G is also faulted, THEN do not establish feed flow to the ruptured S/G unless needed for NC System cooldown.	**NOTE:** The 1C S/G is NOT needed for cooldown.
		• IF any ruptured S/G is non-faulted OR is required for cooldown, THEN….	
	CRS	• GO TO Step 6.	
	RO	(Step 6) Check ruptured S/G(s) pressure – GREATER THAN 350 PSIG.	**Examiner NOTE:** The 1C S/G may be less than 350 psig. **IF so, the crew will transition to ECA-3.1**, at which time the **Exam should be terminated.** If not, continue in E-3 until the NCS cooldown is started.
	BOP	(Step 7) Check any NC pump – RUNNING.	
	BOP	(Step 8) Check Pzr pressure – GREATER THAN 1955 PSIG.	**NOTE:** Pzr pressure may be <1955. If so, the crew will perform the RNO. If not, proceed to Step 9.

Op Test No.: N20-1 Scenario # 2 Event # 6-7 Page 69 of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 8 RNO) IF "P-11 PRESSURIZER S/I BLOCK PERMISSIVE" status light (1SI-18) is lit, THEN block Low Pressure Steamline Isolation as follows:	
		• Depress "BLOCK" on Low Pressure Steamline Isolation block switches.	
		• Maintain NC pressure less than 1955 PSIG.	
	RO	(Step 9) Initiate NC System cooldown as follows:	
	CRS	• Determine required core exit temperature based on lowest ruptured S/G pressure:	**NOTE:** The CRS will determine the target temperature ruptured S/G pressure based on the 1C SG pressure.
	RO	• Check the following valves on ruptured S/G(s) – CLOSED:	
		• MSIV	
		• MSIV bypass valve.	
	RO	• Check ruptured S/G(s) SM PORV – CLOSED.	
	RO	• Check S/G(s) 1B and 1C – INTACT.	**NOTE:** The 1C SG is ruptured.
	RO/ BOP	(Step 9.D RNO) IF 1B OR 1C S/G is ruptured, THEN perform the following:	**NOTE:** If not already done, the CRS will dispatch an AO to close these valves. **If so, Booth Instructor**: **Insert REM_SA0001 = 0** **Insert REM_SA0077 = 0** Within **3 minutes,** as **AO** report that **steam has been isolated to the TD CA Pump from the 1C SG.**
		• Ensure steam to TDCA pump is isolated from ruptured S/G per one of the following:	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	70 of 72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		• Local isolation of SA line (per Step 4.B)	
		OR	
		• Tripping TD CA pump stop valve (per Step 4.B).	
		• Do not continue until affected TDCA pump steam supply is either:	
		• Isolated	
		OR	
		• Determined to be unisolable.	

NOTE

- NC pump trip criteria based on subcooling does not apply after starting a controlled cooldown.
- After the Low Pressure Steamline Isolation signal is blocked, maintaining steam pressure negative rate less than 2 PSIG per second will prevent a Main Steam Isolation.

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 9.E) Check condenser available:	
		• "C-9 COND AVAILABLE FOR STEAM DUMP" status light (1SI-18) – LIT	
		• MSIV on intact S/G(s) - OPEN.	
	RO	(Step 9.E RNO) GO TO RNO for Step 9.H.	
	CRS	(Step 9.H RNO) Perform the following:	
	BOP	• Ensure at least one Pzr PORV isolation valve is OPEN	
		• IF VI is lost, OR a Phase B Isolation has occurred, THEN…..	**NOTE:** VI is NOT lost.
		• IF Pzr pressure is greater than 1955 PSIG, THEN depressurize to 1900 PSIG using Pzr PORV.	**NOTE:** Pzr pressure may be greater than 1955 psig. If NOT, not depressurization will be made.
		• Depress "BLOCK" on Low Pressure Steamline Isolation block switches.	

Op Test No.:	N20-1	Scenario #	2	Event #	6-7	Page	71	of	72

Event Description: **1C MSIV fails CLOSED/ 1C SG SV fails OPEN/ATWS/SGTR/ TD CA Pump Overspeed Trip/1A & B MD CA Pumps fail to start in AUTO**

Time	Pos.	Expected Actions/Behavior	Comments
		• Maintain NC pressure less than 1955 PSIG.	
		• Ensure Main Steam Isolation reset.	
		• Ensure SM PORVs reset.	
		• IF any intact S/G SM PORV isolation valve is closed, AND associated SM PORV is operable, THEN perform the following:	**NOTE:** The Cooldown will be conducted using the 1A and 1B S/Gs.
		• OPEN SM PORV isolation valve.	
		• IF isolation valve will not open,……	
		• Dump steam using all intact S/G(s) SM PORVs at maximum rate as follows:	
		• CLOSE SM PORV manual loader on ruptured S/G(s).	
		• Place intact S/G SM PORV manual loaders at 50%.	
		• Select "MANUAL" on "SM PORV MODE SELECT".	
		• Adjust manual loaders on intact S/G SM PORVs as required to control intact S/G depressurization rate at approximately 2 PSIG per second.	

At the discretion of the Lead Examiner terminate the exam.

UNIT 1 STATUS:

Power Level: 75% NCS [B] 1065 ppm Pzr [B]: 1068 ppm Xe: Per OAC

Power History: At this power level for 14 days Core Burnup: 250.1 EFPDs

UNIT 2 STATUS:

Power Level: 100%

CONTROLLING PROCEDURE:

- OP/1/A/6100/003 (Controlling Procedure for Unit Operation)

OTHER INFORMATION NEEDED TO ASSUME THE SHIFT:

- The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.

The following equipment is Out-Of-Service:

- The 1D S/G PORV is isolated and its actuator is currently removed for maintenance.
- 1KFP-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating).
- MCB Annunciator 1AD-11, L-1, “ETA DEGRADED VOLTAGE,” has alarmed spuriously several times over the last hour and has currently failed ON (IAE has verified that the issue is limited to an annunciator card issue).

Crew Directions:

- The crew will raise power to 100% after taking the shift, starting from Step 3.37.11 of Enclosure 4.1 of OP/1/A/6100/003.
- The fuel is conditioned for 100% power.
- Raise power at 3 MWe/minute.
- The RE recommends 100% Control Rod position of 216 steps on Control Bank D.
- The RE recommends that the BOP perform a 400 gallon Simple Dilute to initiate the power increase.
- RMWST Dissolved O_2 is greater than 1000 ppb.
- Blender content is Reactor Makeup Water.

Work Control SRO	**Jim**
Field SRO	**Joe (FB)**

AO's AVAILABLE

Unit 1	**Unit 2**
Aux Bldg. John	**Aux Bldg. Chris**
Turb Bldg. Bob (FB)	**Turb Bldg. Mike (FB)**

Extra(s) Bill (FB) Ed (FB) Gus (RW) Carol

Facility: **McGuire**	Scenario No.: **3**	Op Test No.: **N20-1**	
Examiners: ______	Operators:	______ (SRO)	
______		______ (RO)	
______		______ (BOP)	

Initial Conditions:	The plant is at 36% power (BOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.
Turnover:	The following equipment is Out-Of-Service: The 1B EDG is OOS for bearing replacement. ACTION has been taken in accordance with Technical Specification LCO 3.8.1 ACTION B. The 1D S/G PORV is isolated and its actuator is currently removed for maintenance. 1KFP-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-9, A-7, "NF SYSTEM TRACE HEATING LOSS OF POWER," has alarmed spuriously several times over the last hour (IAE is investigating). The crew will raise power to 100% after taking the shift.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	R-RO N-BOP N-SRO	Power Increase w/Alternate Dilute
2	MAL SM001C	C-RO C(TS)-SRO	SG 1C PORV fails OPEN
3	REM NV0461	C-BOP C-SRO	1B NCP Standpipe Low Level Alarm
4	MAL NCP008B	C(TS)-SRO	#1 Seal Leak on 1B NCP
5	MAL DEH001 IRE009	C-RO C-SRO	Inadvertent Turbine Trip/Failure of Control Rods to Move in AUTO
6	MAL NCP008B NCP016C NCP015C	C-BOP	#1 Seal Leak on 1B NCP Fails
7	MAL IRE010	C-BOP C-SRO	4 Control Rods fail to Fully Insert on Rx Trip
8	MAL EP002A EP002B DG001A	M-RO M-BOP M-SRO	Loss of Switchyard to Unit 1/1A EDG fails to START

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

<u>McGuire 2020 NRC Scenario #3</u>

The plant is at 36% power (BOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.

The following equipment is Out-Of-Service: The 1B EDG is OOS for bearing replacement. ACTION has been taken in accordance with Technical Specification LCO 3.8.1 ACTION B. The 1D S/G PORV is isolated and its actuator is currently removed for maintenance. 1KFP-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-9, A-7, "NF SYSTEM TRACE HEATING LOSS OF POWER," has alarmed spuriously several times over the last hour (IAE is investigating). The crew will raise power to 100% after taking the shift.

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.35.12 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation." The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.4, "Alternate Dilute," of OP/1/A/6150/009, "Boron Concentration Control," and raise Turbine load in accordance with OP/1/A/6300/001 A, "Turbine-Generator Load Change."

Shortly after starting the power increase, the 1C Steam Generator PORV will fail OPEN. The operator will respond in accordance with AP/1/A/5500/01, "Steam Leak," and isolate the PORV. The operator will address Technical Specification LCO 3.7.4, "Steam Generator Power Operated Relief Valves (SG PORVs)," and may enter LCO 3.4.1, "RCS Pressure, Temperature and Flow Departure from Nucleate Boiling (DNB) Limits."

After this, AD-7/B-2, "NC PUMP B NO. 2 SEAL S-PIPE LO LEVEL," will alarm. The operator will address the Annunciator Response Procedure, and then use Enclosure 4.3, "Filling and Draining NC Pump Standpipe," of OP/1/A/6150/002A, "Reactor Coolant Pump Operation," to refill the standpipe.

Subsequently, a #1 seal leak will develop on the 1B NCP such that #1 Seal leakoff flow is 5.0-5.5 gpm. The operator will respond in accordance with AP/1/A/5500/08, "Malfunction of NC Pump," and address Selected Licensee Commitment 16.9.7, "Standby Shutdown System." The control operators will be directed on the action to take should the #1 Seal Leakoff flow degrade to > 6 gpm (which will occur subsequently).

Shortly afterwards, the Main Turbine will inadvertently trip. The operator will respond in accordance with AP/1/A/5500/02, "Turbine Generator Trip." The operator will discover that the Control Rods will not respond in AUTO and the RO will need to operate the control rods manually. The crew will stabilize the plant in accordance with AP-2 and subsequently enter AP/1/A/5500/14, "Rod Control Malfunction."

While the crew is in AP-2, the 1B NC Pump Hi Vibration alarm will occur and the #1 seal leak flow on the 1B NCP will rise to 6 gpm. The operator will return to Step 8 of AP-8 (Continuous Action Step), and close the 1B NCP Pzr Spray Valve, manually trip the reactor and stop the 1B NCP when reactor power is < 5%. The crew will perform Enclosure 2, "NC Pump Post Trip Actions For #1 Seal Failure," of AP8, while subsequently performing E-0.

The operator will enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," and verify reactor trip. On the reactor trip four control rods will fail to fully insert. The operator will transition to EP/1/A/5000/ES-0.1, "Reactor Trip Response," and emergency borate per AP/1/A/5500/38, "Emergency Boration And Response To Inadvertent Dilution."

Immediately following the initiation of Emergency Boration, a loss of the Unit 1 Switchyard will occur, and the 1A Emergency Diesel Generator will fail to start. The operator will immediately transition to EP/1/A/5000/ECA-0.0, “Loss of All AC Power.” The operator will restore power to 1ETA per Unit 2 6900V busses through SATA or SATB per Enclosure 13 “Energizing Unit 1 4160V Bus From Unit 2 – SATA or SATB.”

The scenario will terminate when one ESF Bus has been re-energized.

Critical Tasks:

Trip the Reactor prior to stopping the 1B NCP during a seal failure/high vibration condition and trip the NCP only after Reactor power level has dropped to less than 5%.

Safety Significance: The P-8 interlock allows one NCP to be stopped less than 48% power. If a NCP is stopped in Mode 1 or 2, Tech Spec 3.4.4 requires the unit to be in Mode 3 within 6 hours. In addition, T-ave for the idle loop may violate Tech Spec 3.4.2, minimum temperature for criticality. In this case, the unit must be sub-critical within 30 minutes. The transient placed on the unit when a NCP is secured at power can challenge both reactor protection and control systems. Furthermore, an added burden is placed on the operator to stabilize the unit and shut down within 6 hours (possibly 30 minutes) to comply with Tech Specs. Even though the plant is designed and analyzed to operate in this configuration for a short time, station management has decided that the conservative approach to dealing with this transient is to trip the reactor anytime a NCP malfunction warrants stopping a pump in Mode 1 or 2. Guidance is given to wait until reactor power is less than 5% before stopping the NC pump. This will ensure the NC pump will provide adequate flow/core cooling until reactor power is sufficiently low enough to preclude a challenge to fuel integrity. If the action can be taken, and is not taken, this demonstrates “mis-operation” or incorrect operation that could unnecessarily challenge a fission product barrier (NCS).

Energize at least one AC Emergency Bus From Unit 2.

Safety Significance: Failure to energize an AC Emergency Bus when able to do so constitutes “mis-operation” or incorrect performance which leads to degraded emergency power capacity. Failure to perform the Critical Task may result in a needless challenge and/or degradation of a fission product barrier at the point of the remaining intact RCP Seals, and will result in the inability to add inventory through the ECCS during the existing and potentially subsequent small break LOCA(s). Since the conditions existed to re-energize an ESF Bus from Unit 2 via the SATA or SATB, not taking this action constitutes incorrect performance that leads to degradation of the RCS and/or fuel cladding fission product barriers.

PROGRAM: McGuire Operations Training

MODULE: Initial License Operator Training Class ILT 20-1

TOPIC: NRC Simulator Exam

Scenario N20-1-3

REFERENCES:

1. Technical Specification LCO 3.8.1, “AC Sources - Operating” (Amendment 314/293)
2. OP/1/A/6100/003, “Controlling Procedure for Unit Operation” (Rev 212)
3. OP/1/A/6150/009, “Boron Concentration Control” (Rev 138)
4. OP/1/A/6300/001 A, “Turbine-Generator Load Change” (Rev 13)
5. AP/1/A/5500/01, “Steam Leak” (Rev 19)
6. Technical Specification LCO 3.4.1, “RCS Pressure, Temperature and Flow Departure From Nucleate Boiling (DNB) Limits” (Amendment 219/201)
7. MCEI -0400-379, “McGuire 1 Cycle 27 Core Operating Limits Report” (Rev 1)
8. Technical Specification LCO 3.7.4, “Steam Generator Power Operated Relief Valves (SG PORVs)” (Amendment 302/281)
9. OP/1/A/6100/010 H, “Annunciator Response for Panel 1AD-7” (Rev 68)
10. OP/1/A/6150/002 A, “Reactor Coolant Pump Operation” (Rev 71)
11. AP/1/A/5500/08, “Malfunction of NC Pump” (Rev 17)
12. SLC 16.9.7, “Standby Shutdown System” (Rev 180)
13. AP/1/A/5500/02, “Turbine Generator Trip” (Rev 30)
14. AP/1/A/5500/14, Rod Control Malfunction (Rev 16)
15. AP/1/A/5500/38, “Emergency Boration and Response to Inadvertent Dilution” (Rev 11)
16. EP/1/A/5000/E-0, “Reactor Trip or Safety Injection” (Rev 36)
17. EP/1/A/5000/ES-0.1, “Reactor Trip Response” (Rev 47)
18. EP/1/A/5000/ECA-0.0, “Loss of All AC Power” (Rev 44)

Validation Time: 115 minutes

Author: David Lazarony, Essential Training & Consulting, LLC

Facility Review: ________________________

Rev. 101419

McGuire 2020 NRC Scenario #3 Objectives:

Given the simulator at an initial condition of 36% power with a normal power increase planned evaluate:

1. the SRO's ability to supervise the control room team during the normal, abnormal, and emergency situations that arise, including compliance with all facility procedures, Technical Specifications, and other commitments.

2. each crew member's ability to effectively communicate as part of a control room team during the normal, abnormal, and emergency situations that arise.

3. the RO and BOP's ability to effectively raise power in accordance with Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation," and the Alternate Dilution process.

4. each crew member's ability to effectively diagnose a failed open Steam Generator PORV and the RO and BOP's ability to respond to such an event in accordance with AP/1/A/5500/01, "Steam Leak."

5. each crew member's ability to effectively diagnose a low-level condition on an NC Pump #2 Seal Pipe, and the BOP's ability to respond to such a condition in accordance with OP/1/A/6150/002A, "Reactor Coolant Pump Operation."

6. each crew member's ability to effectively diagnose a degradation of a #1 Seal on an NC Pump and the RO and BOP's ability to respond to such an event in accordance with AP/1/A/5500/08, "Malfunction of NC Pump."

7. each crew member's ability to effectively diagnose an inadvertent Turbine Trip while < P-8 and a failure of the control rods to move in AUTO when required; and the RO's ability to respond to such an event in accordance with AP/1/A/5500/02, "Turbine Generator Trip," including manual rod control during the transient.

8. each crew member's ability to effectively diagnose a failure of the #1 NC Pump Seal and the RO and BOP's ability to respond to such an event in accordance with AP/1/A/5500/08, "Malfunction of NC Pump, EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," EP/1/A/5000/ES-0.1, "Reactor Trip Response," and emergency borate per AP/1/A/5500/38, "Emergency Boration And Response To Inadvertent Dilution."

9. each crew member's ability to effectively diagnose a loss of the Unit 1 Switchyard and the RO and BOP's ability to respond to such an event in accordance with EP/1/A/5000/ECA-0.0, "Loss of All AC Power."

Facility: **McGuire**	Scenario No.: **3**	Op Test No.: **N20-1**	
Examiners:	Operators:		(SRO)
			(RO)
			(BOP)

Initial Conditions:	The plant is at 36% power (BOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.
Turnover:	The following equipment is Out-Of-Service: The 1B EDG is OOS for bearing replacement. ACTION has been taken in accordance with Technical Specification LCO 3.8.1 ACTION B. The 1D S/G PORV is isolated and its actuator is currently removed for maintenance. 1KFP-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-9, A-7, "NF SYSTEM TRACE HEATING LOSS OF POWER," has alarmed spuriously several times over the last hour (IAE is investigating). The crew will raise power to 100% after taking the shift.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	R-RO N-BOP N-SRO	Power Increase w/Alternate Dilute
2	MAL SM001C	C-RO C(TS)-SRO	SG 1C PORV fails OPEN
3	REM NV0461	C-BOP C-SRO	1B NCP Standpipe Low Level Alarm
4	MAL NCP008B	C(TS)-SRO	#1 Seal Leak on 1B NCP
5	MAL DEH001 IRE009	C-RO C-SRO	Inadvertent Turbine Trip/Failure of Control Rods to Move in AUTO
6	MAL NCP008B NCP016C NCP015C	C-BOP	#1 Seal Leak on 1B NCP Fails
7	MAL IRE010	C-BOP C-SRO	4 Control Rods fail to Fully Insert on Rx Trip
8	MAL EP002A EP002B DG001A	M-RO M-BOP M-SRO	Loss of Switchyard to Unit 1/1A EDG fails to START

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2020 NRC Scenario #3

The plant is at 36% power (BOL). The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.

The following equipment is Out-Of-Service: The 1B EDG is OOS for bearing replacement. ACTION has been taken in accordance with Technical Specification LCO 3.8.1 ACTION B. The 1D S/G PORV is isolated and its actuator is currently removed for maintenance. 1KFP-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-9, A-7, "NF SYSTEM TRACE HEATING LOSS OF POWER," has alarmed spuriously several times over the last hour (IAE is investigating). The crew will raise power to 100% after taking the shift.

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.35.12 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation." The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.4, "Alternate Dilute," of OP/1/A/6150/009, "Boron Concentration Control," and raise Turbine load in accordance with OP/1/A/6300/001 A, "Turbine-Generator Load Change."

Shortly after starting the power increase, the 1C Steam Generator PORV will fail OPEN. The operator will respond in accordance with AP/1/A/5500/01, "Steam Leak," and isolate the PORV. The operator will address Technical Specification LCO 3.7.4, "Steam Generator Power Operated Relief Valves (SG PORVs)," and may enter LCO 3.4.1, "RCS Pressure, Temperature and Flow Departure from Nucleate Boiling (DNB) Limits."

After this, AD-7/B-2, "NC PUMP B NO. 2 SEAL S-PIPE LO LEVEL," will alarm. The operator will address the Annunciator Response Procedure, and then use Enclosure 4.3, "Filling and Draining NC Pump Standpipe," of OP/1/A/6150/002A, "Reactor Coolant Pump Operation," to refill the standpipe.

Subsequently, a #1 seal leak will develop on the 1B NCP such that #1 Seal leakoff flow is 5.0-5.5 gpm. The operator will respond in accordance with AP/1/A/5500/08, "Malfunction of NC Pump," and address Selected Licensee Commitment 16.9.7, "Standby Shutdown System." The control operators will be directed on the action to take should the #1 Seal Leakoff flow degrade to > 6 gpm (which will occur subsequently).

Shortly afterwards, the Main Turbine will inadvertently trip. The operator will respond in accordance with AP/1/A/5500/02, "Turbine Generator Trip." The operator will discover that the Control Rods will not respond in AUTO and the RO will need to operate the control rods manually. The crew will stabilize the plant in accordance with AP-2 and subsequently enter AP/1/A/5500/14, "Rod Control Malfunction."

While the crew is in AP-2, the 1B NC Pump Hi Vibration alarm will occur and the #1 seal leak flow on the 1B NCP will rise to 6 gpm. The operator will return to Step 8 of AP-8 (Continuous Action Step), and close the 1B NCP Pzr Spray Valve, manually trip the reactor and stop the 1B NCP when reactor power is < 5%. The crew will perform Enclosure 2, "NC Pump Post Trip Actions For #1 Seal Failure," of AP8, while subsequently performing E-0.

The operator will enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," and verify reactor trip. On the reactor trip four control rods will fail to fully insert. The operator will transition to EP/1/A/5000/ES-0.1, "Reactor Trip Response," and emergency borate per AP/1/A/5500/38, "Emergency Boration And Response To Inadvertent Dilution."

Immediately following the initiation of Emergency Boration, a loss of the Unit 1 Switchyard will occur, and the 1A Emergency Diesel Generator will fail to start. The operator will immediately transition to EP/1/A/5000/ECA-0.0, "Loss of All AC Power." The operator will restore power to 1ETA per Unit 2 6900V busses through SATA or SATB per Enclosure 13 "Energizing Unit 1 4160V Bus From Unit 2 – SATA or SATB."

The scenario will terminate when one ESF Bus has been re-energized.

<u>Critical Tasks:</u>

Trip the Reactor prior to stopping the 1B NCP during a seal failure/high vibration condition and trip the NCP only after Reactor power level has dropped to less than 5%.

Safety Significance: The P-8 interlock allows one NCP to be stopped less than 48% power. If a NCP is stopped in Mode 1 or 2, Tech Spec 3.4.4 requires the unit to be in Mode 3 within 6 hours. In addition, T-ave for the idle loop may violate Tech Spec 3.4.2, minimum temperature for criticality. In this case, the unit must be sub-critical within 30 minutes. The transient placed on the unit when a NCP is secured at power can challenge both reactor protection and control systems. Furthermore, an added burden is placed on the operator to stabilize the unit and shut down within 6 hours (possibly 30 minutes) to comply with Tech Specs. Even though the plant is designed and analyzed to operate in this configuration for a short time, station management has decided that the conservative approach to dealing with this transient is to trip the reactor anytime a NCP malfunction warrants stopping a pump in Mode 1 or 2. Guidance is given to wait until reactor power is less than 5% before stopping the NC pump. This will ensure the NC pump will provide adequate flow/core cooling until reactor power is sufficiently low enough to preclude a challenge to fuel integrity. If the action can be taken, and is not taken, this demonstrates "mis-operation" or incorrect operation that could unnecessarily challenge a fission product barrier (NCS).

Energize at least one AC Emergency Bus From Unit 2.

Safety Significance: Failure to energize an AC Emergency Bus when able to do so constitutes "mis-operation" or incorrect performance which leads to degraded emergency power capacity. Failure to perform the Critical Task may result in a needless challenge and/or degradation of a fission product barrier at the point of the remaining intact RCP Seals, and will result in the inability to add inventory through the ECCS during the existing and potentially subsequent small break LOCA(s). Since the conditions existed to re-energize an ESF Bus from Unit 2 via the SATA or SATB, not taking this action constitutes incorrect performance that leads to degradation of the RCS and/or fuel cladding fission product barriers.

SIMULATOR OPERATOR INSTRUCTIONS

	Bench Mark	ACTIVITY	DESCRIPTION
☐		**Reset to Temp IC 232** **(Base IC-18 [42% BOL])**	**T = 0 Malfunctions:** **insert MAL_EPQ001B ACTIVE (Loss of D/G B Control Power)** **insert LOA_DG021 RACKED_OUT (1B D/G Output Breaker Control Power Fuses)** **insert LOA_DG012 RACKED_OUT (1B D/G Output Breaker Racked Out)** **Insert REM_SV0025 = 0 (Close 1SV-25 [1D S/G PORV Isolation])** **Insert LOA_SV004 = Racked_Out (SG PORV Breaker Racked Out)** **H_X02_098_3 = 0 (1D PORV Controller LEFT lamp)** **H_X02_098_4 = 0 (1D PORV Controller RIGHT lamp)** **Insert LOA_SV020 = 0 (SM PORV D LOCAL OPERATION)** **insert XMT_ KFTT5130 = 0 (Spent Fuel Pool Temperature Failure)** **insert MAL_IRE010N9 (Shutdown Bank B-3 Stuck at original position)** **insert MAL_IRE010N11 (Shutdown Bank D-3 Stuck at original position)** **insert MAL_IRE010P10 Control Bank B-3 Stuck at original position)** **insert MAL_IRE010P12 Shutdown Bank A-3 Stuck at original position)**
☐		**RUN** **Reset all SLIMs**	**Place Tagout/O-Stick on:** • **1B EDG (Tagout)** • **1SV-25 (Tagout)** • **1KFP-5130 (O-Stick)** • **MCB Annunciator 1AD-9, A-7 (O-stick)**
☐		**Update** Status Board, **Setup OAC**	**NOTE:** RMWST DO = <1000 ppb.
☐		**Freeze.**	
☐		**Update Fresh Tech. Spec. Log.**	

	Bench Mark	ACTIVITY	DESCRIPTION
☐		**Fill out the AO's Available section of Shift Turnover Info.**	
☐	Prior to Crew Briefing	**RUN**	
☐	**Crew Briefing** 1. Assign Crew Positions based on evaluation requirements 2. Review the Shift Turnover Information with the crew. 3. Provide Enclosure 4.1 of OP/1/A/6100/003 marked up as required. 4. Provide the crew with OP/1/A/6150/009 (Boron Concentration Control) and OP/1/A/6300/1 A (Turbine-Generator Load Change). 5. Direct the crew to Review the Control Boards taking note of present conditions, alarms.		
☐	T-0	Begin Familiarization Period	
☐	At direction of examiner	**Execute Simulator Scenario N20-1-3.**	
☐	At direction of examiner	**Event 1** **NA**	Power Increase w/Alternate Dilute
☐	At direction of examiner	**Event 2** **insert MAL_SM001C = 100, ramp=10**	SG 1C PORV fails OPEN

	Bench Mark	ACTIVITY	DESCRIPTION
☐	When AD-7/B-2, "NC PUMP B NO. 2 SEAL S-PIPE LO LEVEL," is LIT	**Event 3** **insertREM_NV0461 = 1.0 (Open Standpipe Drain Valve)** **dellA REM_NV0461 = 0.0 cd 'cd 'x10_152_5 =1 delay = 60 seconds (Closed Standpipe Drain Valve when MCB Annunciator 1AD-7 B-2 is LIT)**	1B NCP Standpipe Low Level Alarm **NOTE: The Malfunction for this event will be inserted in Event 2.**
☐	When crew determines 1B NC Pump #1 Seal leakoff flow is rising or at the discretion of the Lead Examiner	**Event 4** **Insert MAL_NCP008B=12, Ramp = 10 minutes**	#1 Seal Leak on 1B NCP **NOTE: The Malfunction for this event will be inserted in Event 3.**
☐	At direction of examiner	**Event 5** **Insert MAL_DEH001** **Insert MAL_IRE009**	Inadvertent Turbine Trip/Failure of Control Rods to Move in AUTO
☐	At direction of examiner	**Event 6** **Change Severity MAL_NCP008B=15 Ramp = 120 seconds** **insertMAL_NCP016C = 16 Ramp = 120 seconds (1B NCP Hi Vibration)** **insert MAL_NCP015C = 11 Ramp = 120 seconds (1B NCP Hi Vibration)** **H_X10_171_3 EQ1 (NCP 1B Breaker Green Status light ON), dellA MAL-NCP016C and 015C**	#1 Seal Leak on 1B NCP Fails

	Bench Mark	ACTIVITY	DESCRIPTION
☐	Post-Rx Trip	**Event 7** **Insert** **MAL_IRE010N9** **MAL_IRE010N11** **MAL_IRE010P10** **MAL_IRE010P12**	4 Control Rods fail to Fully Insert on Rx Trip
☐	Post-Immediate Boration	**Event 8** **Insert MAL_EP002 AND EP002B = TRIP** **Insert MAL_DG001A = TRUE**	Loss of Switchyard to Unit 1/1A EDG fails to START
☐	**Terminate the scenario upon direction of Lead Examiner**		

Op Test No.: N20-1 Scenario # 3 Event # 1	Page 10 of 66
Event Description:	**Power Increase w/Alternate Dilute**

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.35.12 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, “Controlling Procedure for Unit Operation.” The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.4, “Alternate Dilute,” of OP/1/A/6150/009, “Boron Concentration Control,” and raise Turbine load in accordance with OP/1/A/6300/001 A, “Turbine-Generator Load Change.”
Booth Operator Instructions: **NA**
Indications Available: **NA**

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: Per Limit and Precaution 1.4 of Enclosure 4.1 of OP/1/A/6100/003 the operator will control Tavg-Tref at ±2°F.
OP/1/A/6100/003, CONTROLLING PROCEDURE FOR UNIT OPERATIONS ENCLOSURE 4.1, POWER INCREASE			
			NOTE: The power increase will be at 3 MWe/minute.
	BOP	(Step 3.35.12) WHEN Turbine load greater than 40% (370 psig Turbine Inlet Pressure), THEN begin aligning MSRs per OP/1/B/6250/011 (Moisture Separator Reheater Operation).	
OP/1/A/6300/001A, TURBINE-GENERATOR STARTUP/SHUTDOWN ENCLOSURE 4.1, TURBINE-GENERATOR LOAD CHANGE			
NOTE If reducing power to a level greater than 50%, it is preferable to reduce power at a rate less than 12% per hour in order to minimize sodium peaks. [NCR01574291]			
	RO	(Step 3.4.1) IF Turbine in “OPERATOR AUTO”, perform the following:	
		(Step 3.4.1.1) Ensure desired change within “Calculated Capability Curve”.	

Op Test No.:	N20-1	Scenario #	3	Event #	1	Page	11 of 66
Event Description:	**Power Increase w/Alternate Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
		(Step 3.4.1.2) IF turbine load will increase or decrease more than 10 MWs, notify Dispatcher of expected load change.	
		(Step 3.4.1.3) IF desired to change the load rate, THEN perform the following:	
		• Depress "LOAD RATE".	
		• Enter desired load rate in "VARIABLE DISPLAY".	**NOTE:** the RO will select 3 MWe/Min loading rate.
		• Depress "ENTER".	
		(Step 3.4.1.4) IF desired to change desired load, THEN perform the following:	
		• Depress "REFERENCE".	
		• Enter desired load in "VARIABLE DISPLAY".	
		• Depress "ENTER".	
		• Depress "GO"	
		(Step 3.4.1.5) IF desired to pause load change, THEN perform the following:	
		• Depress "HOLD".	
		• WHEN desired to resume load change, THEN depress "GO".	
OP/1/A/6150/009, BORON CONCENTRATION CONTROL ENCLOSURE 4.4, ALTERNATE DILUTE			
			NOTE: The BOP may repeat this task as needed during the power increase.
	BOP	(Step 3.1) Obtain RMWST Dissolved Oxygen (DO) concentration from Chemistry Daily Status Sheet.	
NOTE High Oxygen concentration within the VCT makeup process can cause an increase in iron corrosion product generation within the charging supply piping (long term Crud Burst control issue). {NCR 01604415}			

Op Test No.:	N20-1	Scenario #	3	Event #	1	Page 12 of 66
Event Description:	**Power Increase w/Alternate Dilute**				

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.2) IF RMWST Dissolved Oxygen (DO) concentration is greater than 1000 ppb, THEN…….	**NOTE:** The RMWST Dissolved Oxygen (DO) concentration is less than 1000 ppb.
	BOP	(Step 3.3) Evaluate all outstanding Clearances that may impact performance of this procedure.	

NOTE

- Large additions of cold water to the VCT (from RMWST) can cause large decreases in NC pump #1 seal leakoff flow. This creates a potential for a #1 seal rub when there is a low leaking seal (less than 2 gpm). {NCR 01632117}
- A temperature decrease at the NC pump seals, will cause a short term increase (5 - 10 min) in seal leakoff flow before it goes to its new lower operating flow.
- A temperature increase at the NC pump seals, will cause a short term decrease (5 - 10 min) in seal leakoff flow before it goes to its new higher operating flow.
- If outside air temperature is less than 75 °F (can use OAC point M1P1484), consideration should be given to making large cold water additions to VCT in 1000 gallon increments with time between additions to restore temperature.

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.4) IF the lowest NCP seal leakoff is less than 2 gpm AND VCT makeup of greater than 1000 gallons will be made, THEN……	
	BOP	(Step 3.5) Evaluate energizing additional pressurizer heaters per OP/1/A/6100/003 (Controlling Procedure For Unit Operation) to enhance system mixing when changing NC System boron concentration. (R.M.)	
	BOP	(Step 3.6) Determine current blender contents and evaluate any potential Reactivity effects prior to performing this enclosure:	
		• Rx Makeup Water	
		• Blend	
		• Boron	

Op Test No.:	N20-1	Scenario #	3	Event #	1	Page	13 of 66
Event Description:	**Power Increase w/Alternate Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.7) Determine amount of reactor makeup water needed to obtain desired boron concentration using McGuire Data Book, OAC, Reactor Group Guidance, or plant parameters (T-Ave, Steam Pressure, Xenon worth, etc.). (R.M.)	
		• Total Reactor Makeup Water:	**NOTE:** The BOP will add 300 gallons of MU Water.
	BOP	(Step 3.8) Ensure the following reset to zero: (R.M.)	
		• Total Make Up Flow Counter	
		• Boric Acid Flow Counter	
	BOP	(Step 3.9) Set Total Make Up Flow Counter to value determined in Step 3.7. (R.M.)	
	BOP	(Step 3.10) Select “ALTERNATE DILUTE” on “NC Sys M/U Controller”.	
	BOP	(Step 3.11) IF desired to makeup only through 1NV-175A (U1 Boric Acid Blender To VCT Outlet Control), THEN select “CLOSED” on 1NV-171A (U1 Boric Acid Blender to VCT Inlet Control).	
NOTE Rapidly changing reactor makeup water flow can cause a Rx Makeup Flow Deviation Annunciator Alarm.			
	BOP	(Step 3.12) IF AT ANY TIME it is desired to adjust reactor makeup water flow, adjust “Rx M/U Water Flow Control” setpoint to achieve desired flowrate.	**NOTE:** Typically, it is NOT desired to adjust reactor makeup water flow.

Op Test No.:	N20-1	Scenario #	3	Event #	1	Page	14	of	66
Event Description:	**Power Increase w/Alternate Dilute**								

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.13) IF AT ANY TIME it is desired to manually adjust reactor makeup water flow, perform the following:	
		(Step 3.13.1) Place “Rx M/U Water Flow Control” in manual.	
		(Step 3.13.2) Adjust “Rx M/U Water Flow Control” output to control reactor makeup water flowrate.	
NOTE IF desired to dilute with a constant flow rate as advised by engineering to minimize VCT temperature decrease, it is preferred to allow 1NV-137A (U1 NC Filter Otlt to VCT 3-Way Diversion Cntrl) to auto divert on high level.			
	BOP	(Step 3.14) IF AT ANY TIME it is desired to lower VCT level, perform the following:	
		(Step 3.14.1) Monitor Letdown Pressure.	
NOTE An increase in Letdown Pressure greater than 20 psig during diverts may be indicative of excessive NB Feed Filter DP. {NCR 01597088}			
		(Step 3.14.2) Select “HUT” on 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Contrl).	**NOTE:** The BOP may do this at any time to lower VCT level.
		(Step 3.14.3) IF Letdown Pressure increases greater than 20 psig, notify CRS.	
		(Step 3.14.4) AFTER desired level achieved, select “AUTO” on 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Cntrl).	
NOTE Steps 3.15 - 3.25 may be completed and then checked off as time allows.			
	BOP	(Step 3.15) IF AT ANY TIME plant parameters require termination of dilution, THEN perform the following:	

Op Test No.:	N20-1	Scenario #	3	Event #	1	Page	15 of 66
Event Description:	**Power Increase w/Alternate Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
		(Step 3.15.1) Place “NC System Make Up” to “STOP”. (R.M.)	
		(Step 3.15.2) IF 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Cntrl) was placed to HUT, place to “AUTO”.	
	BOP	(Step 3.16) IF AT ANY TIME nuisance Reactor Makeup Flow Deviation alarms are being received AND Unit in Mode 5, 6, or NO Mode….	**NOTE:** The plant is in Mode 1.
	BOP	(Step 3.17) Momentarily select “START” on “NC System Make Up”. (R.M.)	
	BOP	(Step 3.18) Check “NC System Make Up” red light lit.	
	BOP	(Step 3.19) Check 1NV-175A (U1 Boric Acid Blender To VCT Outlet Control) open.	
	BOP	(Step 3.20) Check 1NV-252A (Rx M/U Water Supply To U1 BA Blender Cntrl) open or throttled as required.	
	BOP	(Step 3.21) IF 1NV-171A (U1 Boric Acid Blender To VCT Inlet Control) in “AUTO”, THEN check 1NV-171A (U1 Boric Acid Blender to VCT Inlet Control) open.	**NOTE:** 1NV-171A is NOT in AUTO.
	BOP	(Step 3.22) Check Rx M/U Water Pump starts.	
	BOP	(Step 3.23) Monitor Total Make Up Flow Counter. (R.M.)	
	BOP	(Step 3.24) HOLD until one of the following occurs:	

Op Test No.:	N20-1	Scenario #	3	Event #	1	Page	16	of	66
Event Description:		**Power Increase w/Alternate Dilute**							

Time	Pos.	Expected Actions/Behavior	Comments
		• Amount of reactor makeup water recorded per Step 3.7 added	
		OR	
		• Reactor makeup water addition manually terminated	
	BOP	(Step 3.25) Ensure dilution terminated as follows: (R.M.)	
		(Step 3.25.1) IF in “AUTO”, ensure the following off:	
		• 1A Rx M/U Water Pump	
		• 1B Rx M/U Water Pump	
	BOP	(Step 3.25.2) Ensure the following closed:	
		• 1NV-175A (U1 Boric Acid Blender To VCT Outlet Control)	
		• 1NV-252A (RX M/U Water Supply To U1 BA Blender Cntrl)	
		• 1NV-171A (U1 Boric Acid Blender To VCT Inlet Control)	
	BOP	(Step 3.26) Ensure 1NV-171A (U1 Boric Acid Blender to VCT Inlet Control) in “AUTO”.	
	BOP	(Step 3.27) Ensure “Rx M/U Water Flow Control” in “AUTO”. (R.M.)	

NOTE

- OAC point M1P5614 (Unit 1 Effective Boron Concentration) may be used as the desired boron concentration in the following calculations. Use of Effective Boron Concentration will account for B-10 depletion. {NCR 01641629}
- Results of Boron Concentration makeups have been consistently lower than desired. To compensate it may be necessary to use actual Boron Concentration (instead of Effective Boron Concentration) or adjustment of the "desired" Boron Concentration to obtain a desired resultant Boron Concentration. {NCR 01682204}

Op Test No.:	N20-1	Scenario #	3	Event #	1	Page	17 of 66
Event Description:	**Power Increase w/Alternate Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.28) IF "Rx M.U Water Flow Control" adjusted per Step 3.12 or 3.13, THEN…	**NOTE:** Typically, the Rx M.U Water Flow Control was NOT adjusted.
	BOP	(Step 3.29) Ensure 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Cntrl) in "AUTO".	
	BOP	(Step 3.30) IF Reactor Makeup Flow Deviation alarms blocked per Step 3.16, THEN….	**NOTE:** These alarms are NOT blocked.
NOTE CRS concurrence required if flush of blender NOT performed.			
	BOP	(Step 3.31) IF desired to flush blender….	**NOTE:** The BOP will likely request that the flush NOT be performed.
	BOP	(Step 3.32) Select "AUTO" for "NC Sys M/U Controller".	
	BOP	(Step 3.33) Momentarily select "START" on "NC System Make Up".	
	BOP	(Step 3.34) Check "NC System Make Up" red light lit.	
	BOP	(Step 3.35) Ensure the following reset to zero: (R.M.)	
		• Total Make Up Flow Counter	
		• Boric Acid Flow Counter	
	BOP	(Step 3.36) Record in Auto Log that final blender content is Rx Makeup Water.	

Op Test No.:	N20-1	Scenario #	3	Event #	1	Page	18	of 66
Event Description:		**Power Increase w/Alternate Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
OP/1/A/6100/003, CONTROLLING PROCEDURE FOR UNIT OPERATIONS ENCLOSURE 4.1, POWER INCREASE			
	RO	(Step 3.35.13) WHEN Turbine Inlet Pressure 365 - 375 psig, THEN check "AMSAC ACTUATION BLOCK/UNBLOCK" as follows:	
		• IF "UNBLOCK" dark, THEN reset as follows:	
		• Check all "AMSAC S/G LOW FLOW" status lights dark.	
		• Check "S/G PATH CLSD >30 SEC" dark.	
		• Depress "UNBLOCK" for "AMSAC ACTUATION BLOCK/UNBLOCK".	
		• Check "UNBLOCK" lit.	
	BOP	(Step 3.35.14) WHEN 40% RTP, THEN notify RP to adjust setpoints for the following: {NCR 01717012}	
		• 1EMF-71 (S/G A Leakage Hi Rad)	
		• 1EMF-72 (S/G B Leakage Hi Rad)	
		• 1EMF-73 (S/G C Leakage Hi Rad)	
		• 1EMF-74 (S/G D Leakage Hi Rad)	
At the discretion of the Lead Examiner move to Event #2.			

Op Test No.:	N20-1	Scenario #	3	Event #	2	Page	19 of 66
Event Description:	**SG 1C PORV fails OPEN**						

Shortly after starting the power increase, the 1C Steam Generator PORV will fail OPEN. The operator will respond in accordance with AP/1/A/5500/01, "Steam Leak," and isolate the PORV. The operator will address Technical Specification LCO 3.7.4, "Steam Generator Power Operated Relief Valves (SG PORVs)," and may enter LCO 3.4.1, "RCS Pressure, Temperature and Flow Departure from Nucleate Boiling (DNB) Limits."

Booth Operator Instructions: **insert MAL_SM001C 100 delay=0 ramp=10 (S/G PORV 1SV7 SGC fails OPEN)**

Indications Available:

- 1SV-7ABC Red status light LIT
- 1SV-7ABC Black needle indication at 100%
- OAC Alarm: TM FREEZE – MID3497-VLVSV1C SM PORV OPEN
- OAC Alarm: U1 SV-PORV/SAFETY VLV OPEN –T/D CA PMP ON
- OAC Alarm: 1SV-7 1C SM PORV
- Core ΔTs rising
- Rx Power rising
- Steam flow on 1C steam line rising

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: It is likely that the operator will take actions to isolate the 1C SG PORV prior to being directed by the CRS. (Step 13)
		AP/1/A/5500/01, STEAM LEAK	
	CRS	(Step 1) Monitor Foldout page.	
		Manual Reactor Trip Criteria: (IF any of the following occur: (1) Steam leak is jeopardizing personnel safety or plant equipment, (2) T-Avg is less than 551°F AND going down, or (3) UST level is less than 1 ft – NOT Expected).	**NOTE:** Manual Reactor Trip Criteria is NOT expected to be utilized.
	RO	(Step 2) Reduce turbine load to maintain the following:	
		• Excore NI's – LESS THAN OR EQUAL TO 100%.	
		• NC Loop D/T's – LESS THAN 60°F D/T	
		• T-Avg – AT T-REF.	

Op Test No.:	N20-1	Scenario #	3	Event #	2	Page	20 of 66
Event Description:	SG 1C PORV fails OPEN						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 3) Check containment entry – IN PROGRESS.	**NOTE:** A Containment Entry is NOT in progress.
	CRS	(Step 3 RNO) GO TO Step 5.	
	BOP	(Step 5) Check Pzr pressure prior to event – GREATER THAN P-11 (1955 PSIG).	
	BOP	(Step 6) Check Pzr level – STABLE OR GOING UP.	**NOTE:** The CRS may direct the RNO to be performed depending on the timeliness of the S/G PORV closure. If not, proceed to Step 7.
	BOP	(Step 6 RNO) Perform the following as required to maintain level:	
		• Maintain charging flow less than 200 GPM at all times in subsequent steps.	
		• Ensure 1NV-238 (U1 Charging Hdr Control) OPENING.	
		• OPEN 1NV-241 (U1 Seal Water Inj Flow Control) while maintaining NC pump seal flow greater than 6 GPM.	
		• Reduce or isolate letdown.	
		• Start additional NV pump.	
		• IF Pzr level going down with maximum charging flow, THEN …..	
	BOP	(Step 7) IF AT ANY TIME while in this procedure Pzr level cannot be maintained stable, THEN RETURN TO Step 6.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 8) GO TO Step 12.	

Op Test No.:	N20-1	Scenario #	3	Event #	2	Page	21 of 66
Event Description:	SG 1C PORV fails OPEN						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 12) Announce occurrence on paging system.	**NOTE:** CRS may ask U2 RO to make Plant Announcement that AP-1 has been entered. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 13) Identify and isolate leak on Unit 1 as follows:	
		• (Step 13.A) Check SM PORVs – CLOSED.	**NOTE:** The 1C SG PORV is Open.
	RO	(Step 13.A RNO) IF S/G pressure is less than 1092 PSIG, THEN perform the following:	
		• Close affected S/G SM PORV manual loader.	**NOTE:** Closing the Manual Loader will have no effect.
		• IF SM PORV is still open, THEN perform the following:	**NOTE:** The 1C SG PORV Isolation Valve will need to be closed.
		• Close SM PORV isolation valve.	
		• IF SM PORV isolation valve still open……	**NOTE:** The PORV Isolation valve is closed.
	RO	• (Step 13.B) Check condenser dump valves – CLOSED.	
	BOP	• (Step 13.C) Check containment conditions – NORMAL:	
		• Containment temperature	
		• Containment pressure	
		• Containment humidity	
		• Containment floor and equipment sump level.	
	RO / BOP	• (Step 13.D) Check TD CA pump – OFF.	

Op Test No.:	N20-1	Scenario #	3	Event #	2	Page	22 of 66
Event Description:	**SG 1C PORV fails OPEN**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	• (Step 13.E) Check valves on "STEAM LINE DRAIN VALVES" board (1MC-9) – CLOSED.	**NOTE:** One or more of these valves may be cycling. The RNO will direct closing the valves.
	CRS	• (Step 13.F) Check opposite Unit (Unit 2) "STEAM HEADER PRESSURE" – GREATER THAN 200 PSIG.	**NOTE:** CRS may ask U2 RO for AS Header pressure. If so, **Floor Instructor** report as **U2 RO that U2 Steam Header pressure** is **≈1000 psig**.
	CRS	• (Step 13.G) Dispatch operator to check for leaks.	**NOTE:** The CRS may dispatch an AO to look for leaks. If so, **Floor Instructor:** acknowledge. **Booth Instructor:** Report back in 3-5 minutes that there are no leaks.
			NOTE: The CRS may NOT dispatch AOs to look for leaks because it is understood that the SM PORV opening was the reason that AP-1 was entered.
	BOP	(Step 14) Check UST level – STABLE OR GOING UP.	
	CRS	(Step 15) Evaluate unit shutdown as follows:	
		• Check unit status – IN MODE 1 OR 2.	
		• Determine if unit shutdown or load reduction is warranted based on the following criteria:	**NOTE:** CRS may call WCC/Management to address the startup. If so, **Booth Instructor** acknowledge as WCC.
		• Size of leak	
		• Location of leak	
		• Rate of depletion of secondary inventory	
		• IF steam is leaking from a secondary heater relief OR MSR relief valve…	

Op Test No.: N20-1	Scenario # 3	Event # 2	Page 23 of 66
Event Description:	**SG 1C PORV fails OPEN**		

Time	Pos.	Expected Actions/Behavior	Comments
		• IF turbine trip will isolate steam leak (such as feedwater heater leak or MSR leak…	
		• Check unit shutdown or load reduction – REQUIRED.	**NOTE:** Shutdown/Load Reduction will NOT be required.
	CRS	(Step 15.C RNO) Perform the following:	
		• Maintain present plant conditions until leak can be isolated or repaired.	
		• Exit this procedure.	
			NOTE: The CRS may call WCC/IAE to address the Valve failure. If so, **Booth Instructor** acknowledge as WCC, and using Time Compression report that 1SV7ABC is stuck fully open (and cannot be moved even using the Manual handwheel).
			NOTE: The CRS will likely conduct a Focus Brief.
			NOTE: The CRS will address Tech Specs based on plant response.
Booth Operator Instructions:		**While the CRS is checking Tech Specs, insertREM_NV0461 = 1.0 (Open Standpipe Drain Valve) (will take ≈ 3-4 min, to alarm)** **dellA REM_NV0461 = 0.0 cd 'x05_002B02_1 =1 Delay = 30 Seconds (Closed Standpipe Drain Valve when MCB Annunciator 1AD-7 B-2 is LIT)**	
TECHNICAL SPECIFICATION 3.7.4, STEAM GENERATOR POWER OPERATED RELIEF VALVES (SG PORVs)			

Op Test No.:	N20-1	Scenario #	3	Event #	2	Page	24 of 66
Event Description:	**SG 1C PORV fails OPEN**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	LCO 3.7.4 Three SG PORV lines shall be OPERABLE.	
	CRS	APPLICABILITY: MODES 1, 2, and 3, MODE 4 when steam generator is relied upon for heat removal.	
	CRS	ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required SG PORV line inoperable.	A.1 Restore required SG PORV line to OPERABLE status.	7 days

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will determine that Condition A is required and that ACTION A.1 must be taken.
TECHNICAL SPECIFICATION 3.4.1, RCS PRESSURE, TEMPERATURE, AND FLOW DEPARTURE FROM NUCLEATE BOILING (DNB) LIMITS			
	CRS	LCO 3.4.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be within the limits specified in Table 3.4.1-1.	**NOTE:** According to Table 3.4.1-1, Parameter 2, indicated Pressurizer Pressure will be ≥ The limit specified in the COLR.
	CRS	APPLICABILITY: MODE 1.	**NOTE:** According to Table 4 of the COLR, indicated Pressurizer Pressure (with four channels available) must be ≥ 2212.3 psig via the meter indication and ≥ 2209.1 psig via the OAC. During this failure Pressurizer Pressure will lower below these values.
	CRS	ACTIONS	

Op Test No.:	N20-1	Scenario #	3	Event #	2	Page	25 of	66
Event Description:	**SG 1C PORV fails OPEN**							

Time	Pos.	Expected Actions/Behavior	Comments
CONDITION	REQUIRED ACTION	COMPLETION TIME	
A. Pressurizer pressure or RCS average temperature DNB parameters not within limits.	A.1 Restore DNB parameter(s) to within limit.	2 hours	
			NOTE: When Pressurizer Pressure drops to < 2209.1 psig (OAC) on the failure, the CRS will determine that Condition A is required and that ACTION A.1 must be taken.
			NOTE: **Floor Instructor** if the crew attempts to continue the power increase as **Shift Manager** direct that the crew **await further direction to raise power**.
When AD-7/B-2, “NC PUMP B NO. 2 SEAL S-PIPE LO LEVEL,” move to Event 3.			

Op Test No.:	N20-1	Scenario #	3	Event #	3	Page	26 of 66
Event Description:	**1B NCP Standpipe Low Level Alarm**						

After this, AD-7/B-2, “NC PUMP B NO. 2 SEAL S-PIPE LO LEVEL,” will alarm. The operator will address the Annunciator Response Procedure, and then use Enclosure 4.3, “Filling and Draining NC Pump Standpipe,” of OP/1/A/6150/002A, “Reactor Coolant Pump Operation,” to refill the standpipe.

Booth Operator Instructions:

insertREM_NV0461 = 1.0 (Open Standpipe Drain Valve) (will take ≈ 3-4 min, to alarm)

delIA REM_NV0461 = 0.0 cd ‘x05_002B02_1 =1 delay = 30 seconds (Closed Standpipe Drain Valve when MCB Annunciator 1AD-7 B-2 is LIT)

Indications Available:

- OAC Alarm M1D1496: 1B NC Pump Standpipe Level Low
- MCB Annunciator 1AD-7/B-2 NC PUMP B NO.2 SEAL S-PIPE LOW LEVEL

Time	Pos.	Expected Actions/Behavior	Comments
		OP/1/A/6100/010 H, ANNUNCIATOR RESPONSE FOR PANEL 1AD-7 B2, NC PUMP B NO. 2 SEAL S-PIPE LO LVL	
	BOP	(Step 1) IF drain was inadvertently opened, ensure it is closed.	
	BOP	(Step 2) Check the following NC pump parameters stable:	
		• Lower bearing Temperature	
		• Number 1 seal outlet temperature	
		• Number 1 seal leakoff flow	
	BOP	(Step 3) IF any NC pump parameter listed in Step 2 abnormal,…	**NOTE:** All listed parameters are normal.
	BOP	(Step 4) Make up to standpipe as necessary per OP/1/A/6150/002A (Reactor Coolant Pump Operation).	**NOTE:** The CRS will transition to the OP to refill the standpipe.

Op Test No.:	N20-1	Scenario #	3	Event #	3	Page	27 of 66
Event Description:	1B NCP Standpipe Low Level Alarm						

Time	Pos.	Expected Actions/Behavior	Comments
When BOP addresses OP/1/A/6150/002 A to refill the 1B NC Pump Standpipe: **Booth Operator Instructions:** **insert MAL_NCP008B=12 Ramp = 10 minutes (Event 4)** **(NOTE: This malfunction will require several minutes to diagnose).**			
OP/1/A/6150/002 A, REACTOR COOLANT PUMP OPERATION **ATTACHMENT 3, FILLING AND DRAINING NC PUMP STANDPIPE**			
	BOP	(Step 3.1.1) Evaluate all outstanding CLEARANCES that may impact performance of this procedure.	
	BOP	(Step 3.1.2) IF Containment Closure in effect, THEN…..	**NOTE:** Containment Closure is NOT in effect.
	BOP	(Step 3.1.3) Perform the following sections, as applicable:	
		• Section 3.2, Filling NC Pump Standpipes	
	BOP	(Step 3.2) Filling NC Pump Standpipes	
		• Check Reactor Makeup Water System aligned per OP/1/A/6200/012 (Reactor Makeup Water System).	
		• Check 1NC-56B (PRT Spray Cont Outside Isol) OPEN.	

NOTE

- NC Pump Standpipe volume needed to clear applicable "NC Pump No. 2 Seal S-pipe Lo Lvl" alarm is approximately seven gallons. The preferred method to clear the alarm is to allow RMWST gravity feed to fill the affected NC Pump Standpipe. [8.7.9]
- Only one NC Pump Standpipe fill valve should be opened at a time and closed immediately when the low standpipe alarm clears. [8.7.9]
- Minimal NC Pump Standpipe volume is required to reduce flow through the standpipe and reduce debris entering No. 2 and No. 3 seals. [8.7.9]

Op Test No.:	N20-1	Scenario #	3	Event #	3	Page	28 of 66
Event Description:	1B NCP Standpipe Low Level Alarm						

Time	Pos.	Expected Actions/Behavior	Comments
		• Open Applicable valve(s):	
		• 1NV-55B (B NC Pump Standpipe Fill)	
		• IF required, THEN start one of the following:	**NOTE:** It is likely that the BOP will need to start a Rx M/U Water Pump.
		• 1A Rx M/U Water Pump	
		OR	
		• 1B Rx M/U Water Pump	
		• WHEN applicable "NC Pump No. 2 Seal S-pipe Lo Lvl" alarm clears, THEN perform the following:	
		• IF pump started in Step 4, stop applicable pump:	
		• 1A Rx M/U Water Pump	
		OR	
		• 1B Rx M/U Water Pump	
		• Close applicable valve.	
		• 1NV-55B (B NC Pump Standpipe Fill)	
			NOTE: The CRS may call WCC to address the failure. If so, **Booth Instructor** acknowledge as WCC.
			NOTE: The CRS will likely conduct a Focus Brief.

When the crew has determined that the 1B NC Pump #1 Seal leakoff flow is rising or at the discretion of the Lead Examiner, move to Event #4.

Op Test No.:	N20-1	Scenario #	3	Event #	4	Page	29 of 66
Event Description:	**#1 Seal Leak on 1B NCP**						

Subsequently, a #1 seal leak will develop on the 1B NCP such that #1 Seal leakoff flow is 5.0-5.5 gpm. The operator will respond in accordance with AP/1/A/5500/08, "Malfunction of NC Pump," and address Selected Licensee Commitment 16.9.7, "Standby Shutdown System." The control operators will be directed on the action to take should the #1 Seal Leakoff flow degrade to > 6 gpm (which will occur subsequently).

Booth Operator Instructions: **insert MAL_NCP008B=12 Ramp = 10 minutes (NOTE: This malfunction was mostly likely inserted during the completion of Event 3).**

Indications Available:

- 1B NC Pump #1 Seal leakoff flow is rising on the OAC.
- OAC Alarm: 1B NCP Seal Flow > SSF Limit.
- MCB Annunciator 1AD-7/E3, NCP PMP CNTRL LEKAGE HI FLOW

Time	Pos.	Expected Actions/Behavior	Comments
		AP/1/A/5500/08, MALFUNCTION OF NC PUMP **CASE I, NC PUMP SEAL OR PUMP LOWER BEARING MALFUNCTION**	
		NOTE Step 1 RNO should be used to validate the abnormal parameter unless it has been previously validated or is clearly known to be valid.	
	BOP	(Step 1) Check abnormal NC pump parameter – KNOWN TO BE VALID.	**NOTE:** The operator may address Enclosure 1 per the RNO (Not Scripted).
	BOP	(Step 2) Check NC pump parameters within operating limits:	
		• All NC pump lower radial bearing temperatures – LESS THAN 225°F	
		• All NC pump number 1 seal outlet temperatures – LESS THAN 235°F	
		• All NC pump number 1 seal D/Ps – GREATER THAN 200 PSID.	

Op Test No.:	N20-1	Scenario #	3	Event #	4	Page	30 of 66
Event Description:	**#1 Seal Leak on 1B NCP**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3) IF AT ANY TIME, any operating limit in Step 2 is exceeded, THEN GO TO Step 5.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 4) GO TO Step 6.	
	BOP	(Step 6) Check if seal cooling available to affected NC pump as follows:	
		• Seal injection (normal or SSF Supply) – ESTABLISHED	
		OR	
		• KC to Thermal Barrier - ESTABLISHED.	
NOTE Up to 24 hours of NC Pump operation may be required before seals seat and operate normally after seal maintenance or startup.			
	BOP	(Step 7) Check any NC pump number one seal leakoff – GREATER THAN OR EQUAL TO 6 GPM.	**NOTE:** It is likely that by the time the crew arrives at this step the leakoff flow will be rising but will NOT have exceeded 6 GPM.
	BOP	(Step 7 RNO) Perform the following:	
NOTE OP/1/A/6200/001 B (Chemical and Volume Control System Charging), Enclosure 4.10 (Maintaining NC Pump Seal Leakoff) gives guidance on actions used to change seal leakoff flow.			
		• IF seal leakoff slowly going up, THEN contact station management for further guidance.	**NOTE:** The CRS may call WCC/SM to address the seal failure with station management. If so, **Booth Instructor** acknowledge as WCC/SM.

Op Test No.:	N20-1	Scenario #	3	Event #	4	Page	31 of 66
Event Description:	**#1 Seal Leak on 1B NCP**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Continue to monitor NC pump seal leakoff flow.	
	CRS	• IF AT ANY TIME seal leakoff flow goes up to 6 GPM, THEN GO TO Step 8.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	• GO TO Step 9.	
	BOP	(Step 9) Check affected NC pump(s) Seal Return Valve – OPEN:	
		• 1NV-50B (1B NC Pump Seal Return Isol)	
	BOP	(Step 10) Check NC pressure – GREATER THAN 2000 PSIG.	
	BOP	(Step 11) Check any NC Pump number one seal leakoff - LESS THAN 0.8 GPM.	
	CRS	(Step 11 RNO) Perform the following:	
NOTE OP/1/A/6200/001 B (Chemical and Volume Control System Charging), Enclosure 4.10 (Maintaining NC Pump Seal Leakoff) gives guidance on actions used to change seal leakoff flow.			
	BOP	• IF seal leakoff slowly going down, THEN….	
		• Continue to monitor NC Pump seal leakoff flow.	
		• IF AT ANY TIME seal leakoff flow goes below 0.8 GPM, THEN RETURN TO Step 10.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	• GO TO Step 17.	
	BOP	(Step 17) Check for number two seal failure without a number one seal failure as follows:	

Op Test No.: N20-1	Scenario # 3	Event # 4	Page 32 of 66
Event Description:	**#1 Seal Leak on 1B NCP**		

Time	Pos.	Expected Actions/Behavior	Comments
		• Number one seal leakoff - LESS THAN NORMAL OR GOING DOWN.	**NOTE:** #1 Seal Leak off Flow is higher than Normal.
	CRS	(Step 17 RNO) GO TO Step 18.	
	CRS	(Step 18) Check for number three seal failure as follows:	
		• Frequent filling of seal standpipe with standpipe drains closed – HAS OCCURRED.	
	CRS	(Step 18 RNO) GO TO Step 19.	
	CRS	(Step 19) Announce occurrence on paging system.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	BOP	(Step 20) Check NC Pumps - ANY RUNNING.	**NOTE:** All NCPs are running.
	BOP	(Step 21) Check the following NC Pump temperatures - STABLE OR GOING DOWN:	
		• All NC Pump lower radial bearing temperatures	
		• All NC Pump number one seal outlet temperatures.	
	CRS	(Step 22) Have another SRO evaluate if leakage exceeds SLC 16.9.7 Condition C limit and immediately notify security if SSF is inoperable.	**NOTE:** The CRS may ask the SM to evaluate SLC 16.9.7. **If so, Floor Instructor, indicate that another SRO is NOT available.**

Op Test No.:	N20-1	Scenario #	3	Event #	4	Page	33	of 66
Event Description:	**#1 Seal Leak on 1B NCP**							

Time	Pos.	Expected Actions/Behavior	Comments
SELECTED LICENSEE COMMITMENT 16.9.7, STANDBY SHUTDOWN SYSTEM			
	CRS	COMMITMENT The Standby Shutdown System (SSS) shall be operable.	
	CRS	APPLICABILITY: MODES 1, 2, and 3.	
	CRS	REMEDIAL ACTIONS	
		The SRO should ensure that security is notified 10 minutes prior to declaring the SSS inoperable. Immediately upon discovery of the SSS inoperability, Security must be notified to implement compensatory measures within 10 minutes of discovery.	**NOTE:** The CRS may call WCC/Security to implement compensatory measures within 10 minutes of discovery. If so, **Booth Instructor** acknowledge as WCC/Security.

Op Test No.: N20-1	Scenario # 3	Event # 4	Page 34 of 66
Event Description:	**#1 Seal Leak on 1B NCP**		

Time	Pos.	Expected Actions/Behavior	Comments

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Total Unidentified LEAKAGE, Identified LEAKAGE, and reactor coolant pump seal leakoff > 20 gpm. OR Total reactor coolant pump seal leakoff > 16.3 gpm. OR Any reactor coolant pump No. 1 seal leakoff > 4.0 gpm.	C.1 Declare the Standby Makeup Pump inoperable. AND C.2 Enter Condition A.	Immediately
A. One or more required SSS components identified in Table 16.9.7-1.	A.1 Verify the FUNCTIONALITY of fire detection and suppression systems in the associated areas identified in Table 16.9.7-1 AND A.2 Restore the component to FUNCTIONAL status.	1 hour 7 days

Time	Pos.	Expected Actions/Behavior	Comments
			The CRS will identify that Condition C is required and that Actions C.1 and C.2 must be taken immediately; and that C.2 requires Condition A and Actions A.1 and A.2 must be taken.

At the discretion of the Lead Examiner, move to Event #5.

Op Test No.: N20-1	Scenario # 3	Event # 5	Page 35 of 66
Event Description:	**Inadvertent Turbine Trip/Failure of Control Rods to Move in AUTO**		

Shortly afterwards, the Main Turbine will inadvertently trip. The operator will respond in accordance with AP/1/A/5500/02, "Turbine Generator Trip." The operator will discover that the Control Rods will not respond in AUTO and the RO will need to operate the control rods manually. The crew will stabilize the plant in accordance with AP-2 and subsequently enter AP/1/A/5500/14, "Rod Control Malfunction."

Booth Operator Instructions: **insert MAL_DEH001/IRE009**

Indications Available:

- Turbine Trip Valves closed
- Turbine Governor Valves closed
- Rx does NOT trip (Rx Trip Breakers closed)
- Steam Dump Valves open
- No Automatic Rod Motion

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will enter AP-02.
		AP/1/A/5000/02, TURBINE GENERATOR TRIP	
	RO	(Step 1) Check Turbine Trip:	
		• All throttle valves – CLOSED.	
	RO	(Step 2) Check P/R meters – LESS THAN 20%.	**NOTE:** PR indication is > 20%.
	RO	(Step 2 RNO) Perform the following:	
		• Ensure control rods moving in to reduce T-Avg.	**NOTE:** The rods must be moved in MANUAL.
		• Designate an operator to continuously monitor reactor power.	**NOTE:** The CRS will designate the RO.
		• WHEN reactor power is less than 20%, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Place control rods in manual.	
		• Perform Step 3 to stabilize reactor power.	**NOTE:** The RO will stabilize reactor power at about 12-15%.

Op Test No.:	N20-1	Scenario #	3	Event #	5	Page	36 of 66
Event Description:	**Inadvertent Turbine Trip/Failure of Control Rods to Move in AUTO**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	• GO TO Step 4.	
	RO	(Step 4) IF AT ANY TIME reactor power goes below 5%, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	RO	• Do not pull control rods.	
		• Insert control rods as necessary to maintain negative SUR on I/R startup rate meters.	
	RO	(Step 5) Check "C-9 COND AVAILABLE FOR STEAM DUMP" status light (1SI-18) – LIT.	
	BOP	(Step 6) Check any CF pump – IN SERVICE.	**NOTE:** The 1A CF Pump is in service.
	RO	(Step 7) Check both generator breakers – OPEN.	
	RO	(Step 8) Check "EXCITATION" – OFF.	
	RO	(Step 9) IF AT ANY TIME T-Avg is less than 551°F AND going down, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Trip reactor.	
		• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	
	RO	(Step 10) Check all control rods – ALIGNED WITH ASSOCIATED BANK.	
	RO	(Step 11) Check MSR "RESET" light – LIT.	

Op Test No.:	N20-1	Scenario #	3	Event #	5	Page	37	of	66
Event Description:	Inadvertent Turbine Trip/Failure of Control Rods to Move in AUTO								

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 12) Announce the following: “Unit 1 Turbine trip, non-essential personnel stay out of Unit 1 turbine bldg”.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 13) Check “UNBLOCK” light for “AMSAC ACTUATION BLOCK/UNBLOCK” switch (1MC-2) – DARK.	
	RO	(Step 14) Check condenser dump valves – MODULATING OPEN.	
	BOP	(Step 15) Check Pzr pressure control response as follows:	
		• Ensure Pzr heaters are in auto.	
		• Ensure Pzr spray control valves are in auto.	
		• Check Pzr PORVs – CLOSED.	
		• Check Pzr spray control valves – CLOSED.	
	BOP	(Step 16) Check Pzr level –TRENDING TO PROGRAM.	
	RO	(Step 17) Ensure Bearing Lift pump in “AUTO”.	
	RO	(Step 18) WHEN bearing oil pressure goes down to 11-12 PSIG, THEN ensure AC Bearing Oil pump starts.	

Op Test No.: N20-1	Scenario # 3	Event # 5	Page 38 of 66
Event Description:	**Inadvertent Turbine Trip/Failure of Control Rods to Move in AUTO**		

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 19) Perform applicable steps of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown), Enclosure 4.3 (Shutdown).	
When the CRS enters AP-14 for the failure of Automatic Rod Motion or at the discretion of the Lead Examiner move to Events #6-8.			

Op Test No.:	N20-1	Scenario #	3	Event #	6, 7 & 8	Page	39 of 66

Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

While the crew is in AP-2, the 1B NC Pump Hi Vibration alarm will occur and the #1 seal leak flow on the 1B NCP will rise to 6 gpm. The operator will return to Step 8 of AP-8 (Continuous Action Step), and close the 1B NCP Pzr Spray Valve, manually trip the reactor and stop the 1B NCP when reactor power is < 5%. The crew will perform Enclosure 2, “NC Pump Post Trip Actions For #1 Seal Failure,” of AP8, while subsequently performing E-0. The operator will enter EP/1/A/5000/E-0, “Reactor Trip or Safety Injection,” and verify reactor trip. On the reactor trip four control rods will fail to fully insert. The operator will transition to EP/1/A/5000/ES-0.1, “Reactor Trip Response,” and emergency borate per AP/1/A/5500/38, “Emergency Boration And Response To Inadvertent Dilution.” Immediately following the initiation of Emergency Boration, a loss of the Unit 1 Switchyard will occur, and the 1A Emergency Diesel Generator will fail to start. The operator will immediately transition to EP/1/A/5000/ECA-0.0, “Loss of All AC Power.” The operator will restore power to 1ETA per Unit 2 6900V busses through SATA or SATB per Enclosure 13 “Energizing Unit 1 4160V Bus From Unit 2 – SATA or SATB.” The scenario will terminate when one ESF Bus has been re-energized.

Booth Operator Instructions:

Change Severity MAL_NCP008B=15 Ramp = 120 seconds
insertMAL_NCP016C = 16 Ramp = 120 seconds (1B NCP Hi Vibration)
insert MAL_NCP015C = 11 Ramp = 120 seconds (1B NCP Hi Vibration)
H_X10_171_3 EQ1 (NCP 1B Breaker Green Status light ON), dellA MAL_NCP016C and 015C

Indications Available:

- MCB Annunciator 1AD6/E-11, NC PUMP HI VIBRATION
- 1B NC Pump #1 Seal leakoff flow is rising on the OAC to 6 gpm.

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will go back and implement Step 8 of AP-8.
		AP/1/A/5500/08, MALFUNCTION OF NC PUMP CASE I, NC PUMP SEAL OR PUMP LOWER BEARING MALFUNCTION	
	CRS	(Step 8) Stop affected NC pump as follows:	
		• IF A or B NC pump is the affected pump, Then CLOSE associated spray valve:	
	BOP	• 1NC-29C (B NC Loop PZR Spray Control).	

Op Test No.:	N20-1	Scenario #	3	Event #	6, 7 & 8	Page	40 of 66

Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
CAUTION Enclosure 2 (NC Pump Post Trip Actions For #1 Seal Failure) contains actions that must be performed 3 to 5 minutes after stopping the NC Pump. This enclosure must be performed even after transition to EPs.			
	CRS	• Have any available RO perform Enclosure 2 (NC Post Trip Actions for #1 Seal Failure as crew performs the following steps.	**NOTE:** The CRS may direct the Unit 2 BOP to perform this action. If so, **Floor Instructor**: report that the U2 BOP (or any other RO) is NOT available.
		• Check unit status – IN MODE 1 OR 2.	
	RO	• Trip reactor	
	BOP	• WHEN reactor power less than 5%, THEN stop affected NC pump.	

Critical Task:

Trip the Reactor prior to stopping the 1B NCP during a seal failure/high vibration condition and trip the NCP only after Reactor power level has dropped to less than 5%.

Safety Significance: The P-8 interlock allows one NCP to be stopped less than 48% power. If a NCP is stopped in Mode 1 or 2, Tech Spec 3.4.4 requires the unit to be in Mode 3 within 6 hours. In addition, T-ave for the idle loop may violate Tech Spec 3.4.2, minimum temperature for criticality. In this case, the unit must be sub-critical within 30 minutes. The transient placed on the unit when a NCP is secured at power can challenge both reactor protection and control systems. Furthermore, an added burden is placed on the operator to stabilize the unit and shut down within 6 hours (possibly 30 minutes) to comply with Tech Specs. Even though the plant is designed and analyzed to operate in this configuration for a short time, station management has decided that the conservative approach to dealing with this transient is to trip the reactor anytime a NCP malfunction warrants stopping a pump in Mode 1 or 2. Guidance is given to wait until reactor power is less than 5% before stopping the NC pump. This will ensure the NC pump will provide adequate flow/core cooling until reactor power is sufficiently low enough to preclude a challenge to fuel integrity. If the action can be taken, and is not taken, this demonstrates “mis-operation” or incorrect operation that could unnecessarily challenge a fission product barrier (NCS).

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will direct the BOP to perform Enclosure 2, and continue in AP-8 with the RO. If so, **BOP Examiner** follow actions of Enclosure 2. **Other Examiners** follow **AP-8** Actions on **Page 42**.
AP/1/A/5500/08, MALFUNCTION OF NC PUMP ENCLOSURE 2, NC PUMP POST TRIP ACTIONS FOR #1 SEAL FAILURE			
			Examiner NOTE: Follow the actions associated with Enclosure 2 if BOP is assigned by CRS to perform.
CAUTION Failure of number two and three seals may occur unless the affected NC Pump Seal Return Valve is closed immediately after the pump has coasted down to zero speed (3-5 min). This enclosure must be completed even after transition to EPs.			
	BOP	(Step 1) Record time of NC pump shutdown.	
	BOP	(Step 2) Check if seal cooling available to affected pump as follows:	
		• Seal injection from normal charging (NV pump or PD Pump) - ESTABLISHED	
		• KC to Thermal Barrier - ESTABLISHED.	
	BOP	(Step 3) Check if any NC Pump number one seal leakoff flow – GREATER THAN OR EQUAL TO 6 GPM.	
	BOP	(Step 4) Maintain seal injection flow greater than 9 GPM to affected pump(s).	**NOTE:** The BOP will need to adjust Sealwater Injection flow.

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 5) Check all NC Pumps - OFF.	**NOTE:** All NC Pumps are running.
	BOP	(Step 5 RNO) IF any NC Pump continues to run, THEN perform the following:	
		• WHEN affected NC pump has been off 3 minutes, THEN immediately perform the following:	
		• CLOSE affected NC pump seal return valve:	
		• 1NV-50B (B NC Pump Seal Return Isol)	**NOTE:** The BOP will close this valve approximately three minutes after stopping the 1B NC Pump.
		• OPEN all of the following valves:	
		• OPEN 1KC-394A (A NC Pump Therm Bar Otlt)	
		• OPEN 1KC-345A (C NC Pump Therm Bar Otlt)	
		• OPEN 1KC-364B (B NC Pump Therm Bar Otlt)	
		• OPEN 1KC-413B (D NC Pump Therm Bar Otlt)	
		• Exit this enclosure	
AP/1/A/5500/08, MALFUNCTION OF NC PUMP **CASE I, NC PUMP SEAL OR PUMP LOWER BEARING MALFUNCTION**			
			Examiner NOTE: Examiners following the **CRS/RO** continue **HERE.**
	CRS	• Continue with this AP as time allows.	
	CRS	• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
EP/1/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION			
	RO/ BOP	(Step 1) Monitor Foldout page.	
		NC Pump Trip Criteria (Not Expected)	
		CA Suction Sources (CA storage tank (water tower) goes below 1.5 ft – Not expected)	
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	**NOTE:** The BOP will monitor these conditions.
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	
		Ruptured S/G Aux Feedwater Isolation Criteria (Not expected)	
		Faulted S/G Aux Feedwater Isolation Criteria (Not expected)	
	RO	(Step 2) Check Reactor Trip:	**Immediate Action**
		• All rod bottom lights – LIT	**NOTE:** There will be four rods that failed to fully insert on the Rx Trip.
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 2 RNO) Perform the following:	
		• Trip reactor.	
		• IF reactor will not trip…	
	RO	(Step 3) Check Turbine Trip:	**Immediate Action**

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
		• All throttle valves – CLOSED.	
	BOP	(Step 4) Check 1ETA and 1ETB – ENERGIZED.	**Immediate Action**
	RO/ BOP	(Step 5) Check if S/I is actuated:	**Immediate Action**
		• "SAFETY INJECTION ACTUATED" status light (1SI-18) – LIT.	**NOTE:** SI will NOT be actuated.
	RO/ BOP	(Step 5 RNO) Perform the following:	**Immediate Action**
		Check if S/I is required:	
		• Pzr pressure less than 1845 PSIG	
		OR	
		• Containment pressure greater than 1 PSIG.	
		IF S/I is required,…..	**NOTE:** SI will NOT be required.
	RO/ BOP	IF S/I is not required, THEN perform the following:	
		Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
	CRS	GO TO EP/1/A/5000/ES-0.1 (Reactor Trip Response).	
			NOTE: The CRS will transition to ES-0.1.
EP/1/A/5000/ES-0.1, REACTOR TRIP RESPONSE			
	RO/ BOP	(Step 1) Monitor Foldout page.	
		S/I Actuation Criteria	
		CA Suction Sources	

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 2) Check the following:	
		• VI pressure - GREATER THAN 85 PSIG.	
		• Any Unit 1 6900V bus - ENERGIZED.	
	CRS	(Step 3) Announce: "Unit 1 Reactor trip, non-essential personnel stay out of Unit 1 turbine bldg".	**NOTE:** The CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 4) Check any NC Pump - ON.	**NOTE:** The 1A, 1C and 1D NCPs will be ON.
	RO	(Step 5) Check NC temperatures as follows:	
		• IF any NC Pump on, THEN check NC T-Avg - STABLE OR TRENDING TO 557°F.	
	RO	(Step 6) Continue to monitor NC temperature as follows:	
		• Check any NC Pump - ON.	**NOTE:** The 1A, 1C and 1D NCPs will be ON.
		• IF AT ANY TIME while in this procedure either of the following occurs, THEN perform Step 5:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• NC T-Avg is less than 557°F and going down	
		OR	
		• NC T-Avg is greater than 557°F and going up.	
	CRS	(Step 7) REFER TO the following:	**NOTE:** The CRS may ask SM to address. If so, **Floor Instructor** acknowledge as SM.

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
		• RP/0/A/5700/000 (Classification of Emergency)	
		• RP/0/A/5700/010 (NRC Immediate Notification Requirements).	
	RO	(Step 8) Check Main Generator as follows:	
		• Check both generator breakers - OPEN.	
		• Check "EXCITATION" - OFF.	
	RO	(Step 9) Check MSR "RESET" light - LIT.	
	RO	(Step 10) Check NC T-Avg - GREATER THAN 553°F.	
	RO/ BOP	(Step 11) Check feedwater status:	
		• Check any CA Pump - ON.	
		• Check total feed flow to S/Gs - GREATER THAN 450 GPM.	
	CRS	(Step 12) WHEN time and manpower allow, THEN dispatch operator to perform Enclosure 5 (MSR Second Stage Drain Tank Isolation).	**NOTE:** The CRS may dispatch an AO to look for leaks. If so, **Floor Instructor:** acknowledge.
	RO	(Step 13) Check if shutdown margin adequate:	
		• All control rods - FULLY INSERTED.	**NOTE:** There will be four rods that failed to fully insert on the Rx Trip.
	BOP	(Step 13 RNO) Perform the following:	

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Event Description:	**#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**							

Time	Pos.	Expected Actions/Behavior	Comments
		• IF all rod position indication is lost, OR greater than 2 rods not fully inserted, THEN emergency borate total of 8,000 gallons of 7000 PPM boron solution PER AP/1/A/5500/38 (Emergency Boration And Response To Inadvertent Dilution).	**NOTE:** The BOP will borate 8000 gallons of Boric Acid per AP/1/A/5500/38, while the crew continues with ES-0.1.
		• IF 2 rods not fully inserted, THEN	
			NOTE: The CRS may assign the BOP to perform this action. If so, **BOP Examiner** follow actions of Enclosure AP38. **Other Examiners** follow **ES-0.1** Actions, **Step 13.B**, on **Page 50**. **NOTE:** The CRS may these actions to the BOP.
AP/1/A/5500/38, EMERGNCY BORATION AND RESPONSE TO INADVERTENT DILUTION			
			Examiner NOTE: Follow the actions associated with AP38 if BOP is assigned by CRS to perform.
	BOP	(Step 1) Check if boron dilution - SUSPECTED.	
	BOP	(Step 1 RNO) Perform the following:	
		• IF unit in Mode 1 or 2, THEN…..	
		• GO TO Step 12.	
	BOP	(Step 12) Initiate emergency boration as follows:	
		• Check 1A or 1B NV pump - AVAILABLE.	
		• Check any NV pump - ON.	
		• Check the following boric acid system components - AVAILABLE.	
		• Boric Acid Storage Tank	
	BOP	• Boric Acid Transfer pump.	

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
		• OPEN 1NV-265B (U1 NV Pump Boric Acid Sup Isol).	
		• Ensure a boric acid transfer pump is running.	
		• Check boration flow using one of the following methods:	
		• IF 1NV-265B is open, THEN check "EMERGENCY BORATION FLOW" - ESTABLISHED.	
		OR	
		• IF 1NV-269 is open, THEN…..	
NOTE If 1NV-265B opened for emergency boration, OAC point M1P0785 provides the gallons of boric acid added.			
	BOP	(Step 13) IF AT ANY TIME boration no longer required, THEN GO TO Step 20.	**NOTE:** This is a Continuous Action.
	BOP	(Step 14) IF AT ANY TIME a higher boration flowrate is desired, THEN evaluate performing the following as required:	**NOTE:** This is a Continuous Action.
		• Start a second boric acid transfer pump.	
		• Align NV pump suction to FWST as follows:	
		• OPEN the following valves:	
		• 1NV-221A (U1 NV Pump Suct From FWST Isol)	
		• 1NV-222B (U1 NV Pump Suct From FWST Isol).	
		• CLOSE the following valves:	
		• 1NV-141A (U1 VCT Outlet Isol)	
		• 1NV-142B (U1 VCT Outlet Isol).	
	BOP	(Step 15) Align Normal Charging flowpath as follows:	
		• Ensure one of the following NC loop isolation valves is OPEN:	

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
		• 1NV-13B (U1 NV Supply To 1A NC Loop Isol)	
		OR	
		• 1NV-16A (U1 NV Supply To 1D NC Loop Isol).	
		• Check both of the following valves - OPEN:	
		• 1NV-244A (U1 Charging Hdr Cont Outside Isol)	
		• 1NV-245B (U1 Charging Hdr Cont Outside Isol).	
	BOP	(Step 16) Establish desired charging flowrate to the NC System as follows:	
		• THROTTLE OPEN 1NV-238 (U1 Charging Hdr Control) and 1NV-241 (U1 Seal Water Inj Flow Control) to establish desired charging flow, not to exceed 200 GPM.	
		• IF required to compensate for higher charging flowrate, THEN raise letdown to a maximum of 120 GPM.	
NOTE A time delay of up to 3-5 minutes can be expected before indication of negative reactivity insertion is obtained on excore instrumentation.			
	BOP	(Step 17) Check if boric acid flow to NC System is adequate:	
		• Reactor power - STABLE OR GOING DOWN	
		• NC temperature - STABLE OR GOING DOWN	
		• Control Rods - STABLE OR STEPPING OUT.	
	BOP	(Step 18) Check NV pump suction - ALIGNED TO VCT.	

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 19) IF AT ANY TIME VCT level approaches water solid, THEN evaluate performing the following:	
		• Raise charging flow.	
		• Raise letdown flow as required to compensate for higher charging flow.	
		• Ensure 1NV-137A (U1 NC Filter Otlt To VCT 3-Way Diversion Cntrl) diverts to the RHT as required.	
	BOP	(Step 20) WHEN emergency boration no longer required, THEN……	
EP/1/A/5000/ES-0.1, REACTOR TRIP RESPONSE			
			Examiner NOTE: Examiners following the **CRS/RO** continue **HERE**.
	RO	(Step 13.B-D) Stop any dilutions in progress.	
		• Check all NC T-Colds - GREATER THAN 540°F.	
		• IF AT ANY TIME any NC T-Cold goes below 540°F, THEN perform Step 13.C.	**NOTE:** This is a Continuous Action. The CRS will make the RO aware.
	RO	(Step 14) Check Pzr level control:	
		• Check VI pressure - GREATER THAN 60 PSIG.	
		• Pzr level - GREATER THAN 17%.	
		• Check charging and letdown - IN SERVICE.	
		• Check Pzr level trending to program "PZR LEVEL SETPOINT".	**NOTE:** The BOP may adjust Letdown flow as needed.
	RO	(Step 15) Check Pzr pressure - GREATER THAN 1845 PSIG.	

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 16) Check NC loop flow instruments on 1MC-5 - ALL LOOPS INDICATING GREATER THAN 90% FLOW.	**NOTE:** The 1B NC Pump is OFF.
	RO	(Step 16 RNO) Perform the following:	
		• IF 1A OR 1B NC pump is off, THEN place Pzr spray valve in manual and CLOSE for stopped NC Pump.	
		• IF loss of offsite power has occurred, THEN….	
NOTE The following enclosure will place Outside Air Pressure Filter train in service to pressurize the Control Room. This is a 30 minute time critical action to minimize Control Room dose if NC pump locked rotor event has occurred.			
		• Place Outside Air Pressure Filter train in service PER Enclosure 7 (Control Room Pressurization).	
	RO	(Step 17) Check Pzr pressure - STABLE AT OR TRENDING TO 2235 PSIG.	
	RO	(Step 18) Control S/G levels as follows:	
		• Check N/R level in any S/G - GREATER THAN 11%.	
		• THROTTLE feed flow to maintain S/G N/R levels between 11% and 50%.	

Booth Operator Instructions:

Insert MAL_EP002A AND EP002B = TRIP

Insert MAL_DG001A = TRUE

Indications Available:

- Control Room lights dim.
- 1A EDG does NOT start as required.

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Event Description:	**#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**				

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will transition to ECA-0.0.
		EP/1/A/5000/ECA-0.0, LOSS OF ALL AC POWER	
			NOTE: Crew will carry out Immediate Actions of ECA-0.0, prior to the CRS addressing the EP.
	CRS	(Step 1) CSF Status trees should be monitored for information only. EPs referenced by them should not be implemented.	
	RO	(Step 2) Check Reactor Trip:	**IMMEDIATE ACTION**
		• All rod bottom lights – LIT	**NOTE:** DRPI is NOT available on the LOOP.
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 3) Check Turbine Trip:	**IMMEDIATE ACTION**
		• All throttle valves – CLOSED.	
	CRS	(Step 4) Establish NC pump seal injection from the SSF as follows:	
	CRS	• Immediately dispatch operator to SSF to perform the following:	**NOTE:** The CRS will dispatch an AO to complete Enclosure 2. **Booth Instructor** acknowledge as appropriate, after ten minutes **insert ECA-0.0 (Enclosure 2 SSF Actions) and report that Enclosure 2 is complete.**

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
		• Obtain Brown Folder at SSF and complete Enclosure 2 (Unit 1 SSF - ECA-0.0 Actions).	
NOTE The fastest pathway to 1ETA room is to emergency egress into the aux bldg from the Unit 1 MG set room.			
	CRS	• Dispatch operator to 1ETA room as follows:	
		• Check if operator will enter aux bldg – FROM MG SET ROOM.	
		• Give operator dosimeter from Unit 2 SRO desk.	
	CRS	• Dispatch operator to perform Enclosure 3 (Unit 1 ETA And ETB Rooms – ECA-0.0 Actions).	**NOTE:** The CRS will dispatch an AO to complete Enclosure 3. If so, **Booth Instructor** acknowledge as appropriate. **Booth Instructor:** wait **2 minutes**, then **insert ECA-0.0 ENCLOSURE 3, then report that Enclosure 3 is complete.**
	CRS	• Use any of the following to notify security to immediately dispatch officer with key to SSF to ensure operator can access SSF:	**NOTE:** The CRS will dispatch a Security Officer to the SSF. **Booth Instructor:** Acknowledge as Security.
		• Security ringdown phone (located on Unit 2 SRO desk)	
		• 1941 (Same line as ringdown phone)	

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
		• 4900.	**Floor Instructor:** If asked, U2 does NOT have normal power, and both DGs are running.
	RO/ BOP	(Step 5) Monitor Foldout Page	
		Alternate Low Pressure Feedwater (applies after Step 8 in body of the procedure)	
		Loss of Vital Instrumentation or Control Power	
		Low Decay Heat Temperature Control	
		CA Suction Sources (applies after Step 15 in body of the procedure)	
	BOP	(Step 6) Check NC System – ISOLATED:	
	BOP	• Check the following letdown orifice isolation valves – CLOSED.	
		• 1NV-458A (U1 75 GPM L/D Orifice Outlet Cont Isol).	
		• 1NV-457A (U1 45 GPM L/D Orifice Outlet Cont Isol).	
		• 1NV-35A (U1 Variable L/D Orifice Outlet Cont Isol).	
	BOP	• CLOSE the following valves:	
		• 1NV-1A (U1 NC L/D Isol To Regenerative Hx)	
		• 1NV-2A (U1 NC L/D Isol To Regenerative Hx).	
	BOP	• Check Pzr PORVs – CLOSED.	
	BOP	• Check the following excess letdown isolation valves – CLOSED:	

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
		• 1NV-24B (1C NC Loop To Excess L/D Hx Isol)	
		• 1NV-25B (1C NC Loop To Excess L/D Hx Isol).	
	BOP	• Check 1NV-121 (U1 ND Letdown Control) – CLOSED.	
	RO	(Step 7) Check total CA flow – GREATER THAN 450 GPM.	
	BOP	(Step 8) Try to restore power to 1ETA or 1ETB as follows:	
		• Check both D/Gs - RUNNING.	
	BOP	(Step 8.A RNO) Perform the following:	
		• Initiate S/I	
		• Notify Unit 2 to immediately perform Enclosure 5 (Unit 2 Actions) (enclosure ensures 2B RN pump has suction flowpath, which may have isolated on S/I signal).	**NOTE:** The CRS will notify U2. **Floor Instructor:** Acknowledge as U2 RO.
	CRS	• IF at least one D/G starts, THEN …	**NOTE:** The 1B D/G is OOS, and the 1A D/G will NOT start.
	CRS	• GO TO Step 9	
	RO/ BOP	(Step 9) Stabilize S/G pressures using SM PORVs as follows:	**NOTE:** The 1C S/G PORV has previously failed and is isolated; while the 1D S/G PORV is OOS.
		• Reset Main Steam Isolation.	
		• Reset SM PORVs.	
		• CLOSE all SM PORV manual loaders.	
		• Place SM PORVs in manual.	

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
		• Control S/G pressures at 1000 PSIG.	
	CRS	(Step 10) Ensure the following have been implemented:	**NOTE:** The CRS may ask SM to address. If so, **Floor Instructor** acknowledge as SM.
		• RP/0/A/5700/000 (Classification of Emergency)	
		• RP/0/A/5700/010 (NRC Immediate Notification Requirements).	
	RO/ BOP	(Step 11) Control intact S/G levels as follows:	
		• Check N/R level in any intact S/G - GREATER THAN 11% (32% ACC).	
		• THROTTLE CA control valves to maintain all intact S/G N/R levels between 11% (32% ACC) and 50%.	

NOTE

If normal VI supply is lost, the Blackout Header FLEX Air Tank should automatically maintain normal control of CA flow. 1EVDA and 1EVDD are also required for TD CA control valves to work, unless TD CA solenoid valves are bypassed.

Time	Pos.	Expected Actions/Behavior	Comments
		• IF AT ANY TIME CA flow control is lost, THEN perform RNO for Step 11.B.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 12) Ensure Unit 2 performs Enclosure 5 (Unit 2 Actions).	**NOTE:** The CRS will ask U2 to address. If so, **Floor Instructor** acknowledge as U2 BOP.
	RO	(Step 13) Check Unit 1 status - IN MODE 3.	

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Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
NOTE If operating train of VC/YC has failed, it is time critical to swap operating VC/YC trains.			
	BOP	(Step 14) Ensure VC/YC cooling available as follows:	
		• Check VC/YC alignment using Unit 1 status board - AT LEAST ONE OPERABLE VC/YC TRAIN ALIGNED TO AN ENERGIZED UNIT 2 4160V BUS.	
		• Notify an available operator to initiate EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 13 (VC and VA System Operation) within 30 minutes of loss of power.	**NOTE:** The CRS will dispatch an AO. If so, **Floor Instructor** acknowledge. **Booth Instructor:** as **AO**, acknowledge
	BOP	(Step 15) Monitor CA Storage Tank (water tower) level and ensure CA suction source as follows:	
		• Check if external event that has the potential to damage CA Storage Tank (water tower) (such as seismic or tornado) – HAS OCCURRED.	
	CRS	(Step 15.A RNO) Observe Note prior to Step 15.C and GO TO Step 15.C.	
NOTE Control Room indication of CA Storage Tank (water tower) level should be used if available. It will be lost when aux control power is lost or if instrument damaged by external event. If operator is dispatched for periodic local monitoring, he can be used for other tasks.			
		(Step 15.C-E) Monitor CA Storage Tank (water tower) level using available Control Room indication.	

Op Test No.:	N20-1	Scenario #	3	Event #	6, 7 & 8	Page	58	of	66

Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
		• IF AT ANY TIME CA Storage Tank (water tower) level indication is lost (invalid reading), THEN dispatch operator to locally monitor level PER EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 31 (Local CA Storage Tank (Water Tower) Level Monitoring).	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Ensure CA Suction Sources is monitored on Foldout Page.	
	CRS	(Step 16) Check for plant damage as follows:	
		• Check if event that could have caused damage to mechanical systems internal to plant (seismic, tornado, etc) - HAS OCCURRED.	**NOTE:** No such event has occurred.
	CRS	(Step 16 RNO) GO TO Step 17.	
	RO/ BOP	(Step 17) Check if S/I is actuated as follows:	**NOTE:** SI was actuated in an attempt to start the 1A D/G.
		• "SAFETY INJECTION ACTUATED" status light (1SI-18) - LIT.	
		• Reset S/I.	
	CRS	(Step 18) Dispatch operator to open the following breakers to sequencer DC control power:	**NOTE:** The CRS will dispatch an AO. **Booth Instructor** acknowledge as appropriate, **after three minutes insert MAL_EQB002A and EQB002B = FAILURE and report that the Sequencer DC Control Breakers have been opened.**
		• A Train - 1EVDA Breaker 6	
		• B Train - 1EVDD Breaker 8.	

Op Test No.:	N20-1	Scenario #	3	Event #	6, 7 & 8	Page	59	of	66

Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 19) IF AT ANY TIME operator dispatched to perform Enclosure 3 (Unit 1 ETA And ETB Rooms - ECA-0.0 Actions) determines that lockout exists, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Have IAE clear or isolate fault from bus.	
		• WHEN fault cleared or isolated from bus, THEN reset lockout.	

NOTE

Consider the following when selecting power restoration options:

- If problem with D/G is easily correctable, Enclosure 12 (Energizing Unit 1 4160V Bus With 1A OR 1B D/G) may restore power the quickest.
- If Unit 2 6900V busses are energized, Enclosure 13 (Energizing Unit 1 4160V Bus From Unit 2 - SATA or SATB) can be performed within an hour and should be the preferred option.
- If cause of loss of Unit 1 offsite power is known, and grid available, Enclosure 14 (Energizing Unit 1 4160V Bus From Unit 1) may be preferred, but could take 2-3 hours.
- EPSP can restore one essential bus within an hour, but complicates restoration of offsite power later in the event. If ESPS is being used on Unit 2, it shall not be used on Unit 1.

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 20) Restore power to 1ETA or 1ETB using any of the following while continuing with this procedure:	**NOTE:** The CRS may dispatch an AO to evaluate lockouts on 1ETA and 1ETB. **Booth Instructor** acknowledge as appropriate, **after two minutes report that there are no Lockouts on 1ETA and that 1ETB will be checked.**

Op Test No.:	N20-1	Scenario #	3	Event #	6, 7 & 8	Page	60	of	66

Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
		• Local reset and start of 1A or 1B D/G PER Enclosure 12 (Energizing Unit 1 4160V Bus With 1A or 1B D/G)	
		OR	
		• Unit 2 6900V busses through SATA or SATB PER Enclosure 13 (Energizing Unit 1 4160V Bus From Unit 2 - SATA or SATB).	**NOTE:** This is the only option for re-powering either 1ETA or 1ETB.
		OR	
		• Unit 1 offsite power PER Enclosure 14 (Energizing Unit 1 4160V Bus From Unit 1)	
		OR	
		• ESPS PER Enclosure 65 (Energizing Unit 1 4160V Bus With ESPS).	
			NOTE: The CRS will address Enclosure 13.
EP/1/A/5000/ECA-0.0, LOSS OF ALL AC POWER ENCLOSURE 13, ENERGIZING UNIT 1 4160V BUS FROM UNIT 2 – SATA OR SATB			
NOTE • Unit 2 6900V bus 2TB must already be energized for this enclosure to restore power to 1ETB. • Unit 2 6900V bus 2TC must already be energized for this enclosure to restore power to 1ETA. • Available equipment on 1ETA or 1ETB bus should be considered when choosing bus to energize.			

Op Test No.:	N20-1	Scenario #	3	Event #	6, 7 & 8	Page	61 of 66

Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 1) Perform one of the following:	**NOTE:** The CRS may dispatch an AO to evaluate lockouts on 1ETA and 1ETB. **Booth Instructor** acknowledge as appropriate, **after two minutes report that there are no Lockouts on 1ETA and 1ETB will be checked.** **Booth Instructor:** If the CRS elects to re-energize **1ETB**, as Operations Manager direct that Enclosure 13 be used to re-energize **1ETA**.
		• IF 1ETA is to be energized from Unit 2, THEN observe Note prior to Step 18 and GO TO Step 18.	
		OR	
		• IF 1ETB is to be energized from Unit 2, THEN observe Note prior to Step 2 and GO TO Step 2.	
NOTE Steps 18 through 32 will align power from Unit 2 2TC through SATA to Unit 1 1ETA.			
		(Step 18) Have Unit 2 RO check 2ETA Standby Breaker control switch - DARK.	**NOTE:** The CRS/BOP will ask U2 to address. If so, **Floor Instructor** acknowledge as U2 BOP, and report that 2ETA Standby Breaker control switch - DARK.
NOTE Either the 1ETA Normal or 1ETA Standby Breaker control switch will be dark, indicating that it is racked out and open.			

Op Test No.:	N20-1	Scenario #	3	Event #	6, 7 & 8	Page	62	of	66

Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 19) Check the following 4160V breakers - OPEN.	
		• 1ETA Normal Breaker	
		• 1ETA Standby Breaker	
		• 1ETA Emergency Breaker.	
	RO/ BOP	(Step 20) Ensure breakers are racked in as required to power 1ETA from Unit 2 2TC (via SATA) as follows:	
		• Check 1ETA Normal Breaker control switch - LIT (indicates that breaker is racked in).	
		• Dispatch operator to perform Enclosure 68 (Shifting 1ETA from Normal (1ATC) to Standby (SATA)).	**NOTE:** The CRS will dispatch an AO to complete Enclosure 68. **Booth Instructor** acknowledge as appropriate, after **two minutes insert LOA_EP134=RACKOUT and LOA_EP136=RACKIN and report that Enclosure 68 is complete.**
		• Check Unit 1 SATA Feeder Breaker control switch - LIT (indicates that breaker is racked in).	
		• OPEN Unit 1 SATA Feeder Breaker.	

NOTE

If enclosure was initiated in Step 20.B, then enclosures in Steps 20.B and 20.E can be performed concurrently.

Op Test No.:	N20-1	Scenario #	3	Event #	6, 7 & 8	Page	63 of 66
Event Description:	**#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Dispatch operator to perform Enclosure 72 (Shifting SATA from 1TC to Unit 2 2TC).	**NOTE:** The CRS will dispatch an AO to complete Enclosure 72. **Booth Instructor** acknowledge as appropriate, after two minutes **report that Enclosure 72 is complete (No Field Action is required).**
	CRS	(Step 21) Do not continue until the following is performed:	
		• Ensure Steps 18 through 20 are completed.	
		• Ensure operators are away from breakers.	
	CRS	(Step 22) Have Unit 2 RO check Unit 2 SATA Feeder Breaker - CLOSED.	**NOTE:** The CRS will ask U2 to address. If so, **Floor Instructor** acknowledge as U2 BOP, and report that Unit 2 SATA Feeder Breaker is CLOSED.
	BOP	(Step 23) Check if S/I is actuated as follows:	
		• "SAFETY INJECTION ACTUATED" status light (1SI-18) - LIT.	**NOTE:** SI was previously reset.
	CRS	(Step 23.A RNO) GO TO Step 24.	
	CRS	(Step 24) Check "SEQ A LOSS OF CONTROL PWR" alarm (1AD-11, B-2) - LIT.	
	RO/ BOP	(Step 25) Open 1A CA pump breaker.	

Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	(Step 25 RNO) Open breaker by depressing 1A CA pump "START" and "STOP" at same time.	
	RO/ BOP	(Step 26) Open the remaining pump breakers:	
		• 1A NV pump	
		• 1A ND pump	
		• 1A NI pump	
		• 1A1 KC pump	
		• 1A2 KC pump	
		• 1A RN pump	
		• 1A KF pump	
		• 1A NS pump	
	BOP	(Step 27) Open the following 600 V essential load center feeder breakers:	
		• 1ELXA	
		• 1ELXC	
		• 1ELXE	
	BOP	(Step 28) Check 1A D/G Mode Select switch - IN CONTROL ROOM POSITION.	
	BOP	(Step 28 RNO) Place 1A D/G Mode Select switch to Control Room position.	
	BOP	(Step 29) Close 1ETA Standby Breaker.	
	BOP	(Step 30) Place 1A D/G Mode Select switch to "AUTO" position.	
	BOP	(Step 31) Check 1ETA bus - ENERGIZED.	

Op Test No.:	N20-1	Scenario #	3	Event #	6, 7 & 8	Page	65	of	66

Event Description: **#1 Seal Leak on 1B NCP Degrades/4 Control Rods fail to Fully Insert on Rx Trip/ Loss of Switchyard to Unit 1/1A EDG fails to START**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 32) Notify Control Room Supervisor to GO TO Step 47 in body of this procedure.	

Critical Task:

Energize at least one AC Emergency Bus From Unit 2.

Safety Significance: Failure to energize an AC Emergency Bus when able to do so constitutes "mis-operation" or incorrect performance which leads to degraded emergency power capacity. Failure to perform the Critical Task may result in a needless challenge and/or degradation of a fission product barrier at the point of the remaining intact RCP Seals, and will result in the inability to add inventory through the ECCS during the existing and potentially subsequent small break LOCA(s). Since the conditions existed to re-energize an ESF Bus from Unit 2 via the SATA or SATB, not taking this action constitutes incorrect performance that leads to degradation of the RCS and/or fuel cladding fission product barriers.

At the discretion of the Lead Examiner terminate the exam.

UNIT 1 STATUS:

Power Level: 36% NCS [B] 1888 ppm Pzr [B]: 1884 ppm Xe: Per OAC

Power History: At this power level for 20 days Core Burnup: 25.1 EFPDs

UNIT 2 STATUS:

Power Level: 100%

CONTROLLING PROCEDURE:

- OP/1/A/6100/003 (Controlling Procedure for Unit Operation)

OTHER INFORMATION NEEDED TO ASSUME THE SHIFT:

- The area has experienced snow and freezing rain for the last 2 hours, and this is expected to continue for the next 6 hours.

The following equipment is Out-Of-Service:

- The 1B EDG is OOS for bearing replacement. ACTION has been taken in accordance with Technical Specification LCO 3.8.1 ACTION B.
- The 1D S/G PORV is isolated and its actuator is currently removed for maintenance.
- 1KFP-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating).
- MCB Annunciator 1AD-9, A-7, "NF SYSTEM TRACE HEATING LOSS OF POWER," has alarmed spuriously several times over the last hour (IAE is investigating).

Crew Directions:

- The crew will raise power to 100% on this shift, starting with Step 3.35.12 of Enclosure 4.1 of OP/1/A/6100/003 Controlling Procedure for Unit Operation.
- The loading rate will be 3 MWe/minute.
- The RE recommends 100% Control Rod position of 215 steps on Control Bank D.
- RE has recommended a 300-gallon initial dilution using Enclosure 4.4 (Alternate Dilute) of OP/1/A/6150/009 (Boron Concentration Control).
- RMWST Dissolved O_2 is less than 1000 ppb.
- Blender content is Reactor Makeup Water.

Work Control SRO **Jim**

Field SRO **Joe (FB)**

AO's AVAILABLE

Unit 1	**Unit 2**
Aux Bldg. John	**Aux Bldg. Chris**
Turb Bldg. Bob (FB)	**Turb Bldg. Mike (FB)**

Extra(s) Bill (FB) Ed (FB) Gus (RW) Carol

SIM JPM A

Facility: McGuire

Task No.:

Task Title: Restoring Charging Flow with Hot NC Pump Seals

JPM No.: 2020 Systems - Control Room JPM A (Alternate Path)

K/A Reference: APE 022 AA1.04 (3.3/3.2)

Examinee:

NRC Examiner:

Facility Evaluator:

Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- Unit 1 was at 100% power when the 1A NV Pump tripped.
- The 1B NV Pump was Out-Of-Service for maintenance.
- The crew entered AP/1/A/5500/12, “Loss of Letdown, Charging or Seal Injection,” and tripped the reactor on high bearing temperatures on the 1A NC Pump.
- The crew entered EP/1/A/5000/E-0, “Reactor Trip or Safety Injection,” and transitioned to EP/1/A/5000/ES-0.1, “Reactor Trip Response.”
- Maintenance has returned 1B NV pump to Operations and all clearances have been restored.
- The crew has returned to AP/1/A/5500/12, “Loss of Letdown, Charging or Seal Injection,” to restore charging flow.
- All NC Pump lower bearing temperature are greater than 225°F.

Initiating Cue:	The CRS has directed you to perform Enclosure 4 (Restoring Charging Flow With Hot NC Pump Seals) of AP/1/A/5500/12, “Loss of Letdown, Charging or Seal Injection,” and establish approximately 50 gpm charging flow.
Task Standard:	The operator will isolate the NC Pumps seals, attempt to start the 1B NV Pump to re-establish Charging Flow, then start the PD Pump when the 1B NV Pump fails to start and complete the restoration of 50 gpm charging flow per Enclosure 4 of AP/1/A/5500/12.
Required Materials:	None
General References:	EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Rev 36 EP/1/A/5000/ES-0.1 (Reactor Trip Response), Rev 47 AP/1/A/5500/12 (Loss of Letdown, Charging or Seal Injection), Rev 24 OMP 4-3 (Use of Emergency and Abnormal Procedures and FLEX Support Guidelines), Rev 48
Handouts:	Handout 1: Blank copy of Enclosure 4 (Restoring Charging Flow With Hot NC Pump Seals) of AP/1/A/5500/12, “Loss of Letdown, Charging or Seal Injection.”
Time Critical Task:	NO
Validation Time:	15 minutes

Critical Step Justification	
Step 1	This step is critical because initially isolating sealwater flow to the NC Pumps is necessary to complete the restoration of charging flow per Enclosure 4 of AP/1/A/5500/12.
Step 2	This step is critical because sealwater flow to the NC Pumps must be isolated before action is taken to re-establish charging flow to the NC Pumps per Enclosure 4 of AP/1/A/5500/12.
Step 3	This step is critical because pressing the 1B NV Lube Oil Pump MAN pushbutton (White PB) and then pressing the START pushbutton is necessary to start the 1B NV Pump to re-establish Charging Flow.
Step 4	This step is critical because depressing the 1B NV Start pushbutton is necessary to start the 1B NV Pump to re-establish Charging Flow.
Alternate Path Critical Step Justification	
Step 7	This step is critical because depressing the 1RN-64A OPEN pushbutton is necessary to start the PD Pump to complete the restoration of charging flow per Enclosure 4 of AP/1/A/5500/12.
Step 8	This step is critical because selecting the SLIMS output to be displayed on the PD Pump SLIMS and using the DOWN arrow to adjust the SLIMS Output to 0% is necessary to start the PD Pump to complete the restoration of charging flow per Enclosure 4 of AP/1/A/5500/12.
Step 10	This step is critical because depresses the PD Pump START pushbutton is necessary to start the PD Pump to complete the restoration of charging flow per Enclosure 4 of AP/1/A/5500/12.
Step 14	This step is critical because using the UP arrow on the PD Pump SLIMs, over at least a 45 second period is necessary to complete the restoration of 50 gpm charging flow per Enclosure 4 of AP/1/A/5500/12.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-21 (100% Power, Any Time in Life).

2. Place in RUN.

3. INSERT MAL_NV029A (NV Pump A Trips Due To Overcurrent).

4. INSERT MAL_NV006B (NV Pump fails to START)

5. Respond in accordance with AP-12 (The goal is to have all four NC Pumps Lower Bearing temperatures rise above 225°F which will require a plant trip. It may be necessary to close the KC flow to the thermal barrier while doing this, but flow should be restored with bearing temperature above setpoint and stable when the IC is snapped.).

6. Ensure that Simulator reflects that AP-12 was performed to some point, E-0 was entered the when the NC Pumps high bearing temperatures occur and the NC Pumps are stopped, ES-0.1 was entered and performed to step 14.c, and AP-12 is now complete through the Step 23 RNO.

7. Insert the following LOAs:

   - REM_NV0028 EQ 0 (NC Pump 1A Seal Water Manual Control)
   - REM_NV0044 EQ 0 (NC Pump 1B Seal Water Manual Control)
   - REM_NV0060 EQ 0 (NC Pump 1C Seal Water Manual Control)
   - REM_NV0076 EQ 0 (NC Pump 1D Seal Water Manual Control)

8. Freeze the Simulator

OR

1. Reset to IC-239 (August, 2019)

2. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.

3. Leave Simulator in FREEZE until operator is ready to begin.

NOTE: **During the performance of this JPM, the simulator operator may need to control CF flow to the SGs.**

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
*1	(Step 1) Dispatch operator to CLOSE the following valves on the NC pump(s) with hot seals: • 1NV-28 (1A NC Pump Seal Water Injection Throttle) (aux bldg, 733, VCT hallway at reactor bldg wall) • 1NV-44 (1B NC Pump Seal Water Injection Throttle) (aux bldg, 733+2, HH-52, VCT hallway at reactor bldg wall) • 1NV-60 (1C NC Pump Seal Water Injection Throttle) (aux bldg, 733+2, JJ-51, VCT hallway 15 ft southwest of BIT) • 1NV-76 (1D NC Pump Seal Water Injection Throttle) (aux bldg, 716+14, JJ-51, room 603, 4 ft from reactor building wall).	The operator contacts AO and directs that they CLOSE 1NV-28. The operator contacts AO and directs that they CLOSE 1NV-44. The operator contacts AO and directs that they CLOSE 1NV-60. The operator contacts AO and directs that they CLOSE 1NV-76. **BOOTH OPERATOR:** **As AO acknowledge direction and state “Using Time Compression, all NC Pump Sealwater Injection Throttle Valves are CLOSED.”**		
*2	(Step 2) Do not continue until Step 1 complete.	The operator ensure that Step 1 is complete and proceeds to Step 3.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	(Step 3) Start 1A or 1B NV pump as follows: (Step 3.a) Start associated NV Lube Oil pump.	The operator presses the 1B NV Lube Oil Pump MAN pushbutton (White PB) and then presses the START pushbutton observing the Red status light is LIT and the Green status light is OFF.		
*4	(Step 3.b) Start 1A or 1B NV pump.	The operator depresses the 1B NV Pump Start pushbutton and observed Red status remains OFF, and the Green status light is LIT. **(Alternate Path)** The operator proceeds to the Step 3RNO.		
5	(Step 3RNO a) IF PD pump is available, THEN start PD pump as follows: IF SI has occurred OR 1ETA is deenergized, THEN….	The operator observes the 1SI-18 SAFETY INJECTION ACTUATED status light is OFF (Or Equivalent) and recognizes that SI has not occurred or observes that the 1SI-14 LOSS/UNDERVOLTAGE Phase A, B, and C status lights are OFF and recognizes that 1ETA is energized; and proceeds to Step 3RNO b.		
6	(Step 3RNO b) Ensure 1RN-42A (AB Non Ess Supply Isol) is OPEN.	The operator observes the 1RN-42A Red status light LIT, Green status light OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*7	(Step 3RNO c) OPEN the following valves: • 1RN-64A (AB Non Ess Return Isol) • 1RN-63B (AB Non Ess Return Isol).	The operator depresses the 1RN-64A OPEN pushbutton and observes Red status light LIT, Green status light OFF. The operator observes the 1RN-63B Red status light LIT, Green status light OFF.		
*8	(Step 3RNO d) Ensure PD pump speed controller output set to 0%.	The operator selects the SLIMS output to be displayed on the PD Pump SLIMS and uses the DOWN arrow to adjust the SLIMS Output to 0%.		
9	(Step 3RNO e) OPEN 1NV-1047A (U1 NV PD Pump Recirc Isol).	The operator depresses the 1NV-1047A OPEN pushbutton and observes Red status light LIT, Green status light OFF.		
*10	(Step 3RNO f) Start the PD pump.	The operator depresses the PD Pump START pushbutton and observes the Red status light LIT, Green status light OFF.		
11	(Step 3RNO g) Ensure 1NV-1047A CLOSES after 2 minutes.	After two minutes, the operator observes that the 1NV-1047A Green status light is LIT, Red status light is OFF.		
12	(Step 4) Check any of the following charging pumps - ON. • 1A NV pump OR • 1B NV pump OR • PD pump	The operator observes the PD Pump Red status light is LIT, Green status light is OFF and concludes that the PD Pump is running.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
13	(Step 5) Check all four NC pump seals - ISOLATED PER STEP 1.	The operator recognizes that all four valves were closed and proceeds to Step 6.		
*14	(Step 6) Slowly establish desired charging flow by performing one of the following: • THROTTLE OPEN 1NV-238 (U1 Charging Hdr Control) OR • WHEN 1NV-1047A (U1 NV PD Pump Recirc Isol) is closed, THEN raise PD pump speed, taking at least 45 seconds to reach desired flow.	The operator uses the UP arrow on the PD Pump SLIMs, over at least a 45 second period, and observes Charging flow (1NVP5630) is rising to ≈50 gpm (±2.5 gpm).		
15	(Step 7) GO TO Step 37 in the body of this procedure.	The operator informs the CRS of required AP12 action. **Cue:** **Another operator will continue with this procedure.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Systems - Control Room JPM A

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: ____________________

INITIAL CONDITIONS:

- Unit 1 was at 100% power when the 1A NV Pump tripped.
- The 1B NV Pump was Out-Of-Service for maintenance.
- The crew entered AP/1/A/5500/12, “Loss of Letdown, Charging or Seal Injection,” and tripped the reactor on high bearing temperatures on the 1A NC Pump.
- The crew entered EP/1/A/5000/E-0, “Reactor Trip or Safety Injection,” and transitioned to EP/1/A/5000/ES-0.1, “Reactor Trip Response.”
- Maintenance has returned 1B NV pump to Operations and all clearances have been restored.
- The crew has returned to AP/1/A/5500/12, “Loss of Letdown, Charging or Seal Injection,” to restore charging flow.
- All NC Pump lower bearing temperature are greater than 225°F.

INITIATING CUE:

The CRS has directed you to perform Enclosure 4 (Restoring Charging Flow With Hot NC Pump Seals) of AP/1/A/5500/12, “Loss of Letdown, Charging or Seal Injection,” and establish approximately 50 gpm charging flow.

SIM JPM B

Facility:	McGuire	Task No.:	
Task Title:	Auxiliary Feedwater Flow Control with a Loss of Instrument Air	JPM No.:	2020 Systems - Control Room JPM B (Alternate Path)
K/A Reference:	APE 065 AA2.07 (2.8/3/2)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:	• With Unit 1 at 100% power, a seismic event results in a loss of VI and a reactor trip. • The crew is in EP/1/A/5000/ES-0.1, “Reactor Trip Response,” and continuing with AP/1/A/5500/22, “Loss of VI,” as time allows. • The crew has just determined that VI Header pressure is less than 85 psig at Step 2 of ES-0.1.

Initiating Cue:	The CRS has directed you to perform the ES-0.1 Step 2 RNO to control NC System Cooldown.

Task Standard:	The operator will initiate the Step 2 RNO of ES-0.1, determine that all S/G levels are greater than 11% and rising in an uncontrolled manner, then implement Generic Enclosure 16 (CA Flow Control with a Loss of VI) to minimize cooldown and stabilize all Steam Generator levels prior to Steam Generator Narrow Range level in any Steam Generator rising to greater than 92%.

Required Materials: None

General References: EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Rev 36
EP/1/A/5000/ES-0.1 (Reactor Trip Response), Rev 47
AP/1/A/5500/22 (Loss of VI), Rev 39
EP/1/A/500/G-1 (Generic Enclosures), Rev 41
OMP 4-3 (Use of Emergency and Abnormal Procedures and FLEX Support Guidelines), Rev 48

Handouts: Handout 1: Pages 2-3 of 79 of EP/1/A/5000/ES-0.1 (Reactor Trip Response) marked up for place-keeping through Step 2.
Handout 2: EP/1/A/500/G-1 (Generic Enclosures); Generic Enclosure 16 (CA Flow Control With Loss Of VI).

Time Critical Task: NO

Validation Time: 10 minutes

Critical Step Justification	
Step 5	This step is critical because resetting and attempting to control CA flow to the Steam Generators using the CA throttle Valves for both the TDCA and the MDCA Pumps is necessary to determine that SG levels are rising uncontrollably and that Generic Enclosure 16 (CA Flow Control with a Loss of VI) must be implemented.
Step 9	This step is critical because controlling flow from the TDCA Pump into all four Steam Generators is necessary to stabilize all Steam Generator levels prior to Steam Generator Narrow Range level in any Steam Generator rising to greater than 92%.
Step 13	This step is critical because controlling flow from the MD CA Pumps into three of the four Steam Generators is necessary to stabilize all Steam Generator levels prior to Steam Generator Narrow Range level in any Steam Generator rising to greater than 92%.
Alternate Path Critical Step Justification	
Step 16	This step is critical because dispatching an AO to control flow from the MD CA Pump into 1D Steam Generator is necessary to stabilize the 1D Steam Generator level prior to Narrow Range level rising to greater than 92%.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-39 (100% power, Any Time In Life).

2. Place in RUN.

3. Insert MAL-VI001B (INSTR AIR SYS LEAK:AUX-A ESS HDR) and VI001C (INSTR AIR SYS LEAK:AUX-B ESS HDR) [The goal is to have a loss of VI such that a reactor trip is required by AP-22].

4. Create a Scenario Manger File N20 JPM B.sce as follows:

   - Insert LOA_VI108 0.0 Ramp = 0, Delay = 5 Seconds
   - Insert LOA_VI109 0.0 Ramp = 8, Delay = 5 Seconds
   - Label CPJEM1A0001INP 0 (OAC Point)
   - Insert REM-CA0042B = 1 (1CA-42B [1B CA Pump Disch To 1D S/G Isol] will not move from position from the Control Room)

5. RUN Scenario Manger File N20 JPM B.sce

6. Perform AP-22 through Step 14 RNO.

7. Perform E-0 and ES-0.1 such that all CA Control valves are open delivering flow to all four Steam Generators such that Narrow Range Level for all S/Gs are greater than 11% and rising uncontrollably.

8. Freeze the Simulator

OR

1. Reset to IC-240 (August, 2019)

2. RUN Scenario Manger File N20 JPM B.sce

3. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.

4. Leave Simulator in FREEZE until operator is ready to begin.

NOTE: **During the performance of this JPM, the simulator operator may need to control all plant alarms and processes not associated with the control of CA flow and Steam Generator Narrow Range Levels.**

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(ES-0.1, Step 2RNO) Perform the following: (ES-0.1, Step 2RNO A) IF loss of offsite power has occurred, THEN……	The operator observes voltage on the 6900V Busses (Or Equivalent) and determines that a loss of offsite power has NOT occurred, and proceeds.		
2	(ES-0.1, Step 2RNO B) IF AT ANY TIME VI pressure is less than 60 PSIG, THEN CLOSE the following valves: • All MSIVs • All MSIV Bypass Valves.	The operator observes VI pressure on 1MC13 to be less than 60 psig (≈35 psig). The operator observes Green status lights are LIT Red status lights are OFF for all four MSIVs. The operator observes all four MSIVs Bypass valves are closed using the OAC.		
3	(ES-0.1, Step 2RNO C) IF CA control valves cannot be throttled in subsequent steps, THEN control flow PER EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 16 (CA Flow Control With Loss Of VI).	The operator reads the Continuous Action Step and proceeds.		
4	(ES-0.1, Step 2RNO D) IF S/G N/R level is less than 11% in all S/Gs, THEN…..	The operator observes all four S/G Narrow Range levels and determines that all levels are NOT less than 11% and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(ES-0.1, Step 2RNO E) WHEN N/R level is greater than 11% in at least one S/G, THEN THROTTLE feed flow further to achieve the following: • Minimize cooldown • Maintain at least one S/G N/R level greater than 11%.	The operator observes all four S/G Narrow Range levels and determines that level is greater than 11% in at least one S/G. The operator will reset and attempt to control CA flow to the Steam Generators using the CA throttle Valves for both the TDCA and the MDCA Pumps and determine that these valves have failed OPEN. **NOTE:** **The operator may attempt to regain control of these valves throughout the JPM.** The operator addresses Generic Enclosure 16. **NOTE:** **When the operator locates Generic Enclosure 16, PROVIDE the operator with Handout 2.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
6	(Generic Enclosure 16, NOTE prior to Step 1) This enclosure may be required if the Unit 1 VI Blackout Header FLEX Air Tank is not providing adequate air supply or if control of CA valves is lost for any other reason such as loss of vital DC control power (1EVDA or 1EVDD). The Unit 1 VI Blackout Header FLEX Air Tank should provide air for CA control valves for 16 hours if normal VI supply is lost.	The operator reads the Note and proceeds.		
7	(Step 1) Continue to use any normal CA flow control valve that works instead of associated S/G motor operator isolation valve.	The operator reads the Continuous Action Step and proceeds.		
8	(Step 2) Check TD CA pump - ON.	The operator observes flow from the TDCA Pump into all four Steam Generators (Or Equivalent) and determines that the TD CA Pump is ON.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*9	(Step 3) Control TD CA pump flow by operating the following TD CA pump to S/G motor operated isolation valves as required: • 1CA-66AC (U1 TD CA Pump Disch To 1A S/G Isol) • 1CA-54AC (U1 TD CA Pump Disch To 1B S/G Isol) • 1CA-50B (U1 TD CA Pump Disch To 1C S/G Isol) • 1CA-38B (U1 TD CA Pump Disch To 1D S/G Isol).	The operator presses the 1CA-66AC CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF. The operator presses the 1CA-54AC CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF. The operator presses the 1CA-50B CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF. The operator presses the 1CA-38B CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF.		
10	(Step 4) Check 1A or 1B CA pump - ON.	The operator observes flow from the 1A and 1B MD CA Pump into all four Steam Generators (Or Equivalent) and determines that both MD CA Pumps are ON.		
11	(Note prior to Step 5) At S/G pressures less than 600 PSIG, only one S/G is fed at a time from each MD CA pump through an unthrottled discharge path, to ensure adequate margin to pump runout and overcurrent trip setpoint.	The operator reads the Note and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
12	(Step 5) IF AT ANY TIME S/G pressure is less than 600 PSIG, THEN perform the following: • Only feed one S/G at a time from each MD CA pump until flow is throttled in subsequent steps. • Ensure each MD CA pump flow is maintained less than 600 GPM.	The operator observes S/G pressure to be greater than 600 psig. The operator reads the Continuous Action Step and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*13	(Step 6) Control MD CA pump flow by operating the following CA to S/G motor operated isolation valves as required: 1A CA pump: • 1CA-62A (1A CA Pump Disch To 1A S/G Isol) • 1CA-58A (1A CA Pump Disch To 1B S/G Isol). 1B CA pump: • 1CA-46B (1B CA Pump Disch To 1C S/G Isol) • 1CA-42B (1B CA Pump Disch To 1D S/G Isol).	The operator presses the 1CA-62A CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF. The operator presses the 1CA-58A CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF. The operator presses the 1CA-46B CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF. The operator presses the 1CA-42B CLOSE pushbutton and observes the Red status light remains LIT, and the Green status light remains OFF. **NOTE:** **When the operator attempts to close 1CA-42B the valve will not move from position. (Alternate Path)** The operator will recognize that 1CA-42B cannot be controlled from the MCB and proceed to the RNO.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
14	(Step 6 RNO A) Control MD CA pump flow as follows: IF any of the CA to S/G motor operator isolation valves OR air operated control valves work, THEN continue to control that S/G level from the Control Room.	The operator recognizes that the motor operator isolation valves for all CA flow loops with the exception of the MD CA Pump to the 1D Steam Generator are operating and proceeds with the RNO.		
15	(Note prior to Step 6 RNO B) Valves take 20-22 turns to stroke. Most of the throttling occurs in the first 4 turns from closed seat.	The operator reads the Note and proceeds.		
*16	(Step 6 RNO B) Dispatch operator to unlock and THROTTLE the following valve(s) on just the S/G(s) that flow cannot be controlled from the Control Room: 1D S/G: 1CA-39 (1B CA Pump Disch To 1D S/G Control Inlet Isol) (Unit 1 CA pump rm, 716+12, CC-50, 6 ft north of 1B CA Pump near reactor bldg wall).	The operator contacts an AO to unlock and THROTTLE 1CA-39 **BOOTH OPERATOR:** **Close 1CA-39 using REM-CA0039.** The operator determines that all four Steam Generator Narrow Range levels are under control between 11-92%.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Systems - Control Room JPM B

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

INITIAL CONDITIONS:

- With Unit 1 at 100% power, a seismic event results in a loss of VI and a reactor trip.
- The crew is in EP/1/A/5000/ES-0.1, “Reactor Trip Response,” and continuing with AP/1/A/5500/22, “Loss of VI,” as time allows.
- The crew has just determined that VI Header pressure is less than 85 psig at Step 2 of ES-0.1.

INITIATING CUE: The CRS has directed you to perform the ES-0.1 Step 2 RNO to control NC System Cooldown.

SIM JPM C

Facility:	McGuire	Task No.:	
Task Title:	CA Suction Source Realignment	JPM No.:	2020 Systems - Control Room JPM C (Alternate Path)
K/A Reference:	061 A2.07 (3.4/3.5)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:	• Unit 1 has just tripped from 100% power, due to seismic activity. • The crew is now implementing EP/1/A/5000/ES-0.1 (Reactor Trip Response). • The CA Storage Tank has developed a leak, and level has lowered to 1.5 feet.
Initiating Cue:	The CRS has directed you to perform EP/1/A/5000/G-1, Generic Enclosure 20 (CA Suction Source Realignment), while the crew continues with ES-0.1.
Task Standard:	The operator will realign the suction of the CA Pumps from the non-safety related to the safety-related source (RN). During this action, the operator will recognize that RN Supply to the 1B MDCA Pump cannot be established and stop the pump.
Required Materials:	None

General References:	EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Rev 36 EP/1/A/5000/ES-0.1 (Reactor Trip Response), Rev 47 EP/1/A/5000/G-1 (Generic Enclosures), Rev 41 OMP 4-3 (Use of Emergency and Abnormal Procedures and FLEX Support Guidelines Procedures), Rev 48
Handouts:	Handout 1: Blank copy of Enclosure 20 (CA Suction Source Realignment) of EP/1/A/5000/G-1 (Generic Enclosures).
Time Critical Task:	NO
Validation Time:	8 minutes

Critical Step Justification	
Step 4	This step is critical because pressing the 1RN-69A OPEN pushbutton is necessary to realign the suction of the CA Pumps from the non-safety related to the safety-related source.
Step 5	This step is critical because pressing the 1CA-15A OPEN pushbutton is necessary to realign the suction of the CA Pumps from the non-safety related to the safety-related source.
Step 6	This step is critical because pressing the 1CA-86A OPEN pushbutton is necessary to realign the suction of the CA Pumps from the non-safety related to the safety-related source.
Alternate Path Critical Step Justification	
Step 12	This step is critical because pressing the STOP pushbutton for the 1B MDCA Pump is necessary to stop the 1B MDCA pump.
Step 15	This step is critical because pressing the 1CA-11A CLOSE pushbutton is necessary to realign the suction of the CA Pumps from the non-safety related to the safety-related source.
Step 19	This step is critical because pressing the 1CA-7AC CLOSE is necessary to realign the suction of the CA Pumps from the non-safety related to the safety-related source.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-39 (100%).
2. Place Simulator in RUN.
3. Ensure that the B Train of RN is in operation.
4. Insert REM_CA0018B=0 to ensure that 1CA-18B (1B CA Pump Suction from 1B RN Isol) will not OPEN.
5. Insert (CA) PLP_078 = 1.00 – (Simulates Leak in CAST).
6. Override ON OBE Exceeded Annunciator (1AD-13 E-7). (1AD13_E07 = ON)
7. Manually trip the reactor and perform the actions of EP/1/A/5000/E-0, and transition to EP/1/A/5000/ES-01.
8. Ensure both MDCA Pumps are running, acknowledge and silence all annunciators, and Freeze the Simulator.

OR

1. Reset to IC-241 (August, 2019)
2. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.
3. Leave Simulator in FREEZE until operator is ready to begin.

NOTE: **The Booth/Floor Instructor will need to control BOP during the performance of this JPM and ENSURE that SI Actuation is NOT needed.**

(Denote Critical Steps with an asterisk)*

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(Enclosure 20, Step 1/1.A) Check if RN assured CA suction should be immediately aligned as follows: Check if failure (causing leak) of CA Storage Tank (water tower) or associated CA suction piping - KNOWN TO EXIST.	The operator recognizes from the Initial Conditions that a CAST leak exists, and proceeds.		
2	(Step 1.B) GO TO Step 4.	The operator proceeds to Step 4.		
3	(Step 4) Align A train RN to CA suction as follows: (Step 4.A) Start 1A RN pump.	The operator observes the 1A RN Pump Red status light LIT, Green status light OFF; and motor amps at ≈ 88 amps and determines the 1A RN Pump is running.		
*4	(Step 4.B) OPEN 1RN-69A (1A RN Assured Supply To Unit 1 CA Isol).	The operator presses the 1RN-69A OPEN pushbutton and observes the Red status light LIT, Green status light OFF. The operator will acknowledge alarm on 1AD-5.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(Step 4.C) OPEN 1CA-15A (1A CA Pump Suction From 1A RN Isol)	The operator presses the 1CA-15A OPEN pushbutton and observes the Red status light LIT, Green status light OFF. The operator will acknowledge alarm on 1AD-5.		
*6	(Step 4.D) OPEN 1CA-86A (U1 TD CA Pump Suction From 1A RN Isol).	The operator presses the 1CA-86A OPEN pushbutton and observes the Red status light LIT, Green status light OFF. The operator will acknowledge alarm on 1AD-5.		
7	(Step 5) Align B train RN to CA suction as follows: (Step 5.A) Start 1B RN pump.	The operator observes the 1B RN Pump Red status light LIT, Green status light OFF; and motor amps at ≈ 88 amps and determines the 1B RN Pump is running.		
8	(Step 5.B) OPEN 1RN-162B (1B RN Assured Supply To Unit 1 CA Isol).	The operator presses the 1RN-162B OPEN pushbutton and observes the Red status light LIT, Green status light OFF. The operator will acknowledge alarm on 1AD-5.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
9	(Step 5.C) OPEN 1CA-18B (1B CA Pump Suction From 1B RN Isol).	The operator presses the 1CA-18B OPEN pushbutton and observes the Green status light remains LIT, Red status light OFF (**Alternate Path**). The operator proceeds to the RNO.		
10	(Step 5.C RNO) IF 1B CA pump is on, THEN stop 1B MD CA pump as follows: (Step 5.C RNO 1) Reset S/I.	The operator may press the RESET Pushbuttons and observes RESET status lights LIT for both Train A and B SI. (Already RESET)		
11	(Step 5.C RNO 2) Reset 1B Sequencer.	The operator may press the Sequencer RESET and observes RESET status lights LIT Pushbuttons for both Train A and B. (Already RESET)		
*12	(Step 5.C RNO 3) Stop 1B CA pump.	The operator presses the STOP pushbutton for the 1B MDCA Pump and observes the Green status light LIT, Red status light OFF; and that motor amps drop to 0. The operator will acknowledge alarm on 1AD-5.		
13	(Step 5.C RNO 4) IF 1B CA pump still on,….	The operator observes that the 1B MDCA Pump is OFF, and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
14	(Step 5.D) OPEN 1CA-116B (U1 TD CA Pump Suction From 1B RN Isol).	The operator presses the 1CA-116B OPEN pushbutton and observes the Red status light LIT, Green status light OFF. The operator will acknowledge alarm on 1AD-5.		
*15	(Step 6) Isolate non-safety CA suction sources from MD CA pumps as follows: (Step 6.A) CLOSE 1CA-11A (1A CA Pump Suction Isol).	The operator presses the 1CA-11A CLOSE pushbutton and observes the Green status light LIT, Red status light OFF.		
16	(Step 6.B) CLOSE 1CA-9B (1B CA Pump Suction Isol).	The operator presses the 1CA-9B CLOSE pushbutton and observes the Green status light LIT, Red status light OFF.		
17	(Step 7) Isolate non-safety CA suction sources from TD CA pump as follows: (Step 7.A) Check the following valves - OPEN: 1RN-69A (1A RN Assured Supply To Unit 1 CA Isol) 1CA-86A (U1 TD CA Pump Suction From 1A RN Isol).	The operator observes the 1RN-69A Red status light LIT, Green status light OFF. The operator observes the 1CA-86A Red status light LIT, Green status light OFF.		
18	(Step 7.B) GO TO Step 7.D.	The operator proceeds to Step 7.D.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*19	(Step 7.D) CLOSE 1CA-7AC (U1 TD CA Pump Suction Isol).	The operator presses the 1CA-7AC CLOSE pushbutton and observes the Green status light LIT, Red status light OFF.		
20	(Step 8) WHEN time allows, THEN….	**Cue:** **Another operator will complete the remaining steps.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

Job Performance Measure No.: 2020 Systems - Control Room JPM C

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- Unit 1 has just tripped from 100% power, due to seismic activity.
- The crew is now implementing EP/1/A/5000/ES-0.1 (Reactor Trip Response).
- The CA Storage Tank has developed a leak, and level has lowered to 1.5 feet.

INITIATING CUE:

The CRS has directed you to perform EP/1/A/5000/G-1, Generic Enclosure 20 (CA Suction Source Realignment), while the crew continues with ES-0.1.

SIM JPM D

Facility: McGuire

Task No.:

Task Title: Place LTOP in Service and Respond to a Failed PORV

JPM No.: 2020 Systems - Control Room JPM D (Alternate Path)

K/A Reference: 010 A4.03 (4.0/3.8)

Examinee:

NRC Examiner:

Facility Evaluator:

Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:	• A Unit 1 NC cooldown and depressurization is in progress in accordance with OP/1/A/6100/SD-4 (Cooldown to 240 Degrees F). • Attachment 2 (Cooldown to 240°F (Control Room Activities)) is in progress. • The 1A and 1B NCPs are operating. • NC System pressure is ≈320 psig and NC System temperature is 310-320°F. • NC Pressure control via normal spray and PZR heaters. • NC pressure is being controlled using 1NC-29C, 1B NC Loop Pzr Spray Control, in MANUAL. • Attachment 1 of OP/1/A/6100/SO-10 (Controlling Procedure for LTOP Operation) has been completed through Step 3.13.a. • LTOP vent requirements are to be satisfied by Pzr PORVs 1NC-32B and 1NC-34A.

Initiating Cue: The CRS has directed you to place the LTOP System in operation beginning with Step 3.13.b - of Attachment 1 of OP/1/A/6100/SO-10 (Controlling Procedure for LTOP Operation) and monitor for proper operation.

Task Standard: The operator will place LTOP in service by first placing 1NC-32B in service per procedure; and then respond to a failed open Pzr PORV (1NC-34A) by closing the failed open Pzr PORV Block Valve.

Required Materials: None

General References: OP/1/A/6100/SD-4 (Cooldown to 240 Degrees F), Rev 73

OP/1/A/6100/SO-10 (Controlling Procedure for LTOP Operation), Rev 43

AP/1/A/5500/11 (Pressurizer Pressure Anomalies), Rev 12

AD-OP-ALL-1001 (Conduct of Abnormal Operations), Rev 3

OMP 4-3 (Use of Emergency And Abnormal Procedures And FLEX Support Guidelines), Rev 48

Handouts: Handout 1: Enclosure 4.1 (Placing LTOP System in Service per OP/1/A/6100/SO-10 (Cooldown to 240 Degrees F)) marked up for place-keeping through Step 3.13.a.

Time Critical Task: NO

Validation Time: 10 minutes

Critical Step Justification	
Step 7	This step is critical because placing the PORV Overpress Protection Select Switch in LOW PRESS is necessary to change the Pzr PORV mode of operation from Normal mode to the Low Temperature Overpressure Protection (LTOP) mode.
Alternate Path Critical Step Justification	
Step 17	This step is critical because placing the 1NC-33A Control Switch in the CLSD position is necessary to respond to a failed open Pzr PORV (1NC-34A) by closing the failed open Pzr PORV Block Valve.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-45.
2. Place in RUN
3. Adjust NCS Temperature to 300-320ºF, and NCS Pressure to 320-330 psig.
4. Place LTOP PORV switches in NORMAL
5. When NCS Temperature/Pressure in range place Steam Dump System in AUTO (SG Pressure ≈70 psig)
6. Ensure that Simulator reflects that Attachment 2 of OP/1/A/6100/SD-4 is complete through Step 3.19 and Attachment 1 of OP/1/A/6100/SO-10 is completed through Step 3.13.a.
7. Insert **REM_NC0034A=1 cd X10_162_1EQ1 (Conditional on the LOW PRESS position of the PORV Overpress Protection Select 1NC-34A)**
8. Freeze the Simulator

OR

1. Reset to IC-242 (August, 2019)
2. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.
3. Ensure that the “AFD” Computer screen displays the “C/D Tab” panel and that the “BOP” screen displays the “NCLTOP” panel.
4. Place Info Stickers on PORV Controls.
5. Leave Simulator in FREEZE until operator is ready to begin.

NOTE: During the performance of this JPM, the simulator operator may need to control CF flow to the SGs (Monitor Wide Range Levels).

(Denote Critical Steps with an asterisk)*

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(Step 3.13.b) Ensure in service: M1A1359 (NC NR Pressure for 1NC-32B actuation). M1A1365 (NC NR Pressure for 1NC-34A actuation).	The operator calls up both points on OAC.		
2	(Step 3.13.c) Monitor: M1A1359 (NC NR pressure for 1NC-32B actuation). M1A1365 (NC NR pressure for 1NC-34A actuation).	The operator monitors both points and observes NC NR Pressure to be between 320-330 psig.		
3	(Step 3.13.d) Ensure the following for A Cold Leg Accumulator: Pressure greater than 200 psig. Level less than 38.7% (7342 gallons maximum).	The operator observes 1NIP-5050 and 1NIP-5040, and determines A CLA pressure to be ≈610 psig. The operator observes 1NIP-5051 and 1NIP-5041, and determines A CLA Level to be ≈30%.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
4	(Step 3.13.e) Ensure the following for B Cold Leg Accumulator: Pressure greater than 200 psig. Level less than 38.7% (7342 gallons maximum).	The operator observes 1NIP-5070 and 1NIP-5060 and determines B CLA pressure to be ≈610 psig. The operator observes 1NIP-5071 and 1NIP-5061 and determines B CLA Level to be ≈25%.		
5	(Step 3.13.f) Ensure OPEN: 1NC-31B (Pzr PORV Isol). 1NC-33A (Pzr PORV Isol).	The operator observes Red status light LIT, Green status light OFF for 1NC-31B. The operator observes Red status light LIT, Green status light OFF for 1NC-33A.		
6	(Note prior to Step 3.13.g) For NC Loop in which an NC Pump is operating, NR pressure may indicate up to 30 psig lower than NR pressure for NC Loop in which an NC Pump is NOT operating.	The operator reads the Note, and proceeds to Step 3.13.g.		
*7	(Step 3.13.g) When M1A1359 indicates 320-330 psig, perform the following: (Step 3.13.g.1) Select “LOW PRESS” on “PORV Overpress Protection Select 1NC-32B.”	The operator observes M1A1359 is between 320-330 psig and selects LOW PRESS on PORV Overpress Protection Select 1NC-32B. **NOTE:** 1AD-6/F-10 will alarm.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
8	(Step 3.13.g.2) Ensure 1NI-431B (Emerg N2 from CLA to 1NC-32B & 36B) OPEN.	The operator observes that Red status light is LIT, Green status light OFF for 1NI-431B. **NOTE:** If CLOSED, the operator presses the OPEN Pushbutton and Observes Red status light is LIT, Green status light OFF for 1NI-431B.		
9	(Step 3.13.g.3) Check lit 1AD-6, F10 (PORV NC-32B Emerg CLA N_2 Enabled)	The operator observes that 1AD-6, F-10 is LIT.		
10	(Note prior to Step 3.13.g.4) Continue with the rest of the procedure while performing Step 3.13.g.4.	The operator reads the Note, and proceeds to Step 3.13.g.4.		
11	(Step 3.13.g.4) Place Info Sticker on control switch for 1NI-431B stating: "Do NOT operate, N_2 aligned to 1NC-32B for LTOP."	**Cue:** **Another operator will fill out and place an Info Sticker for 1NI-431B** The operator acknowledges and proceeds to Step 3.13.g.5.		
12	(Step 3.13.g.5) Ensure 1NC-32B (Pzr PORV) in "AUTO."	The operator observes that Control Switch for 1NC-32B is in AUTO.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
13	(Step 3.13.h) WHEN M1A1365 indicates 320-330 psig, THEN perform the following: (Step 3.13.h.1) Select "LOW PRESS" on "PORV Overpress Protection Select 1NC-34A."	The operator observes M1A1365 is between 320-330 psig and selects LOW PRESS on PORV Overpress Protection Select 1NC-34A **(Alternate Path)**. **NOTE:** **When this occurs 1NC-34A will fail full open, causing NCS pressure to lower, and creating the plant conditions need to enter AP/1/A/500/11, Pressurizer Pressure Anomalies.** The operator will carry out the Immediate Actions of AP11. **NOTE:** **The operator may take the immediate actions without addressing AP11 first. (Section 5.2.5 of OMP 4-3 and Section 3.12, 5.1.4.1, and 5.7.3 of AD-OP-ALL-1001).**		
14	(AP11 Immediate Action Step 1) Check Pzr pressure - HAS GONE DOWN.	The operator observes NCS pressure to be lowering rapidly.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
15	(Immediate Action Step 2) Check Pzr PORVs - CLOSED.	The operator observes the 1NC-34A Red status light is LIT and determines that the valve is OPEN.		
16	(Immediate Action Step 2 RNO) Perform the following: (Immediate Action Step 2 RNO A) CLOSE PORVs.	The operator rotates the 1NC-34A control Switch to CLOSE.		
17 *	(Immediate Action Step 2 RNO) Perform the following: (Immediate Action Step 2 RNO B) IF PORV will not close, THEN CLOSE PORV isolation valve.	The operator observes that 1NC-34A is still OPEN and places the 1NC-33A Control Switch in the CLSD position; and observes the 1NC-33A Green status light is LIT, and the Red status light is OFF.		
18	(Immediate Action Step 3) Check Pzr spray valves - CLOSED.	The operator observes that only the 1NC-27C SLIM CLOSED window light is LIT. The operator observes that only the 1NC-29C SLIM CLOSED window light is LIT.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Systems - Control Room JPM D

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

INITIAL CONDITIONS:

- A Unit 1 NC cooldown and depressurization is in progress in accordance with OP/1/A/6100/SD-4 (Cooldown to 240 Degrees F).
- Attachment 2 (Cooldown to 240°F (Control Room Activities)) is in progress.
- The 1A and 1B NCPs are operating.
- NC System pressure is ≈320 psig and NC System temperature is 310-320ºF.
- NC Pressure control via normal spray and PZR heaters.
- NC pressure is being controlled using 1NC-29C, 1B NC Loop Pzr Spray Control, in MANUAL.
- Attachment 1 of OP/1/A/6100/SO-10 (Controlling Procedure for LTOP Operation) has been completed through Step 3.13.a.
- LTOP vent requirements are to be satisfied by Pzr PORVs 1NC-32B and 1NC-34A.

INITIATING CUE:

The CRS has directed you to place the LTOP System in operation beginning with Step 3.13.b - of Attachment 1 of OP/1/A/6100/SO-10 (Controlling Procedure for LTOP Operation) and monitor for proper operation.

SIM JPM E

Facility:	McGuire	Task No.:	
Task Title:	Restore Normal Power to 1ETB and Unload the 1B EDG/Respond to 1ETB Lockout	JPM No.:	2020 Systems - Control Room JPM E (Alternate Path)
K/A Reference:	056 AA1.02 (4.0/3.9)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:	• Unit 1 was operating at 100% power when the normal power breaker to 1ETB was inadvertently opened. • The 1B EDG started and re-energized the bus and sequenced loads onto 1ETB as expected. • The crew entered AP/1/A/5500/07, Loss of Electrical Power, Case II, Loss of Normal Power to Either 1ETA or 1ETB; and are currently at Step 86. • An investigation has revealed that the breaker was inadvertently opened, and that the breaker is ready to be re-closed. • The crew is attempting to return 1ETB to normal power and shutdown the 1B D/G. • AO John is standing by in the field to support this activity.

Initiating Cue:	The CRS has directed you to restore 1ETB to normal power and separate the 1B D/G from the Grid from the Control Room per OP/1/A/6350/002 (Diesel Generator), Enclosure 4.4 (1B D/G Shutdown).

Task Standard:	While 1ETB is being powered by the 1B D/G, the operator will parallel 1ETB, with 1ATD, and then unload the 1B D/G. Once the 1ETB Emergency Breaker is opened, Bus 1ETA will experience an overcurrent lockout, and the operator will carry out the immediate actions of AP/1/A/5500/07 by starting the 1B NV Pump and the 1B KC Pumps manually.
Required Materials:	None
General References:	EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Rev 36 EP/1/A/5000/ES-0.1 (Reactor Trip Response), Rev 47 AP/1/A/5500/07 (Loss of Electrical Power), Rev 40 OP/1/A/6350/002 (Diesel Generator), Rev 130 OMP 4-3 (Use of Emergency And Abnormal Procedures And FLEX Support Guidelines), Rev 48 AD-OP-ALL-1001 (Conduct of Abnormal Operations), Rev 3
Handouts:	Handout 1: Enclosure 4.4 of OP/1/A/6350/002 (Diesel Generator) marked up through Step 3.1.
Time Critical Task:	NO
Validation Time:	11 minutes
NOTE:	The JPM should be pre-briefed in the Briefing Room.

Critical Step Justification	
Step 1	This step is critical because rotating the “1B D/G Mode Select” switch counter-clockwise to the C/R position is necessary for the Control Room operator to control the 1B D/G.
Step 4	This step is critical because rotating "1B D/G Volt Adjust" switch clockwise and/or counterclockwise as necessary to match voltages is necessary to parallel 1ETB (powered by the 1B D/G), with 1ATD.
Step 5	This step is critical because rotating the 1B D/G Sync Scope Switch to ON is necessary to parallel 1ETB (powered by the 1B D/G), with 1ATD.
Step 7	This step is critical because depressing the RAISE/LOWER pushbutton causing the synchroscope to move slowly in the FAST direction is necessary to parallel 1ETB (powered by the 1B D/G), with 1ATD.
Step 8	This step is critical because depressing the 1ETB Normal Breaker CLOSE pushbutton with the synchroscope pointer is 3 minutes before vertical is necessary to parallel 1ETB (powered by the 1B D/G), with 1ATD.
Step 9	This step is critical because pressing the Raise pushbutton to raise DG load after paralleling and rotating the Voltage Adjust handle to raise power factor within band are necessary to parallel 1ETB (powered by the 1B D/G), with 1ATD.
Step 14	This step is critical because depressing the 1B D/G Gov Control LOWER pushbutton until load meter indicates < 200 KW is necessary to unload the 1B D/G.
Step 15	This step is critical because depressing the 1ETB Emergency Breaker OPEN pushbutton is necessary to unload the 1B D/G.
Alternate Path Critical Step Justification	
Step 19	This step is critical because pressing the 1B NV Pump, 1B1 KC Pump and 1B2 KC Pump START Pushbutton is necessary to carry out the immediate actions of AP/1/A/5500/07.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-21, 100% Power (or equivalent at power IC).
2. Ensure that Train A Pumps are in service.
3. Place Simulator in RUN and allow time to stabilize.
4. Open the 1ETB Normal Power Breaker (Simulating an inadvertent opening of the breaker).
5. Insert MAL_EP008A on Trigger #1 and establish a condition such that when the 1ETB Emergency Breaker is opened the malfunction will go active (H_X11_229_3_1 [Emergency Breaker OPEN light is LIT]).
6. Perform the actions of Case II AP/1/A/5500/07 up through step 86.B.
7. Freeze the Simulator

OR

1. Reset to IC-243 (August, 2019)

(Denote Critical Steps with an asterisk)*

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
*1	(Step 3.2) Place Control Room "1B D/G Mode Select" switch to the applicable position: "LOCAL" to operate D/G from local panel. OR "C/R" to operate D/G from Control Room.	The operator rotates the "1B D/G Mode Select" switch counter-clockwise to C/R for the 1B D/G.		
2	(Step 3.3) If D/G is operating Unloaded,…..	The operator observes Emergency Breaker status (Red light LIT) and determines that the D/G is not running unloaded (Or Equivalent).		
3	(Step 3.4) IF D/G is carrying 1ETB separated from the Duke Grid, THEN parallel D/G to Grid as follows: (Step 3.4.1) Check "Line Volts" 3960-4360 V.	The operator observes Normal and Emergency Breaker status and determines that the D/G is separated from the Duke Grid. The operator observes Line Volts Meter at ≈4175V.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(Step 3.4.2) Match D/G voltage with line voltage using "1B D/G Voltage Adjust."	The operator rotates "1B D/G Voltage Adjust" switch clockwise and/or counterclockwise as necessary and observes voltage meters are matched.		
*5	(Step 3.4.3) Place the “1B D/G Sync Switch” to “ON.”	The operator rotates the 1B D/G Sync Scope Switch to ON. The operator observes synch scope meter dial is NOT moving or moving slowly in the SLOW direction.		
6	(Note prior to Step 3.4.4) As a guide, have synchroscope traveling no faster than one revolution in 20 seconds.	The operator reads the NOTE and proceeds.		
*7	(Step 3.4.4) Using "1B D/G Gov Control," adjust D/G speed to allow synchroscope to move slowly and smoothly in "FAST" direction.	The operator depresses the RAISE/LOWER pushbutton causing the synchroscope to move slowly in the FAST direction.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*8	(Step 3.4.5) IF desired to align 1ETB to normal supply (1ATD), perform the following: (Notes prior to Step 3.4.5.1): • D/G load will drop to 0 amps when bus is paralleled to Duke Grid. • D/G load shall be quickly raised after breaker closed to prevent reverse power condition. IF a reverse power condition occurs, the D/G Emergency Breaker will trip after a short time delay. • Steps 3.4.5.1 and 3.4.5.2 may be completed and then signed off as time allows. (Step 3.4.5.1) HOLD until synchroscope pointer is within 3 minutes before the 12 o'clock position, THEN firmly depress AND release "CLOSE" on "1ETB Normal Breaker."	The operator determines from initial conditions that it is desired to align 1ETB to 1ATD. The operator reads the NOTES and proceeds. The operator observes pointer is 3 minutes before vertical, then depresses the 1ETB Normal Breaker CLOSE pushbutton and observes Red Status light is LIT.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*9	(Step 3.4.5.2) Perform concurrently: Quickly raise D/G load to 800 - 1000 KW using "1B D/G Gov Control." Adjust power factor to 0.90 – 0.92 lagging using "1B D/G Voltage Adjust."	The operator presses Raise pushbutton and observes KW meter indicates 800-1000KW. The operator rotates Voltage Adjust handle and observes meter indication reads 0.9 Lagging.		
10	(Step 3.4.5.3) Place “1B D/G Sync Switch” to “OFF.”	The operator turns the 1B D/G Sync scope to OFF.		
11	(Step 3.4.5.4) Evaluate Offsite Power OPERABILITY.	The operator has the CRS sign for offsite power operability. **Cue:** **As CRS, initial Step 3.4.5.4.**		
12	(Step 3.4.5.5) Go to Step 3.5.9.	The operator proceeds to Step 3.5.9.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
13	(Step 3.5.9) HOLD for 10 minutes	The operator waits for 10 minutes. **Cue:** **Using TIME COMPRESSION, the 1B D/G has been at the current load for 10 minutes.**		
*14	(Step 3.5.10) Perform the following: (Step 3.5.10.1) Lower D/G load to less than 200 kW using "1B D/G Gov Control."	The operator depresses the 1B D/G Gov Control LOWER pushbutton until load meter indicates < 200 KW. The operator observes that meter indicates < 200KW.		
*15	(Step 3.5.10.2) Open "1ETB Emergency Breaker."	The operator depresses the 1ETB Emergency Breaker OPEN pushbutton and observes the Green Status light is LIT.		
Simulator Instructor NOTE: Trigger #1 is set up to cause an Overcurrent Lockout on Bus 1ETA when the 1ETB Emergency Breaker is OPEN. (Alternate Path)				

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
16	(Note prior to Step 3.6) IF D/G has been loaded less than full load (3600 - 4000 kW) for an extended event, performing a full load run for 1 hour essentially reconfirms McGuire Tech Spec SR 3.8.1.3 AND conforms to industry practices.	The operator will recognize that an Overcurrent Lockout has occurred on 1ETA and perform the Immediate Actions of Case II of AP/1/A/5500/07. **NOTE:** **The operator may take the immediate actions without addressing AP7 first. (Section 5.2.5 of OMP 4-3 and Section 3.12, 5.1.4.1, and 5.7.3 of AD-OP-ALL-1001).**		
17	(AP/1/A/5500/07 IA Step 1) Check affected bus(s) - ENERGIZED AND SEQUENCER APPLYING LOADS.	The operator observes 1ETA remains de-energized, and proceeds to the RNO.		
18	(AP/1/A/5500/07 IA Step 1RNO.A) Perform the following: IF both busses deenergized, THEN….	The operator observes that 1ETB is energized, and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*19	(AP/1/A/5500/07 IA Step 1RNO.B) Perform the following: Ensure the following pumps running on energized bus: • NV pump • KC pumps • RN pump.	The operator presses the 1B NV Pump START Pushbutton and observes the Red status light is LIT, and the Green status light is OFF. The operator presses the 1B1 KC Pump START Pushbutton and observes the Red status light is LIT, and the Green status light is OFF. The operator presses the 1B2 KC Pump START Pushbutton and observes the Red status light is LIT, and the Green status light is OFF. The operator observes the 1B RN Pump Red status light is LIT, and the Green status light is OFF. **Cue:** **Another operator will continue with this procedure.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Systems - Control Room JPM E

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

INITIAL CONDITIONS:

- Unit 1 was operating at 100% power when the normal power breaker to 1ETB was inadvertently opened.
- The 1B EDG started and re-energized the bus and sequenced loads onto 1ETB as expected.
- The crew entered AP/1/A/5500/07, Loss of Electrical Power, Case II, Loss of Normal Power to Either 1ETA or 1ETB; and are currently at Step 86.
- An investigation has revealed that the breaker was inadvertently opened, and that the breaker is ready to be re-closed.
- The crew is attempting to return 1ETB to normal power and shutdown the 1B D/G.
- AO John is standing by in the field to support this activity.

INITIATING CUE:

The CRS has directed you to restore 1ETB to normal power and separate the 1B D/G from the Grid from the Control Room per OP/1/A/6350/002 (Diesel Generator), Enclosure 4.4 (1B D/G Shutdown).

SIM JPM F

Facility:	McGuire	Task No.:	
Task Title:	Control Room Air Intake High Radiation Alarms	JPM No.:	2020 Systems - Control Room JPM F
K/A Reference:	061 AA2.01 (3.5/3.7)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM).

Initial Conditions:	• Units 1 and 2 are operating at 100% power. • Annunciator 1RAD-2 B2, EMF 43B CR AIR INTAKE B HI RAD, alarmed 45 seconds ago. • Annunciator 1RAD-1 B2, EMF 43A CR AIR INTAKE A HI RAD, alarmed 15 seconds ago.
Initiating Cue:	The CRS has directed you to perform the Annunciator Response Procedures for both alarms.

Task Standard: The operator will determine that the Unit 2 intake presents a greater threat than Unit 1 and align the VC inlet to take suction on Unit 1 only; and then pressurize the Control Room from the B Train Outside Air Pressure Fan.

Required Materials: None

General References: OP/1/A/6100/010 Q (Annunciator Response for Panel 1RAD-1), Rev 68
OP/1/A/6100/010 R (Annunciator Response for Panel 1RAD-2), Rev 42

	OP/0/A/6450/011 (Control Area Ventilation/Chilled Water System), Rev 107
	AD-HU-ALL-004 (Procedure And Work Instruction Use and Adherence), Rev 10
Handouts:	Handout 1: Enclosure 4.14 (Response When EMF43A or 43B In Trip 2 or Non-Functional) of OP/0/A/6450/011 (Control Area Ventilation/Chilled Water System) Handout 2: Enclosure 4.4 (Control Room Atmosphere Pressurization During Abnormal Conditions) of OP/0/A/6450/011 (Control Area Ventilation/Chilled Water System)
Time Critical Task:	NO
Validation Time:	10 minutes

Critical Step Justification	
Step 8	This step is critical because observing EMF 43A and EMF 43B and determining that EMF 43B has the highest reading is necessary to determine that the operator must align the VC inlet to take suction on Unit 1 only.
Step 13	This step is critical because pressing the 1VC-9A, 10A, 11B and 12B CLOSE pushbutton is necessary to align the VC inlet to take suction on Unit 1 only.
Step 14	This step is critical because determining that both EMF 43A and EMF 43B are valid alarms is necessary to pressurize the Control Room from the B Train Outside Air Pressure Fan.
Step 21	This step is critical because rotating the B Train CR Outside Air Press Fan Control Switch to the ON position is necessary to pressurize the Control Room from the B Train Outside Air Pressure Fan.
Step 22	This step is critical because pressing the MAN pushbutton for #1 & #2 CRA Otsd Air Fan is necessary to pressurize the Control Room from the B Train Outside Air Pressure Fan.
Step 23	This step is critical because pressing the OFF pushbutton for CRA-OAD-3 and 4 is necessary to pressurize the Control Room from the B Train Outside Air Pressure Fan.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-39 (100%).
2. Place in RUN
3. Adjust the output of EMF 43B to greater than the Trip II setpoint (Insert MAL_EMF-43B = 5400).
4. Adjust the output of EMF 43A to greater than the Trip II setpoint, but less than the value of EMF 43B (Insert MAL_EMF-43A = 4100).
5. Ensure 1RAD-1 B2 and 1RAD-2 B2 are both LIT.
6. Ensure Air Intake Valves from BOTH Units are OPEN.
7. Ensure that the B Train of VC/YC is operating.
8. Acknowledge all alarms.
9. Freeze the Simulator

OR

1. Reset to IC-244 (August, 2019)
2. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.
3. Leave Simulator in FREEZE until operator is ready to begin.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM).

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(OP/1/A/6100/010 Q, 1RAD-1 B2 IA) Perform OP/0/A/6450/011 (Control Area Ventilation / Chilled Water System) Enclosure 4.14 (Response When EMF 43A and/or EMF 43B In Trip 2 or Non-Functional).	After checking the other ARP, the operator proceeds to OP/0/A/6450/011 Enclosure 4.14. **Examiner Note:** **The Immediate Actions for both ARPs are the same. The operator can address in either order (Step 1 and 2 can be done in any order).** **When operator seeks Enclosure 4.14, provide Handout 1.**		
2	(OP/1/A/6100/010 R, 1RAD-2 B2 IA) Perform OP/0/A/6450/011 (Control Area Ventilation / Chilled Water System) Enclosure 4.14 (Response When EMF 43A and/or EMF 43B In Trip 2 or Non-Functional).	After checking the other ARP, the operator proceeds to OP/0/A/6450/011 Enclosure 4.14.		
3	(OP/0/A/6450/011 Enclosure 4.14, Step 2.1) EMF43A or EMF43B in Trip 2 Alarm or Non-Functional.	The operator observes that EMF-43A is in TRIP II. The operator observes that EMF-43B is in TRIP II.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
4	(Step 3.1) Evaluate all outstanding Clearances that may impact performance of this procedure.	The operator requests this information from the CRS. **Cue:** **There are no outstanding Clearances on this equipment.**		
5	(Step 3.2) Perform the following sections, as applicable: • Section 3.3, Response for EMF43A or EMF43B Non Functional • Section 3.4, Response for Trip 2 on EMF43A (Control Rm Air Intake Loc A) • Section 3.5, Response for Trip 2 on EMF43B (Control Rm Air Intake Loc B) • Section 3.6, Response for Trip 2 on EMF43A (Control Rm Air Intake Loc A) AND EMF43B (Control Rm Air Intake Loc B)	The operator observes that EMF-43A is in TRIP II. The operator observes that EMF-43B is in TRIP II. The operator proceeds to Section 3.6. **Examiner Note:** **The operator may go to Section 3.4 or 3.5. If so, the first step of both sections will direct the use of Section 3.6.**		
6	(Step 3.6) Response for Trip 2 on EMF43A (Control Rm Air Intake Loc A) AND EMF43B (Control Rm Air Intake Loc B) (Step 3.6.1) Notify RP of Trip 2 on both EMF43A and EMF43B.	The operator calls and notifies RP of the situation, and records. **Cue:** **RP Technician Don Smith acknowledges.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
7	(Note prior to Step 3.6.2) Both sets of air intakes should never be closed at same time.	The operator reads the Note and proceeds.		
*8	(Step 3.6.2) IF both Unit 1 and Unit 2 intake valves open, perform the following: (Step 3.6.2.1) Determine location with highest radiation hazard per one or both of the following: (Step 3.6.2.1.A) Check EMF readings in Control Room and determine location with highest radiation hazard. Record Location:	The operator observes that both Unit 1 and Unit 2 intake valves are OPEN. The operator observes EMF 43A and EMF 43B and determines that EMF 43B has the highest reading and records EMF 43B in the space provided.		
9	(Note prior to Step 3.6.2.1.B) Each unit's intake can be accessed from associated unit's D/G building roof. The intake is 2 candy cane shaped 18" pipes on Aux building roof, next to Reactor building.	The operator reads the Note and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
10	(Step 3.6.2.1.B) Notify RP to check VC intake radiation and determine location with highest radiation hazard. Record Location:	The operator calls requests RP to survey the areas. **Cue:** **The CRS directs you to continue with your task.**		
11	(Step 3.6.2.2) IF both intake radiation hazards are the same,…..	The operator recognizes that the threat at Unit 2 is higher and that this step is NA.		
12	(Step 3.6.2.3) IF Unit 1 intake (monitored by EMF43A) is intake with highest radiation hazard….	The operator recognizes that the threat at Unit 2 is higher and that this step is NA.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*13	(Step 3.6.2.4) IF Unit 2 intake (monitored by EMF43B) is intake with highest radiation hazard ensure the following closed: • 1VC-9A (VC Outside Air Intake From Unit 2 Isol)	The operator presses the 1VC-9A CLOSE pushbutton, and observes the Green status light LIT, Red status light OFF.		
	• 1VC-10A (VC Outside Air Intake From Unit 2 Isol)	The operator presses the 1VC-10A CLOSE pushbutton, and observes the Green status light LIT, Red status light OFF.		
	• 1VC-11B (VC Outside Air Intake From Unit 2 Isol)	The operator presses the 1VC-11B CLOSE pushbutton, and observes the Green status light LIT, Red status light OFF.		
	• 1VC-12B (VC Outside Air Intake From Unit 2 Isol)	The operator presses the 1VC-12B CLOSE pushbutton, and observes the Green status light LIT, Red status light OFF.		
		Cue: **If asked, indicate that a Concurrent Verification (CV) has been completed.**		
		Examiner NOTE: **HVAC OAD-11 H-8 and H-9 are expected alarms.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*14	(Step 3.6.3) IF EMF43A (Control Rm Air Intake Loc A) AND EMF43B (Control Rm Air Intake Loc B) Trip 2 alarm valid (no loss of power), perform the following: (Step 3.6.3.1) Pressurize Control Room per Enclosure 4.4 (Control Room Atmosphere Pressurization During Abnormal Conditions).	The operator observes both instruments and determines that both EMF 43A and EMF 43B are valid alarms; and proceeds to Enclosure 4.4. **Examiner Note:** **When operator seeks Enclosure 4.4, provide Handout 2.**		
15	(OP/0/A/6450/011 Enclosure 4.4, Step 2.1) Control Room atmosphere has been determined to be in need of pressurization to protect Control Room personnel.	The operator recognizes that this Initial Condition has been satisfied during the performance of the Immediate Actions.		
16	(Step 2.2) VC / YC Train A OR B is selected and is in operation per this procedure.	The operator observes that the VC/YC Train B Mode Select Switch is in “B,” and that the VC/YC Train A Mode Select Switch is in “OFF,” and determines that the Train B is selected and in operation.		
17	(Step 3.1) Evaluate all outstanding Clearances that may impact performance of this procedure.	The operator requests this information from the CRS. **Cue:** **There are no outstanding Clearances on this equipment.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
18	(Step 3.2) Perform the following sections as applicable: • Section 3.3, Pressurize Control Room Using Outside Air Pressure Fans • Section 3.4, Securing Pressurization Of Control Room	The operator recognizes that Section 3.3 is required and proceeds.		
19	(Step 3.3) Pressurize Control Room using Outside Air Pressure Fans (Step 3.3.1) Ensure at least one the following groups of intake valves open: • 1VC-1A (VC Outside Air Intake From Unit 1 Isol) • 1VC-2A (VC Outside Air Intake From Unit 1 Isol) • 1VC-3B (VC Outside Air Intake From Unit 1 Isol) • 1VC-4B (VC Outside Air Intake From Unit 1 Isol) OR • 1VC-9A (VC Outside Air Intake From Unit 2 Isol) • 1VC-10A (VC Outside Air Intake From Unit 2 Isol) • 1VC-11B (VC Outside Air Intake From Unit 2 Isol) • 1VC-12B (VC Outside Air Intake From Unit 2 Isol)	The operator observes the Red status lights LIT for the Unit 1 valves. **Cue:** **If asked, indicate that a Concurrent Verification (CV) has been completed.**		
20	(Step 3.3.2) IF A Train VC/ YC operating, …..	The operator observes that the A Train of VC/YC is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*21	(Step 3.3.3) IF B Train VC / YC operating, place "B" Train CR Outside Air Press Fan" to "ON".	The operator rotates the B Train CR Outside Air Press Fan Control Switch to the ON position. The operator will observe the Red B Train CR Outside Air Press Fan status light is LIT. (Not Critical) The operator will observe the White B Train CR Filter Preheat Enabled status light is LIT. (Not Critical) The operator observes the CRA-OAPFT-2 Dampers Red status light is LIT, and the Green status light is OFF. (Not Critical) **Cue:** **If asked, indicate that a Concurrent Verification (CV) has been completed.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
22 *	(Step 3.3.4) Depress "MAN" for the following (to ensure fans off): • #1 CRA Otsd Air Fan • #2 CRA Otsd Air Fan	The operator presses the MAN pushbutton for #1 CRA Otsd Air Fan, and observes the Green status light is LIT, Red status light is OFF. The operator presses the MAN pushbutton for #2 CRA Otsd Air Fan, and observes the Green status light is LIT, Red status light is OFF. **Cue:** **If asked, indicate that a Concurrent Verification (CV) has been completed.**		
*23	(Step 3.3.5) Depress "OFF" for the following: • CRA-OAD-4 (CR Area Otsd Air Fans Damper) • CRA-OAD-3 (CR Area Otsd Air Fans Damper)	The operator presses the OFF pushbutton for CRA-OAD-4, and observes the Red status light is OFF. The operator presses the OFF pushbutton for CRA-OAD-3, and observes the Red status light is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
24	(Step 3.3.6) Check the following dark: • CRA-OAD-4 (CR Area Otsd Air Fans Damper) "OPEN" light • CRA-OAD-3 (CR Area Otsd Air Fans Damper) "OPEN" light	The operator observes CRA-OAD-4 light is OFF. The operator observes CRA-OAD-3 light is OFF.		
25	(Note prior to Step 3.4) CR Outside Air Press Fan is credited to minimize Control Room dose for events such as:	The operator starts to read the Note. **Cue:** **Another operator will complete this task.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ____________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Systems - Control Room JPM F

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

INITIAL CONDITIONS:

- Units 1 and 2 are operating at 100% power.
- Annunciator 1RAD-2 B2, EMF 43B CR AIR INTAKE B HI RAD, alarmed 45 seconds ago.
- Annunciator 1RAD-1 B2, EMF 43A CR AIR INTAKE A HI RAD, alarmed 15 seconds ago.

INITIATING CUE:

The CRS has directed you to perform the Annunciator Response Procedures for both alarms.

SIM JPM G

Facility:	McGuire	Task No.:	
Task Title:	Control Pressurizer Relief Tank Parameters	JPM No.:	2020 Systems - Control Room JPM G
K/A Reference:	007 A1.03 (2.6/2.7)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: ___X___

Classroom ______ Simulator ___X___ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- Unit 1 is operating at power.
- A transient has resulted in a discharge to the Pressurizer Relief Tank from the Pressurizer PORVs.
- The plant has stabilized and all Pressurizer PORVs are closed.
- Previous PRT cooling operations have lowered PRT Temperature, however, MCB Annunciator 1AD-6, C9, PRT HI TEMP, is still LIT.
- The following PRT parameters are observed:
  - PRT Level is ≈ 76%.
  - PRT Pressure is ≈ 4 psig.
  - PRT Temperature ≈ 112°F.
- Steps 3.1 through 3.5 of Enclosure 4.3 (PRT Cooling) of OP/1/A/6150/004 (Pressurizer Relief Tank), have been completed.

Initiating Cue: The CRS has directed you to perform Enclosure 4.3 (PRT Cooling) of OP/1/A/6150/004 (Pressurizer Relief Tank), starting with Step 3.6, to lower PRT Temperature to clear 1AD-6, C9, PRT HI TEMP.

Task Standard:	The operator will complete Enclosure 4.3 (PRT Cooling) of OP/1/A/6150/004 (Pressurizer Relief Tank) such that PRT Temperature is less than 110°F, and 1AD-6, C9, PRT HI TEMP, is EXTINGUISHED.
Required Materials:	None
General References:	OP/1/A/6150/004 (Pressurizer Relief Tank), Rev 60 OP/1/A/6100/010G (Annunciator Response for Panel 1AD-6) Rev 77 AD-HU-ALL-004 (Procedure And Work Instruction Use and Adherence), Rev 10
Handouts:	Handout 1: Enclosure 4.3 (PRT Cooling) of OP/1/A/6150/004 (Pressurizer Relief Tank) marked up for place-keeping through Step 3.5.
Time Critical Task:	NO
Validation Time:	12 minutes
NOTE:	The JPM should be pre-briefed in the Briefing Room.

Critical Step Justification	
Step 4	This step is critical because pressing the 1NC-107A OPEN pushbutton is necessary to cool the PRT per Enclosure 4.3 of OP/1/A/6150/004 (Pressurizer Relief Tank).
Step 5	This step is critical because pressing the 1WL-33 OPEN pushbutton is necessary to cool the PRT per Enclosure 4.3 of OP/1/A/6150/004 (Pressurizer Relief Tank).
Step 6	This step is critical because pressing the 1WL-3 and 1WL-36 CLOSE pushbutton is necessary to cool the PRT per Enclosure 4.3 of OP/1/A/6150/004 (Pressurizer Relief Tank).
Step 7	This step is critical because rotating the 1WL-23 Control Switch clockwise to MAN is necessary to cool the PRT per Enclosure 4.3 of OP/1/A/6150/004 (Pressurizer Relief Tank).
Step 11	This step is critical because pressing the 1WL-3 and 1WL-36 OPEN pushbutton is necessary to cool the PRT per Enclosure 4.3 of OP/1/A/6150/004 (Pressurizer Relief Tank).
Step 12	This step is critical because pressing 1WL-33 and the 1NC-107A CLS pushbutton is necessary to cool the PRT per Enclosure 4.3 of OP/1/A/6150/004 (Pressurizer Relief Tank).
Step 16	This step is critical because rotating the 1WL-23 Control Switch counter-clockwise to AUTO is necessary to cool the PRT per Enclosure 4.3 of OP/1/A/6150/004 (Pressurizer Relief Tank).

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-39 (100%).
2. Place Simulator in RUN.
3. Lower reactor power to ≈97% by manually adjusting Turbine load, or some other convenient means.
4. Open one Pressurizer PORV until PRT Temperature is ≈114°F, and THEN Close.
5. Ensure that PRT Level is < 88% and that PRT Rupture Disc does NOT fail.
6. Ensure 1WL-41B is Open.
7. Ensure that PRT and NCDT pressures are approximately equal.
8. If necessary, use NCPLP90 = 4, to raise PRT pressure to 4 psig.
9. Ensure 1AD-6, C-9, PRT HI TEMP, is LIT.
10. Since 1AD-6, C-9, PRT HI TEMP, alarms at 114°F and does NOT clear until 110°F, cool the PRT to 112°F to lower the time commitment of the JPM.

OR

1. Reset to IC-245 (August, 2019)
2. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.
3. Leave Simulator in FREEZE until operator is ready to begin.

NOTE: **The Booth/Floor Instructor will need to control BOP during the performance of this JPM.**

(Denote Critical Steps with an asterisk)*

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(Caution prior to Step 3.6) NCDT pressure will rise rapidly to PRT pressure. IF NCDT pressure goes above VCT pressure, NC Pump #2 and #3 seals will be adversely affected.	The operator reads the Caution and proceeds.		
2	(Step 3.6) IF 1NV-94AC (U1 NC Pumps Seal Water Return Cont Inside Isol) AND 1NV-95B (U1 NC Pump Seal Water Return Cont Outside Isol) open, check VCT pressure is greater than PRT pressure.	The operator observes the 1NV-94AC and 1NV-95B Red status lights are LIT, and Green status lights are OFF. The operator observes 1NVP5500 (VCT pressure) and 1NCP-5130 (PRT pressure) and determines that VCT pressure is greater than PRT pressure.		
3	(Note prior to Step 3.7) IF 1WL-41B (NCDT Vent Cont Outside Isol) open, Steps 3.7 - 3.9 should be performed without delay.	The operator reads the Note and proceeds.		
*4	(Step 3.7) Open 1NC-107A (Unit 1 PRT To NCDT Pump Drn Isol).	The operator presses the 1NC-107A OPEN pushbutton and observes the Red status light LIT, Green status light is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(Step 3.8) Open 1WL-33 (NCDT Pumps to PRT).	The operator presses the 1WL-33 OPEN pushbutton and observes the Red status light LIT, Green status light is OFF.		
*6	(Step 3.9) Close: • 1WL-3 (Unit 1 NCDT Outlet Isol) • 1WL-36 (NCDT Pumps Recirc)	The operator presses the 1WL-3 CLOSE pushbutton and observes the Green status light LIT, Red status light is OFF. The operator presses the 1WL-36 CLOSE pushbutton and observes the Green status light LIT, Red status light is OFF.		
*7	(Step 3.10) Align 1WL-23 (NCDT Pumps Disch Control) as follows: (Step 3.10.1) Select "MAN" on "1WL-23 Mode Select".	The operator rotates the 1WL-23 Control Switch clockwise to MAN.		
8	(Step 3.10.2) Close 1WL-23 (NCDT Pumps Disch Control).	The operator observes the 1WLM0230 controller output to be “0.”		
9	(Step 3.11) IF 1WL-41B (NCDT Vent Cont Outside Isol) open, perform the following: (Step 3.11.1) Monitor NCDT level.	The operator observes the 1WL-41B Red status light is LIT, Green status light is OFF. The operator observes 1WLP-5153 (NCDT Level) to be 48%.		
10	(Step 3.11.2) IF NCDT level approaches 90%, close 1WL-41B (NCDT Vent Cont Outside Isol).	The operator reads the Step and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*11	(Step 3.12) WHEN PRT at desired temperature OR necessary to stop and lower NCDT level, perform the following: (Step 3.12.1) Open: • 1WL-3 (Unit 1 NCDT Outlet Isol) • 1WL-36 (NCDT Pumps Recirc)	The operator observes1NCP-5350 (PRT Temperature) to be lowering. The operator observes that 1AD-6, C9, is DARK. The operator presses the 1WL-3 OPEN pushbutton and observes the Red status light LIT, Green status light is OFF. The operator presses the 1WL-36 OPEN pushbutton and observes the Red status light LIT, Green status light is OFF. **NOTE:** **MCB Annunciator 1AD-6, C9 will clear at 110°F.**		
*12	(Step 3.12.2): Close: • 1WL-33 (NCDT Pumps to PRT) • 1NC-107A (Unit 1 PRT To NCDT Pump Drn Isol)	The operator presses the 1WL-33 CLS pushbutton and observes the Green status light LIT, Red status light is OFF. The operator presses the 1NC-107A CLS pushbutton and observes the Green status light LIT, Red status light is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
13	(Step 3.12.3) IF PRT over pressure initiated, THEN notify Radwaste to isolate PRT over pressure per OP/0/A/6200/518 (Waste Gas Operation).	The operator recognizes that the PRT is not overpressurized, and proceeds.		
14	(Step 3.12.4) Align 1WL-23 (NCDT Pumps Disch Control) as follows: (Step 3.12.4.1) IF NCDT level greater than 48%, lower NCDT level to 48% using 1WL-23 (NCDT Pumps Disch Control).	The operator observes 1WLP-5153 (NCDT Level) is lowering to ≈42-46%.		
15	(Step 3.12.4.2) Ensure 1WL-23 (NCDT Pumps Disch Control) closed.	The operator observes the 1WLM0230 controller output to be “0.”		
*16	(Step 3.12.4.3) Select "AUTO" on "1WL-23 Mode Select".	The operator rotates the 1WL-23 Control Switch counter-clockwise to AUTO.		
17	(Step 3.12.5) WHEN NCDT level AND pressure normal, ensure 1WL-41B (NCDT Vent Cont Outside Isol) open.	The operator observes the 1WL-41B the Red status light is LIT, Green status light is OFF.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

Job Performance Measure No.: 2020 Systems - Control Room JPM G

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- Unit 1 is operating at power.
- A transient has resulted in a discharge to the Pressurizer Relief Tank from the Pressurizer PORVs.
- The plant has stabilized and all Pressurizer PORVs are closed.
- Previous PRT cooling operations have lowered PRT Temperature, however, MCB Annunciator 1AD-6, C9, PRT HI TEMP, is still LIT.
- The following PRT parameters are observed:
    - PRT Level is ≈ 76%.
    - PRT Pressure is ≈ 4 psig.
    - PRT Temperature ≈ 112°F.
- Steps 3.1 through 3.5 of Enclosure 4.3 (PRT Cooling) of OP/1/A/6150/004 (Pressurizer Relief Tank), have been completed.

INITIATING CUE:

The CRS has directed you to perform Enclosure 4.3 (PRT Cooling) of OP/1/A/6150/004 (Pressurizer Relief Tank), starting with Step 3.6, to lower PRT Temperature to clear 1AD-6, C9, PRT HI TEMP.

SIM JPM H

Facility:	McGuire	Task No.:	
Task Title:	Start and Stop the 1B NCP for NCS Venting	JPM No.:	2020 Systems - Control Room JPM H
K/A Reference:	003 A4.01 (3.3/3.2)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: __X__

Classroom ______ Simulator __X__ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- A plant startup is in progress per OP/1/A/6100/001 (Controlling Procedure For Unit Startup).
- The crew is implementing Attachment 2 (Venting the NC System (Control Room Activities)) of OP/1/A/6100/SU-6 (Venting the NC System).
- The NC System is water solid.
- NC System pressure is being maintained between 320-350 psig.
- During the NC System pressure increase to the current system pressure, it was noted that the 1B NCP Seal Leakoff flow increased 0.2 gpm.
- The crew is ready to conduct an initial 60 second run of the 1B NC Pump.
- Attachment 1 (Startup and Operation) of OP/1/A/6150/002 A (Reactor Coolant Pump Operation) has been completed through step 3.1.3 to support NC Pump operation.
- Another operator has been assigned to control and maintain NCS pressure during the NCP run.
- AO’s are standing by in the field to assist.

Initiating Cue:	The CRS has directed you to start the 1B NCP per Section 3.3 of Attachment 1 (Startup and Operation) of OP/1/A/6150/002 A (Reactor Coolant Pump Operation); and then stop the 1B NCP under either of the following conditions: • The LOWEST NC Tcold lowers to 74°F. • The 1B NCP has operated for 60 seconds.

Task Standard: The operator will conduct a 60 second run of the 1B NC Pump in accordance with Attachment 1 of OP/1/A/6150/002 A.

Required Materials: None

General References:
OP/1/A/6100/001 (Controlling Procedure For Unit Startup), Rev 186
OP/1/A/6100/SU-6 (Venting the NC System), Rev 38
OP/1/A/6150/002 A (Reactor Coolant Pump Operation), Rev 71
OP/1/A/6100/022 (Unit 1 Data Book), Rev 481
AD-HU-ALL-004 (Procedure And Work Instruction Use and Adherence), Rev 10

Handouts: Handout 1: Attachment 1 (Startup and Operation) of OP/1/A/6150/002 A (Reactor Coolant Pump Operation) marked up for place-keeping.

Time Critical Task: NO

Validation Time: 15 minutes

NOTE: The JPM should be pre-briefed in the Briefing Room.

Critical Step Justification

Step 16	This step is critical because pressing the START pushbutton for either 1B1 or 1B2 Oil Lift Pumps is necessary to conduct a 60 second run of the 1B NC Pump in accordance with Attachment 1 of OP/1/A/6150/002 A.
Step 19	This step is critical because pressing the 1B NC Pump START pushbutton is necessary to conduct a 60 second run of the 1B NC Pump in accordance with Attachment 1 of OP/1/A/6150/002 A.
Step 22	This step is critical because pressing the 1B NC Pump STOP pushbutton is necessary to conduct a 60 second run of the 1B NC Pump in accordance with Attachment 1 of OP/1/A/6150/002 A.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-5 (Mode 5, water solid).
2. Place Simulator in RUN.
3. Take actions through Step 3.3.9 of Attachment 2 (Venting the NC System (Control Room Activities)) of OP/1/A/6100/SU-6 (Venting the NC System)
4. Ensure NC System pressure adjusted between 320-350 psig.
5. Ensure that Seal Water Injection flow to each NCP is 8-12 gpm.
6. Ensure that 1NV-127A is aligned to the VCT.
7. Ensure that plant conditions permit the startup of the 1B NC Pump per Attachment 1 of OP/1/A/6150/002 A (Reactor Coolant Pump Operation).
8. Allow plant conditions to stabilize.
9. Freeze the Simulator.

OR

1. Reset to IC-246 (August, 2019) [It may be necessary to run the CTS file to defeat the NCP overcurrent relay: CTS-SET_NCP_51_RELAYDISABLED.CTS]
2. Ensure that Seal Water Injection flow to each NCP is 8-12 gpm.
3. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.
4. Leave Simulator in FREEZE until operator is ready to begin.

NOTE: **During the performance of this JPM, the Simulator Instructor will need to control NCS pressure between 325-350 psig and monitor unrelated alarms and silence as needed.**

(Denote Critical Steps with an asterisk)*

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(Step 3.3.1) Check the associated 6900 V supply breaker closed.	The operator observes the 1B NC Pump supply breaker Red status light lit, Green status light OFF.		
2	(Step 3.3.2) Check reactor power less than 25%.	The operator observes that the Reactor Trip Breakers are OPEN (or equivalent).		
3	(Step 3.3.3) Check 1B NC Pump No. 1 Seal D/P is greater than 200 psid.	The operator observes 1B NC Seal ΔP, 1NVP-5220, and notes ΔP is 300 psid.		
4	(Step 3.3.4) Check VCT pressure equal to OR greater than 15 psig.	The operator observes VCT Pressure, 1NVP-5500, and notes pressure is approximately 30 psig.		
5	(Step 3.3.5) Check 8 gpm seal injection flow established to 1B NC Pump.	The operator observes 1B NC Pump Seal Flow, 1NVP-5320, and notes flow is approximately 9.0 gpm.		
6	(Notes prior to Step 3.3.6) NORMAL is described as ZERO static level. The preferred method to check NC Pump oil level is by visual inspection.	The operator reads the Notes and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
7	(Caution prior to Step 3.3.6) Starting an NC motor with LOW oil has the risk of an immediate bearing wipe.	The operator reads the Caution and proceeds.		
8	(Step 3.3.6) Check the following Normal via OAC OR by visual inspection of 1B NC Pump. Upper oil pot level Lower oil pot level	The operator uses OAC, NCPMPALL (or equivalent), and notes that lower and upper oil levels – all green. **Cue:** **IF asked, AO reports that all lower and upper oil pot levels are satisfactory.**		
9	(Step 3.3.7) Check 1NC-29 (B Loop Pzr Spray Control) CLOSED.	The operator observes the B Loop Pzr Spray SLIMS Red closed light (or equivalent) is LIT.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
10	(Notes prior to Step 3.3.8) Effective spray flow can be achieved with any of the following: • 1B NC Pump using 1NC-29 (B Loop Spray Control) • 1A, 1C and 1D NC Pumps using 1NC-27 (A Loop Pzr Spray Control) • ND System in RHR Mode using 1NV-840A (ND to Pzr Aux Spray Control) • ND System not in RHR Mode using 1NV-21A (NV Spray to Pzr Isol)	The operator reads the Notes and proceeds.		
11	(Caution prior to Step 3.3.8) Starting an NC Pump with either Pressurizer Spray Valve open will increase spray flow and affect NC System pressure.	The operator reads the Caution and proceeds.		
12	(Step 3.3.8) IF 1A NC Pump OFF, THEN ensure 1NC-27 (A Loop Pzr Spray Control) CLOSED.	The operator observes the A Loop Pzr Spray SLIMS Red closed light (or equivalent) is LIT.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
13	(Step 3.3.9) IF 1B NC Pump No. 1 seal leakoff NOT greater than or equal to the minimum leakoff required per Unit 1 Data Book, perform one of the following: (Step 3.3.9.a) Check that a 0.2 gpm increase occurred during pressurization. OR (Step 3.3.9.b) Perform Attachment 4 (Operator Action for Low No.1 Seal Leakoff Flow) to locally measure flow.	The operator recognizes that a 0.2 gpm increase on the 1B NC Pump seal leakoff flow occurred during pressurization; and continues.		
14	(Step 3.3.10) IF either 1B NC Pump Standpipe alarm lit,…..	The operator observes that AD-7/A-2, NC Pump B No. 2 Seal S-Pipe Hi Level, and AD-7/B-2, NC Pump B No. 2 Seal S-Pipe Lo Level, annunciators are EXTINGUISHED.		
15	(Step 3.3.11) Ensure all personnel are clear of 1B NCP Safety Breaker by at least 10 feet.	The operator contacts AO and directs that they ensure that all personnel are clear of the 1B NC Pump Safety Breaker by at least 10 feet. **Cue:** **AO reports that all personnel are clear of the 1B NC Pump Safety Breaker by at least 10 feet.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*16	(Step 3.3.12) Two minutes prior to starting 1B NC Pump, start one of the associated oil lift pumps.	The operator presses the START pushbutton for either 1B1 or 1B2 Oil Lift Pumps, and observes Red status light LIT, Green status light OFF.		
17	(Step 3.3.13) Announce starting of 1B NC Pump.	The operator announces that the 1B NC Pump will be started.		
18	(Caution prior Step 3.3.14) In Low Pressure Mode, PORVs will open on NC Narrow Range Pressure of 378 - 382 psig.	The operator reads the Caution and proceeds.		
*19	(Step 3.3.14) Start 1B NC Pump.	The operator presses the 1B NC Pump START pushbutton and observes Red status light LIT, Green status light OFF. The operator observes Motor amps increase, spike high, and then stabilize lower. The operator observes NC System flow for the 1B NC Loop increases to 100%.		
20	(Step 3.3.15) Record time 1B NC Pump started:	The operator records the time the pump is started in the space provided.		
21	(Step 3.3.16) IF desired to stop 1B NC Pump in less than one minute after start,…	The operator recognizes that the CRS direction is to run the 1B NC Pump until either the LOWEST NC Tcold lowers to 74°F, (Not Expected) or the 1B NCP has operated for 60 seconds; and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*22	(CRS Directed Action) The CRS has directed you to start the 1B NCP per Section 3.3 of Attachment 1 (Startup and Operation) of OP/1/A/6150/002 A (Reactor Coolant Pump Operation); and then stop the 1B NCP under either of the following conditions: • The LOWEST NC Tcold lowers to 74°F. • The 1B NCP has operated for 60 seconds.	≥60 seconds after pump start, the operator presses the 1B NC Pump STOP pushbutton and observes Green status light LIT, Red status light OFF. The operator observes Motor amps lower to 0. The operator observes NC System flow for the 1B NC Loop decrease to 0%.		
23	(Step 3.3.17) WHEN two minutes have elapsed from 1B NC Pump start, THEN check the oil lift pump that was started has stopped.	The operator observes the running Oil Lift Pump Green status light is LIT, Red status light is OFF.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Systems - Control Room JPM H

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

INITIAL CONDITIONS:

- A plant startup is in progress per OP/1/A/6100/001 (Controlling Procedure For Unit Startup).
- The crew is implementing Attachment 2 (Venting the NC System (Control Room Activities)) of OP/1/A/6100/SU-6 (Venting the NC System).
- The NC System is water solid.
- NC System pressure is being maintained between 320-350 psig.
- During the NC System pressure increase to the current system pressure, it was noted that the 1B NCP Seal Leakoff flow increased 0.2 gpm.
- The crew is ready to conduct an initial 60 second run of the 1B NC Pump.
- Attachment 1 (Startup and Operation) of OP/1/A/6150/002 A (Reactor Coolant Pump Operation) has been completed through step 3.1.3 to support NC Pump operation.
- Another operator has been assigned to control and maintain NCS pressure during the NCP run.
- AO's are standing by in the field to assist.

INITIATING CUE:

The CRS has directed you to start the 1B NCP per Section 3.3 of Attachment 1 (Startup and Operation) of OP/1/A/6150/002 A (Reactor Coolant Pump Operation); and then stop the 1B NCP under either of the following conditions:

- The LOWEST NC Tcold lowers to 74°F.
- The 1B NCP has operated for 60 seconds.

IN-PLANT JPM I

Facility:	McGuire	Task No.:	
Task Title:	Emergency Borate the Reactor Coolant System Locally Using 2NV-269	JPM No.:	2020 Systems – In-Plant JPM I
K/A Reference:	APE 024 AA1.04 (3.6/3.7)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: X Actual Performance: ______

Classroom ______ Simulator ______ Plant X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- Unit 2 was at 100% power when a Boron dilution event occurred.
- AP/2/A/5500/38 (Emergency Boration and Response to Inadvertent Dilution) was entered.
- While attempting to open 2NV-265B (Boric Acid To NV Pumps), the BOP discovered that 2NV-265B was de-energized.

Initiating Cue: The CRS has directed you to emergency borate the NC System by performing Step 12.d RNO of AP/2/A/5500/38 (Emergency Boration and Response to Inadvertent Dilution).

A Portion of this JPM is TIME CRITICAL

Task Standard: The operator will attempt to open 2NV-265B, and when this fails open 2NV-269 within ten (10) minutes of dispatch.

Required Materials: PPE (Hardhat, Safety Glasses, Hearing Protection, Safety Shoes etc.)
Dosimetry

General References: AP/2/A/5500/38 (Emergency Boration and Response to Inadvertent Dilution), Rev 10

OMP 4-3 (Use of Emergency and Abnormal Procedures and FLEX Guidelines), Rev 48

PT/0/A/4600/113 (McGuire Time Critical Actions/Time Sensitive Actions), Enclosure 13.3 (Stop Dilution and Borate During a Dilution Event), Rev 28

Handouts: Handout 1: Step 12.d RNO (Page 8 of 19) of AP/2/A/5500/38 (Emergency Boration and Response to Inadvertent Dilution) marked up for place-keeping.

Time Critical Task: YES – Enclosure 13.3 of PT/0/A/4600/113

Modes 1 and 2: Operators will stop dilution and initiate boration within 15 minutes. This may involve time critical local actions to open NV-265 or NV-269 (10 minutes from dispatch) per AP-38. Time starts when rods reach insertion limit (automatic rod control), or when reactor trips (manual rod control). (If you stop the dilution prior to going below rod insertion limit or reactor trip, emergency boration is not required.)

Only securing dilution within times above is required by the safety analysis, but UFSAR 15.4.6 states that operators can also initiate boration in these stated times. Operators will therefore be required to meet times for both securing dilution and initiating boration. The stated times are long enough for operators to perform actions. Note that UFSAR Section 15.4.6 states that operators have "at least 15 minutes" (Modes 1 and 2). The actual limiting times per UFSAR Table 15-19 are 16.6 minutes when rods are in manual (after trip), and 25.9 minutes when rods are in auto (after reaching rod insertion limit).

Validation Time: 8 minutes

NOTE: Start this JPM from the hallway outside of the Ops kitchen area.

Record the Time Critical Completion Time (in JPM step number 2) when 2NV-269 is open.

Critical Step Justification	
Step 1	This step is critical because locating 2NV-265B, pressing downward on the Motor handwheel clutch, and rotating the handwheel in the counter-clockwise direction is necessary to attempt to open 2NV-265B.
Step 2	This step is critical because locating 2NV-269, removing the locking device, and rotating the handwheel in the counter-clockwise direction is necessary to manually open 2NV-269.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*1	(Step 12.d RNO) Perform the following: (Step 12.d RNO 1) Dispatch operator to OPEN 2NV-265B (aux bldg, 733+3, JJ-57, near chemical addition tank).	The operator locates 2NV-265B, presses downward on the Motor handwheel clutch, and rotates the handwheel in the counter-clockwise direction. **Cue:** **Handwheel clutch engaged** **Force applied in the counter-clockwise direction** **Handwheel is <u>NOT</u> moving** The operator recognizes that valve cannot be opened and continues.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
2 *	(Step 12.d RNO 2) IF 2NV-265B cannot be opened, THEN perform the following: (Step 12.d RNO 2.a) Dispatch operator to unlock and OPEN 2NV-269 (Unit 2 NV Pump Boric Acid Supply Isol (Emergency Boration Valve)) (aux bldg, 733+4, JJ-58, near chemical addition tank).	The operator locates 2NV-269, removes the locking device, and rotates the handwheel in the counter-clockwise direction within ten minutes of dispatch. **Cue:** **Lock removed, Handwheel rotated fully counter-clockwise.** **Stop Time for Time Critical Task:** ____________________		
3	(Step 12.d RNO 2.b) OPEN 2NV-267A (Boric Acid To Blender Control).	The operator calls the Control Room to report 2NV-269 Open and requests that the BOP Open 2NV-267A. **Cue:** **The Control Room operator acknowledges that 2NV-269 and 2NV-267A is open.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
4	(Step 12.d RNO 3) Do not continue until 2NV-265B or 2NV-269 flowpath above is aligned.	The operator recognizes that 2NV-269 is OPEN and indicates that the task is complete.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: _______________

Job Performance Measure No.: 2020 Systems – In-Plant JPM I

Examinee’s Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner’s Signature: ________________________________ Date: ____________________

INITIAL CONDITIONS:	• Unit 2 was at 100% power when a Boron dilution event occurred. • AP/2/A/5500/38 (Emergency Boration and Response to Inadvertent Dilution) was entered. • While attempting to open 2NV-265B (Boric Acid To NV Pumps), the BOP discovered that 2NV-265B was de-energized.
INITIATING CUE:	The CRS has directed you to emergency borate the NC System by performing Step 12.d RNO of AP/2/A/5500/38 (Emergency Boration and Response to Inadvertent Dilution).

A Portion of this JPM is TIME CRITICAL

NOTE: No plant equipment should be operated during the performance of this JPM. All actions must be SIMULATED.

IN-PLANT JPM J

Facility:	McGuire	Task No.:	
Task Title:	Start the Hydrogen Analyzers	JPM No.:	2020 Systems – In-Plant JPM J
K/A Reference:	069 AA1.03 (2.8/3.0)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: X Actual Performance: _______

Classroom _______ Simulator _______ Plant X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), Key 172 and Handout 1.

Initial Conditions:

- Unit 1 has tripped from 100% power due to an accident.
- The crew is in EP/1/A/5000/FR-Z.1 (Response to High Containment Pressure).
- The crew is checking Containment Hydrogen Concentration.

Initiating Cue: The CRS has directed you to place the Hydrogen Analyzers in service in accordance with Enclosure 5 (Placing H_2 Analyzers In Service) of EP/1/A/5000/G-1 (Generic Enclosures).

Task Standard: The operator will place the 1A Hydrogen Analyzer in service.

Required Materials: PPE (Hardhat, Safety Glasses, Hearing Protection, Safety Shoes etc.)
Dosimetry
KEY #172 (Key 178 will be Simulated)

General References: EP/1/A/5000/FR-Z.1 (Response to High Containment Pressure), Rev 19

	EP/1/A/5000/G-1 (Generic Enclosures), Rev 41
	OMP 4-3 (Use of Emergency and Abnormal Procedures and FLEX Support Guidelines), Rev 48
Handouts:	Handout 1: Enclosure 5 (Placing H_2 Analyzers In Service) of EP/1/A/5000/G-1 (Generic Enclosures).
Time Critical Task:	NO
Validation Time:	20 minutes
NOTE:	The Examiner will need to sign out Key 172 from the WCC before using this JPM.

Critical Step Justification	
Step 2	This step is critical because going to the 1MICA6851 1A VX HYDROGEN ANALYZER REMOTE CABINET is necessary to place the 1A Hydrogen Analyzer in service.
Step 3	This step is critical because using Key 172 to Open the 1MICA6851 1A VX HYDROGEN ANALYZER REMOTE CABINET is necessary to place the 1A Hydrogen Analyzer in service.
Step 4	This step is critical because is placing Key 178 in the “ISOLATION VALVES OPEN” switch, and rotating the switch clockwise is necessary to place the 1A Hydrogen Analyzer in service.
Step 6	This step is critical because rotating the "HYDROGEN ANALYZER SAMPLE ENABLE SWITCH" clockwise is necessary to place the 1A Hydrogen Analyzer in service.
Step 7	This step is critical because rotating the "HYDROGEN ANALYZER SAMPLE SELECT" switch counter-clockwise is necessary to place the 1A Hydrogen Analyzer in service.
Step 8	This step is critical because pressing the "OFF" pushbutton for “SAMPLE ROUTED TO PAMS PANEL” switch is necessary to place the 1A Hydrogen Analyzer in service.
Step 9	This step is critical because rotating the “OFF-STANDBY /ANALYZE” switch clockwise is necessary to place the 1A Hydrogen Analyzer in service.
Step 10	This step is critical because pressing the "LOCAL/REMOTE SELECTOR" pushbutton is necessary to place the 1A Hydrogen Analyzer in service.
Step 12	This step is critical because rotating the “FUNCTION SELECTOR” counterclockwise is necessary to place the 1A Hydrogen Analyzer in service.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), Key 172 and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Step 1) Obtain one key 172 and two keys 178 from "Unit 1 EP/AP Keys" on Unit 1 SRO desk.	The operator recognizes that the required Keys have been obtained and proceeds. **Cue:** **The Use of the 178 Keys will be <u>simulated</u> during this JPM.**		
*2	(Step 2) Start 1A H_2 Analyzer as follows: (Step 2.A) Proceed to “1MICA6851 1A VX HYDROGEN ANALYZER REMOTE CABINET (750' elevation in cable spreading room).	The operator proceeds to cabinet.		
*3	(Step 2.B) Use key 172 to access remote panel.	The operator uses Key 172 to Open Cabinet.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(Step 2.C) Inside remote panel, use key 178 to place “ISOLATION VALVES OPEN” switch to “ON”.	The operator places Key 178 in the “ISOLATION VALVES OPEN” switch and rotates the switch clockwise. **Cue:** **The Switch is in the ON position.**		
5	(Step 2.D) Check "POWER ON" light above “ISOLATION VALVES OPEN” switch – LIT.	The operator observes the “POWER ON" light. **Cue:** **The POWER ON light is LIT.**		
*6	(Step 2.E) Place "HYDROGEN ANALYZER SAMPLE ENABLE SWITCH" to "SAMPLE".	The operator rotates the "HYDROGEN ANALYZER SAMPLE ENABLE SWITCH" clockwise. **Cue:** **The Switch is in SAMPLE.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*7	(Step 2.F) Select sample location as follows: (Step 2.F.1) Place "HYDROGEN ANALYZER SAMPLE SELECT" switch to “UPPER CONT” (Step 2.F.2) Check “POWER ON” light for selected location - OFF	The operator rotates the "HYDROGEN ANALYZER SAMPLE SELECT" switch counter-clockwise. **Cue:** **The Switch is in UPPER CONT.** The operator observes the “POWER ON" light. **Cue:** **The POWER ON light is OFF.**		
*8	(Step 2.G) Depress "OFF” pushbutton on “SAMPLE ROUTED TO PAMS PANEL” switch.	The operator presses the "OFF" pushbutton for “SAMPLE ROUTED TO PAMS PANEL” switch.		
*9	(Step 2.H) Place “OFF-STANDBY/ANALYZE” switch to "ANALYZE"	The operator rotates the “OFF-STANDBY /ANALYZE” switch clockwise. **Cue:** **The Switch is in Analyze.**		
*10	(Step 2.I) Depress "LOCAL/REMOTE SELECTOR" pushbutton.	The operator presses the "LOCAL/REMOTE SELECTOR" pushbutton.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
11	(Step 2.J) Ensure "H2 DUAL RANGE SW" is in 0-30% range.	The operator observes the position of the "H2 DUAL RANGE SW". **Cue:** **The Switch is in the 0-30% range.**		
*12	(Step 2.K) Place "FUNCTION SELECTOR" to "SAMPLE".	The operator rotates the "FUNCTION SELECTOR" counterclockwise. **Cue:** **The Function Selector is in the SAMPLE position.**		
13	(Step 2.L) Do not continue until 5 minutes have elapsed.	The operator waits for five minutes. **Cue:** **Using Time Compression, five minutes have elapsed.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
14	(Step 2.M) IF "COMMON ALARM" lit, THEN perform the following: (Note prior to Step 2.M.1) A low gas flow condition may be causing the "COMMON ALARM" and may clear itself once condensation is removed from the sample line. (Step 2.M.1) Depress "ALARM RESET". (Step 2.M.2) IF "COMMON ALARM" clears, THEN GO TO Step 2.n.	The operator observes the COMMON ALARM. **Cue:** **The COMMON ALARM light is LIT.** The operator reads the NOTE, and proceeds. The operator presses the "ALARM RESET" pushbutton and observes the COMMON ALARM. **Cue:** **ALARM RESET is depressed.** **The COMMON ALARM light is CLEAR.** The operator proceeds to Step 2.N.		
15	(Step 2.N) Notify Control Room that 1A H2 Analyzer is in service.	The operator calls the control room and reports. **Cue:** **As the BOP, acknowledge report.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
16	(Step 3) Start 1B H2 Analyzer as follows.....	The operator starts to place the 1B Hydrogen Analyzer in service. **Cue:** **Another Operator will start 1B H2 Analyzer and complete the Enclosure.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Systems – In-Plant JPM J

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- Unit 1 has tripped from 100% power due to an accident.
- The crew is in EP/1/A/5000/FR-Z.1 (Response to High Containment Pressure).
- The crew is checking Containment Hydrogen Concentration.

INITIATING CUE:

The CRS has directed you to place the Hydrogen Analyzers in service in accordance with Enclosure 5 (Placing H_2 Analyzers In Service) of EP/1/A/5000/G-1 (Generic Enclosures).

NOTE: No plant equipment should be operated during the performance of this JPM. All actions must be SIMULATED.

IN-PLANT JPM K

Facility: McGuire

Task No.:

Task Title: <u>Establish NC Pump Seal Injection From the SSF</u>

JPM No.: <u>2020 Systems – In-Plant JPM K</u>

K/A Reference: EPE 055 EK3.02 (4.3/4.6)

Examinee:

NRC Examiner:

Facility Evaluator:

Date:

<u>Method of testing:</u>

Simulated Performance: __X__ Actual Performance: ______

Classroom ______ Simulator ______ Plant __X__

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and WHEN the operator locates the Brown Folder at the SSF, provide Handout 1.

Initial Conditions:	• A Loss of All AC has occurred on Unit 1. • EP/1/A/5000/ECA-0.0 (Loss of All AC Power) has been implemented. • The CRS has dispatched an operator to complete Enclosure 3 (Unit 1 ETA And ETB Rooms - ECA-0.0 Actions).
Initiating Cue:	The CRS has directed you to obtain the Brown Folder at SSF and complete Enclosure 2 (Unit 1 SSF-ECA-0.0 Actions).

Task Standard: The operator will place the SSF Diesel in operation and supply power to 1SLXG, start the Standby Makeup Pump and ensure that it is supplying NCP seal injection within seven (7) minutes of dispatch, ensure that 1SLXG is supplying power to SMXG and SMXG-1, and that Battery Chargers SDSP-1 and SDSP-2 supply breakers are closed.

Required Materials: PPE (Hardhat, Safety Glasses, Hearing Protection, Safety Shoes etc.)

General References:	EP/1/A/5000/ECA-0.0 (Loss of All AC Power), Rev 44 OMP 4-3 (Use of Emergency And Abnormal Procedures And FLEX Support Guidelines), Rev 48 PT/0/A/4600/113 (McGuire Time Critical Actions/Time Sensitive Actions), Enclosure 13.9 (Initiate SSF NCP Seal Injection and Swap to the SSF), Rev 28
Handouts:	Handout 1: Blank copy of Enclosure 2 (Unit 1 SSF – ECA-0.0 Actions) of EP/1/A/5000/ECA-0.0 (Loss of All AC Power)
Time Critical Task:	YES: According to PT/0/A/4600/113 (Operator Time Critical Task Verification), Enclosure 13.9 (Initiate SSF NCP Seal Injection and Swap to the SSF): **Expectation**: Seal injection from standby makeup pump can be initiated within 10 minutes of a loss of all AC power event or an NFPA 805 fire event. This requires completion of actions at SSF to start SBMUP within 7 minutes of dispatch, and completion of actions in ETA room to swap EMXA-4 within 4 minutes of dispatch. To support the local actions, the following dispatches must be initiated: Operator dispatched to SSF within 3 minutes of loss of all NCP seal cooling. (Total time = 7 min + 3 min = 10 min to initiate NCP seal injection from SBMUP). Consequently, the operator must place the SSF Diesel in operation and supply power to 1SLXG, start the Standby Makeup Pump and ensure that it is supplying NCP seal injection within 7 minutes of dispatch. This JPM should be timed starting from the OPS Kitchen. Once flow from the standby makeup pump is verified, the “critical time” stops.
Validation Time:	15 minutes

Critical Step Justification	
Step 4	This step is critical because rotating the “SSF DIESEL TEST/EMERG” switch clockwise to “EMER” is necessary to place the SSF Diesel in operation and supply power to 1SLXG.
Step 6	This step is critical because placing the “SSF DIESEL START CONTROL” switch to ON is necessary to place the SSF Diesel in operation and supply power to 1SLXG.
Step 8	This step is critical because pressing “TRIP” for “NORMAL INCOMING BREAKER CONTROL and for the two breaker control switches on far right of bottom row holding for two seconds is necessary to place the SSF Diesel in operation and supply power to 1SLXG.
Step 9	This step is critical because pressing “CLOSE” for GENERATOR BREAKER CONTROL is necessary to place the SSF Diesel in operation and supply power to 1SLXG.
Step 10	This step is critical because pressing “CLOSE” for “1SLXG-5C CTRL SW is necessary to place the SSF Diesel in operation and supply power to the SBMUP.
Step 12	This step is critical because pressing “CLOSE” for “1SLXG-4C CTRL SW is necessary to place the SSF Diesel in operation and supply power to the SBMUP.
Step 13	This step is critical because pressing the 1NV-842AC OPEN pushbutton and 1NV-849 AC is necessary to start the Standby Makeup Pump and ensure that it is supplying NCP seal injection within 7 minutes.
Step 15	This step is critical because pressing the 1NV-94AC CLOSE pushbutton is necessary to start the Standby Makeup Pump and ensure that it is supplying NCP seal injection within 7 minutes.
Step 16	This step is critical because pressing the SBMUP START pushbutton is necessary to start the Standby Makeup Pump and ensure that it is supplying NCP seal injection within 7 minutes.
Step 25	This step is critical because resetting the shunt trip and closing breaker SMXG1-FAE is necessary to ensure that 1SLXG is supplying power to SMXG.
Step 28	This step is critical because resetting the shunt trip and closing breaker SMXG1-RAD is necessary to ensure that 1SLXG is supplying power to SMXG-1, and that Battery Chargers SDSP-1 and SDSP-2 supply breakers are closed.
Step 30	This step is critical because pressing the "CLOSE" pushbutton on "1SLXG-5D CTRL SW is necessary to ensure that Battery Chargers SDSP-1 and SDSP-2 supply breakers are closed.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and WHEN the operator locates the Brown Folder at the SSF, provide Handout 1.

START TIME: ___________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Note prior to Step 1) The following steps are performed at SSF Control Panel until stated otherwise.	The operator reads the NOTE and proceeds.		
2	(Step 1) Check "LINE VOLTAGE" – APPROXIMATELY 600V.	The operator observes the line voltage meter. **Cue:** **Meter reads "0" Volts.**		
3	(Step 1 RNO) GO TO Step 3.	Operator goes to Step 3.		
*4	(Step 3) Place "SSF DIESEL TEST/EMERGENCY" switch to "EMER"	The operator rotates "SSF DIESEL TEST/EMERG" switch clockwise to "EMER" **Cue:** **Switch rotated clockwise to EMER position.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
5	(Step 4) Check “SSF DIESEL START CONTROL” switch - “OFF”	The operator observes the “SSF DIESEL START CONTROL”. **Cue:** **Switch is in "OFF" position.**		
*6	(Step 5) Place “SSF DIESEL START CONTROL” switch to “ON”	The operator places “SSF DIESEL START CONTROL” switch to ON. **Cue:** **Switch is rotated clockwise to "ON" position.**		
7	(Step 6) Check D/G – STARTS WITHIN 30 SECONDS	The operator observes Diesel condition. **Cue:** **Background noise level has increased, various gage indications are up.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*8	(Step 7) Open the following breakers: (Step 7.A) Depress "TRIP" on all nine breaker control switches inside yellow time critical border.	For all nine breakers inside the yellow time critical border the operator presses “TRIP”. For the two breaker control switches on the far right of the bottom row they will hold for 2 seconds. **Cue:** **Pushbuttons depressed, Green lights are LIT.**		
	(Step 7.B) Ensure two breaker control switches on far right of bottom row were depressed for 2 seconds.	If the operator did not already perform on previous bullet they will depress “TRIP” and hold for two seconds for the two breaker control switches on the far right of bottom row. There are no lights for these pushbuttons. **Cue:** **Pushbuttons depressed.**		
*9	(Step 8) Depress "CLOSE" on "GENERATOR BREAKER CONTROL".	The operator presses “CLOSE” for GENERATOR BREAKER CONTROL.” **Cue:** **Pushbutton depressed, Red light is LIT.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*10	(Step 9) Depress "CLOSE" on "1SLXG-5C CTRL SW".	The operator presses "CLOSE" for "1SLXG-5C CTRL SW." **Cue:** **Pushbutton depressed, Red light is LIT.**		
11	(Step 10) Wait 10 seconds.	The operator waits 10 seconds.		
*12	(Step 11) Depress "CLOSE" on "1SLXG-4C CTRL SW".	The operator presses "CLOSE" for "1SLXG-4C CTRL SW." **Cue:** **Pushbutton depressed, Red light is LIT.**		
*13	(Step 12) Open the following valves: 1NV-842AC (U1 Standby Makeup Pump Suction Isol) 1NV-849AC (U1 Standby Makeup Pump Cont Outside Isol)	The operator presses the 1NV-842AC OPEN pushbutton, observes Red status light LIT. The operator presses the 1NV-849AC OPEN pushbutton, observes Red status light LIT. **Cue:** **As each valve is repositioned, pushbutton depressed, red light is LIT.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
14	(Step 13) Check 1NV-1013C (Standby M/U Pump to NC Pmp Seals Isol) – OPEN	The operator observes Red status light LIT. **Cue:** **Red light is LIT.**		
*15	(Step 14) CLOSE 1NV-94AC (U1 NC Pumps Seal Water Return Cont Inside Isol)	The operator presses the 1NV-94AC CLOSE pushbutton, and observes Green status light LIT. **Cue:** **Pushbutton depressed, Green light is LIT.**		
*16	(Step 15) Start Unit 1 Standby Makeup pump.	The operator presses the SBMUP START pushbutton, observes Red status light LIT. **Cue:** **Pushbutton depressed, Red light is LIT.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
17	(Step 16) Check Unit 1 Standby Makeup pump flow (1NVP6420) - GREATER THAN OR EQUAL TO 26 GPM.	The operator observes meter **Cue:** **Meter indicates 28 gpm.** **Stop Time for Time Critical Task:** **--------------------------------** **NOTE: This time must be ≤ 7 minutes.**		
18	(Note prior to Step 17) Remaining steps in this enclosure are not time critical, but must be completed in a timely manner.	The operator reads the NOTE and proceeds.		
19	(Step 17) Check 1NV-1012C (Standby M/U Pump Disch to Cont Sump) - CLOSED	The operator observes Green status light LIT. **Cue:** **Green light is LIT.**		
20	(Step 18) Check SSF D/G - RUNNING	The operator observes Diesel condition. **Cue:** **Background noise level is heard, various gage indications are up.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
21	(Step 19) Check SSF D/G "FREQUENCY" - AT 60 Hz.	The operator observes frequency meter. **Cue:** **Meter indicates 60 Hz.**		
22	(Step 20) Check SSF D/G "VOLTAGE" – AT 600V.	The operator observes meter. **Cue:** **Meter indicates 600 Volts.**		
23	(Note prior to Step 21) If SMXG1-FAE and SMXG1-RAD were previously shunt tripped from the SSF Control Panel, they will be in their intermediate position.	The operator reads the NOTE and proceeds.		
24	(Step 21) At SMXG1: (Step 21.A) Check breaker SMXG1-FAE (SDSP1 BATTERY CHARGER) – IN INTERMEDIATE POSITION.	The operator observes breaker SMXG1-FAE. **Cue:** **Breaker is in the Tripped/Intermediate position.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*25	(Step 21.B) Reset shunt trip and close breaker SMXG1-FAE as follows: (Step 21.B.1) Slide breaker fully to OPEN position. (Step 21.B.2) CLOSE breaker.	The operator resets the shunt trip by sliding the breaker down to the fully Open position. **Cue:** **Breaker is down in Open position.** The operator closes the breaker by pushing the breaker up into the Closed position. **Cue:** **Breaker is up in the Closed position.**		
26	(Step 21.C) Wait 10 seconds.	The operator waits 10 seconds.		
27	(Step 21.D) Check breaker SMXG1-RAD (SDSP2 BATTERY CHARGER) - IN INTERMEDIATE POSITION.	The operator observes breaker SMXG-1 RAD. **Cue:** **Breaker is in the Tripped/Intermediate position.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*28	(Step 21.E) Reset shunt trip and close breaker SMXG1-RAD (SDSP2 BATTERY CHARGER) as follows: (Step 21.E.1) Slide breaker fully to OPEN position. (Step 21.E.2) CLOSE breaker.	The operator resets the shunt trip by sliding the breaker down to the fully Open position. **Cue:** **Breaker is down in Open position.** The operator closes the breaker by pushing the breaker up into the Closed position. **Cue:** **Breaker is up in the Closed position.**		
29	(Step 22) At SMXG: (Step 22.A) Ensure SMXG-F5A (UNIT 1 PRESSURIZER HEATERS 28/55/56 FEEDER) is CLOSED.	The operator observes breaker position. **Cue:** **Breaker is closed.**		
*30	(Step 23) At SSF Control Panel: (Step 23.A) Depress "CLOSE" on "1SLXG-5D CTRL SW (SDSS BATTERY CHARGER FDR BKR CONTROL)".	The operator presses the CLOSE pushbutton and observes the Red status light. **Cue:** **Pushbutton depressed, Red light is LIT.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
31	(Step 23.B) Check SSF D/G "FREQUENCY" - AT 60 HZ	The operator observes SSF D/G Frequency Meter. **Cue:** **Meter indicates 60 Hz.**		
32	(Step 23.C) Check SSF D/G "VOLTAGE" – AT 600V.	The operator observes SSF D/G Voltage Meter. **Cue:** **Meter indicates 600 volts.**		
33	(Step 23.D) Check SSF Generator Load - LESS THAN OR EQUAL TO 700 KW.	The operator observes SSF Generator Load Meter. **Cue:** **Meter indicates 500 KW.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
34	(Step 24) Check proper operation of SSF battery chargers in upper level of SSF as follows: Check the following indications on SDSP1 Battery Charger: • "AC POWER FAILURE" - DARK • "LOW DC VOLTAGE" - DARK • "DC OUTPUT (VOLTMETER)" - 124-134 VDC. Check the following indications on SDSP2 Battery Charger: • "AC POWER FAILURE" - DARK • "LOW DC VOLTAGE" - DARK • "DC OUTPUT (VOLTMETER)" - 124-134 VDC.	The operator moves toward SDSP1 Battery Charger. **Cue:** **Another operator has checked the condition of the Battery Chargers and they are operating as expected.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
35	(Step 25) Ensure SSF D/G room intake louvers are OPEN (located above rollup doors in D/G room).	The operator observes SSF D/G room intake louvers position. **Cue:** **Intake louvers are open.** **Cue:** **Another operator will continue with this procedure.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Systems – In-Plant JPM K

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

INITIAL CONDITIONS:

- A Loss of All AC has occurred on Unit 1.
- EP/1/A/5000/ECA-0.0 (Loss of All AC Power) has been implemented.
- The CRS has dispatched an operator to complete Enclosure 3 (Unit 1 ETA And ETB Rooms - ECA-0.0 Actions).

INITIATING CUE:

The CRS has directed you to obtain the Brown Folder at SSF and complete Enclosure 2 (Unit 1 SSF-ECA-0.0 Actions).

A Portion of the JPM is TIME CRITICAL.

NOTE: No plant equipment should be operated during the performance of this JPM. All actions must be SIMULATED.

JPM A1a RO

Facility:	McGuire	Task No.:	
Task Title:	Complete a Surveillance for Mode Change	JPM No.:	2020 Admin – JPM A1a RO
K/A Reference:	2.1.20 (4.6)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-2.

Initial Conditions:

- Unit 1 is in Mode 4 during a plant startup.
- Current EFPD is 348.
- NC System pressure has stabilized at 1600 psig.
- Chemistry has reported that the CLA Boron Concentrations are as follows:
  - CLA 1A – 2485 ppm
  - CLA 1B – 2482 ppm
  - CLA 1C – 2491 ppm
  - CLA 1D – 2349 ppm
- It has become necessary to perform Enclosure 13.4, NC Boron Concentration Checklist, of PT/1/A/4600/003D, Monthly Surveillance Items, in order to continue with the plant startup.

Initiating Cue:

- The CRS has directed you to complete Enclosure 13.4, NC Boron Concentration Checklist, of PT/1/A/4600/003D, Monthly Surveillance Items.
- Identify any Flex Strategy Administrative Limits and/or Technical Specification LCO's that are not met.

Task Standard:	The operator will complete Enclosure 13.4 of PT/1/A/4600/003D in accordance with the attached KEY, determine that all Flex Strategy Administrative Limits are met, and determine that LCO 3.5.1 is not currently met.
Required Materials:	Calculator
General References:	PT/1/A/4600/003D (Monthly Surveillance Items), Rev 95 MCEI-0400-379 (McGuire Unit 1 Cycle 27 Core Operating Limits Report), Rev 1 McGuire Technical Specification LCO 3.5.1 (Accumulators), Amendment 218/200
Handouts:	Handout 1: PT/1/A/4600/003D, Monthly Surveillance Items and Enclosure 13.4, Boron Concentration Checklist marked up for JPM. Handout 2: McGuire Unit 1 Cycle 27 Core Operating Limits Report.
Time Critical Task:	NO
Validation Time:	15 minutes

Critical Step Justification	
Step 3	This step is critical because recording Mode 3 on Enclosure 13.4 is necessary to complete Enclosure 13.4 of PT/1/A/4600/003D in accordance with the attached KEY.
Step 5	This step is critical because using the COLR to determine the minimum required and maximum permitted Accumulator Boron Concentration is necessary to complete Enclosure 13.4 of PT/1/A/4600/003D in accordance with the attached KEY.
Step 8	This step is critical because identifying that CLA 1D is <2400ppm Boron is necessary to complete Enclosure 13.4 of PT/1/A/4600/003D in accordance with the attached KEY.
Step 9	This step is critical because identifying that CLA 1D is <2400ppm Boron is necessary to complete Enclosure 13.4 of PT/1/A/4600/003D in accordance with the attached KEY.
Step 10	This step is critical because determining the average boron concentration of the three CLAs >2400 ppm boron is necessary to complete Enclosure 13.4 of PT/1/A/4600/003D in accordance with the attached KEY.
Step 11	This step is critical because determining the average boron concentration of the four CLAs is necessary to complete Enclosure 13.4 of PT/1/A/4600/003D in accordance with the attached KEY.
Step 12	This step is critical because this step is necessary to determine that all Flex Strategy Administrative Limits are met.
Step 17	This step is critical because this step is necessary to determine that LCO 3.5.1 is not currently met.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-2.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Step 1) Prerequisites: (Step 1.1) IF performing routine monthly surveillances, THEN……	The operator recognizes that the Surveillance is NOT being performed for the Monthly Surveillance and proceeds.		
2	(Note prior to Step 1.2) IF performing this procedure in preparation for mode change, Enclosure 13.4 may be performed prior to Mode 3 however, this surveillance shall be met in Mode 3 prior to NC System pressure increasing to greater than 1000 psig.	The operator reads the Note and proceeds.		
*3	(Step 1.2) IF performing this procedure prior to entering Mode 3 OR Unit in Mode 3 prior to NC System pressure increasing greater than 1000 psig, THEN record the following: Mode to be entered: _____ Date: _____	The operator records Mode **3** and **Today (or Equivalent)**, and proceeds. **NOTE: The Date recorded is NOT critical.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
4	(Step 2) Check Boron Concentration of Cold Leg Accumulators within limits specified in COLR (Step 2.1) Record the following: Cold Leg Accumulator 1A Cold Leg Accumulator 1B Cold Leg Accumulator 1C Cold Leg Accumulator 1D	The operator records **2485** in the 1A CLA space provided. The operator records **2482** in the 1B CLA space provided. The operator records **2491** in the 1C CLA space provided. The operator records **2349** in the 1D CLA space provided.		
*5	(Step 2.2) Record Cold Leg Accumulator limits as specified in COLR: (Min) _____________ ppmB (Max) _____________ ppmB	The operator reviews the procedure and Section 2.11.1 of the Unit 1 COLR and determines that based on a current EFPD of 348, the minimum required Accumulator Boron Concentration is **2350** ppm, and records this in the space provided. The operator recognizes that the 1D CLA is less than that required by Tech Spec LCO 3.5.1. The operator reviews the procedure and Section 2.11.1 of the Unit 1 COLR and determines that the maximum allowable Accumulator Boron Concentration is **2875** ppm, and records this in the space provided.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
6	(Notes prior to Step 3) The FLEX Strategy CLA minimum Boron Concentration limit is a Beyond Design Basis External Event administrative limit and does NOT affect Tech Spec operability. The FLEX Strategy Boron Concentration administrative limit for Cold Leg Accumulators is greater than 2400 ppmB.	The operator reads the Notes and proceeds.		
7	(Step 3) Check FLEX CLA Boron Concentration administrative limit met (Step 3.1) IF all Cold Leg Accumulators Boron Concentration greater than 2400 ppmB, THEN….	The operator recognizes that the 1D CLA Boron Concentration is NOT greater than 2400 ppm, and proceeds.		
*8	(Step 3.2) IF only one Cold Leg Accumulator below 2400 ppmB, THEN perform the following: (Step 3.2.1) Record affected CLA: ___________	The operator records **<u>1D</u>** in the space provided.		
*9	(Step 3.2.2) Record affected CLA Boron Concentration: ___________ ppmB	The operator records **<u>2349</u>** in the space provided.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*10	(Step 3.2.3) Determine average Boron Concentration of the other three CLAs: [(__________ ppmB [1st CLA]) + (__________ ppmB [2nd CLA]) + (__________ ppmB [3rd CLA])] ÷ 3 = _____ [Avg of other CLAs]	The operator records **2485** in one space provided. The operator records **2482** in a second space provided. The operator records **2491** in the third space provided. The operator performs the calculation and determines that the Average of the Other CLAs is **2486** ppm, and this value is recorded.		
*11	(Step 3.2.4) Determine average CLA Boron Concentration: (____________ ppmB [Affected CLA] + ____________ ppmB [Average of other CLAs]) ÷ 2 = ____________ ppmB [Average CLA Boron Conc]	The operator records **2349** in the space provided for the Affected CLA. The operator records **2486** in the space provided for the Average of the Other CLAs. The operator performs the calculation and determines that the Average CLA Boron Concentration is **2417.5** ppm, and this value is recorded.		
*12	(Step 3.2.5) IF Average CLA Boron Concentration is greater than 2400 ppmB, THEN this surveillance is met.	The operator recognizes that the Average CLA Boron Concentration is greater than 2400 ppm and concludes that the Surveillance (i.e. All Flex Strategy Administrative Limits) is met, and proceeds.		
13	(Step 3.2.6) IF above calculation is less than 2400 ppmB, THEN….	The operator recognizes that this step is NOT applicable, and proceeds.		
14	(Note prior to Step 3.3) Steps 3.3.1 and 3.3.2 may be performed concurrently.	The operator reads the Note and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
15	(Step 3.3) IF more than one CLA is less than 2400 ppmB, THEN….	The operator recognizes that CLA 1A, 1B and 1C are all greater than 2400 ppm, that this step is NOT applicable, and proceeds.		
16	(Step 4) Initial one of the following: • No Discrepancy • Discrepancy Sheet Attached (IF any Acceptance Criteria NOT met, THEN it is identified as a discrepancy, evaluated per Tech Spec/SLC and appropriate corrective action taken.)	The operator leaves both bullets unsigned and hands off the Enclosure to the CRS.		
*17	(Directed Action) Complete Enclosure 13.4, NC Boron Concentration Checklist, of PT/1/A/4600/003D, Monthly Surveillance Items. Identify any Flex Strategy Administrative Limits and/or Technical Specification LCO's that are not met.	The operator recognizes that the 1D CLA is less than that required by Tech Spec LCO 3.5.1. The operator recognizes that all Flex Strategy Administrative Limits are met.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Admin – JPM A1a RO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- Unit 1 is in Mode 4 during a plant startup.
- Current EFPD is 348.
- NC System pressure has stabilized at 1600 psig.
- Chemistry has reported that the CLA Boron Concentrations are as follows:
  - CLA 1A – 2485 ppm
  - CLA 1B – 2482 ppm
  - CLA 1C – 2491 ppm
  - CLA 1D – 2349 ppm
- It has become necessary to perform Enclosure 13.4, NC Boron Concentration Checklist, of PT/1/A/4600/003D, Monthly Surveillance Items, in order to continue with the plant startup.

INITIATING CUE:

- The CRS has directed you to complete Enclosure 13.4, NC Boron Concentration Checklist, of PT/1/A/4600/003D, Monthly Surveillance Items.
- Identify any Flex Strategy Administrative Limits and/or Technical Specification LCO's that are not met.

Are ALL Flex Strategy Administrative Limits met? ________________

Are ALL Technical Specification LCO's met? ________________

If NOT, identify requirements NOT met:

<u>JPM A1b RO</u>

Facility:	McGuire	Task No.:	
Task Title:	Verification of Keff <0.99 with Shutdown Banks Withdrawn	JPM No.:	2020 Admin – JPM A1b RO
K/A Reference:	2.1.37 (4.3)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-2.

Initial Conditions:

- Unit 1 was shutdown 16 hours ago after having run at 100% power for the previous three weeks.
- A Unit 1 startup is in progress per OP/1/A/6100/001 (Controlling Procedure for Unit Startup) and PT/0/A/4150/047 (1/M Monitoring During Startup).
- However, all control banks have just been reinserted because the extrapolated critical rod position indicated that criticality would occur below the lower ECP band.
- Criticality is now scheduled for 8 hours from now.
- The following Cycle 27 conditions exist currently:
  - EFPD = 25
  - NC Boron = 1966 PPM
  - Xenon Worth = 0 PCM
  - Differential Samarium worth = - 150 PCM
- The OAC and REACT Program are unavailable.
- It is expected that Tavg will be maintained at its current value of 557°F

Initiating Cue:	The CRS has directed you to perform Enclosure 4.7 (Verification of Keff <0.99 with Shutdown Banks Withdrawn) of OP/0/A/6100/006 (Reactivity Balance Calculation) to determine Mode 2 Boron Deficit.
Task Standard:	The operator determines that under the current plant conditions there is a 2.7 ppm Mode 2 Effective Boron Deficit, and that there is sufficient NCS boron concentration to maintain Mode 2. (See attached KEY).
Required Materials:	Calculator
General References:	OP/1/A/6100/001 (Controlling Procedure for Unit Startup), Rev 186 PT/0/A/4150/047 (1/M Monitoring During Startup), Rev 7 OP/0/A/6100/006 (Reactivity Balance Calculation), Rev 81 MCEI-0400-380 (McGuire 1 Cycle Startup and Operational Report), Rev 0 MCEI-0400-379 (McGuire 1 Cycle 27 Core Operating Limits Report), Rev 1 AD-OP-ALL-0203 (Reactivity Management), Rev 11
Handouts:	Handout 1: Blank Copy of Enclosure 4.7 of OP/0/A/6100/006 (Reactivity Balance Calculation) Handout 2: McGuire 1 Cycle Startup and Operational Report Handout 3: Blank Copy of Enclosure 4.8 of OP/0/A/6100/006 (Fission Product Correction Calculation)
Time Critical Task:	NO
Validation Time:	20 minutes

Critical Step Justification	
Step 17	This step is critical because determining the Fission Product Correction is necessary to determine that under the current plant conditions there is a 2.7 ppm Mode 2 Effective Boron Deficit.
Step 19	This step is critical because selecting and using SOR Table 15 properly is necessary to determine that under the current plant conditions there is a 2.7 ppm Mode 2 Effective Boron Deficit.
Step 20	This step is critical because selecting and using SOR Table 1 properly is necessary to determine that under the current plant conditions there is a 2.7 ppm Mode 2 Effective Boron Deficit.
Step 21	This step is critical because completing Table 4.7.1 of Enclosure 4.7 of OP/0/A/6100/006 is necessary to determine that under the current plant conditions there is a 2.7 ppm Mode 2 Effective Boron Deficit.
Step 22	This step is critical because determining the Mode 2 Effective Boron Deficit is greater than 0 is necessary to determine that under the current plant conditions there is sufficient NCS boron concentration to maintain Mode 2.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-2.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Note prior top Step 3.1) All curves/tables used in this procedure, except for the Table referenced in Step 3.1.5, are found in the Control Room Data section of each units Startup and Operational Report (SOR).	The operator reads the NOTE and proceeds.		
2	(Step 3.1) Record the following: (Step 3.1.1) Unit ___ Cycle ___	The operator records Unit **1** and Cycle **27**, and proceeds.		
3	(Step 3.1.2) Burnup (P1457) ___________ EFPD	The operator records **<u>25 EFPD</u>**.		
4	(Step 3.1.3) Present/ Desired NC System Effective Boron Concentration: (Step 3.1.3.1) IF OAC is unavailable: (Step 3.1.3.1.A) Record Present/Desired NC Boron Concentration: (Step 3.1.3.1.B) Apply 100 ppm B-10 correction penalty: (Step 3.1.3.1A - 100 ppm) = (____________ - 100) =	The operator recognizes that the OAC is unavailable, and records **<u>1966 ppm</u>** as the present Boron Concentration. The operator applies the 100 ppm B-10 correction penalty and records **<u>1866 ppm</u>** as the present Boron Concentration.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
5	(Note prior to Step 3.1.3.2) If performing this enclosure prior to a dilution and wish to use a desired boron concentration instead of a current boron concentration, Step 3.1.3.2 shall be marked N/A.	The operator reads the NOTE and proceeds.		
6	(Step 3.1.3.2) IF desired to calculate effective boron using the OAC:…..	The operator recognizes that the OAC is unavailable, and proceeds.		
7	(Step 3.1.3.3) IF desired to calculate effective boron manually:…..	The operator recognizes that it is not desired to calculate the effective boron manually, and proceeds.		
8	(Step 3.1.3.4) Record the Effective Boron Concentration: (Step 3.1.3.1B or 3.1.3.2C or Step 3.1.3.3C) =	The operator records **1866 ppm** as the Effective Boron Concentration.		
9	(Note prior to Step 3.1.4) If performing this enclosure prior to a temperature change, the limiting temperature as described in L&P 1.1.2.3 shall be used for Step 3.1.4. Otherwise, use the present temperature.	The operator reads the NOTE and proceeds.		
10	(Step 3.1.4) Present OR limiting NC system temperature:	The operator recognizes from initial conditions that Tavg is **557°F** and records.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
11	(Step 3.1.5) IF EFPD = 0 AND boron concentration from Step 3.1.3.4 is greater than the Rod Drop boron concentration specified in the SOR Table SOR-2:….	The operator recognizes from the initial conditions that EFPD is NOT = 0 <u>or</u> compares the Rod Drop boron concentration specified in the SOR Table SOR-2 (1963 ppm) with the Effective Boron Concentration (1866) and recognizes that this step is NA and proceeds.		
12	(Step 3.1.6) IF burnup from step 3.1.2 is > 0 EFPD, record the difference between equilibrium and present samarium worth (P1475, OAC Program Xenon Samarium-XESM, or REACT program).	The operator recognizes that burnup is > 0 EFPD and records **-<u>150 pcm</u>** from initial conditions.		
13	(Step 3.1.7) IF burnup from Step 3.1.2 is > 12 EFPD, perform Enclosure 4.8 to determine the fission product correction.	The operator recognizes that burnup is > 12 EFPD and that fission product correction is needed. **Cue:** **When operator requests a copy of Enclosure 4.8 of OP/0/A/6100/006, provide the operator with Handout 3.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
14	(Enclosure 4.8, Notes prior to Step 3.1) • The values in Table 4.8 (found at the end of this Enclosure) are pulled from MCEI-0400-268, Table 3. • Number of hours shutdown is the difference in time between the time the reactor went subcritical and the expected time of criticality.	The operator reads the NOTEs and proceeds.		
15	(Step 3.1) Shutdown Fission Product Correction Calculation: (Step 3.1.1) IF Unit operated > 3 EFPD from previous shutdown to current shutdown: (Step 3.1.1.1) Use Table 4.8 to determine the shutdown fission product correction:	The operator recognizes that Unit 1 operated for >3 EFPD from previous shutdown to current shutdown and addresses Table 4.8.		
16	(Step 3.1.1.2) Number of hours shutdown	The operator recognizes that the difference in time between the time the reactor went subcritical and the expected time of criticality is 24 hours.		
*17	(Step 3.1.1.3) Shutdown Fission Product Correction:	The operator records the Fission Product Correction as **10 ppmb** and returns to Step 3.1.7 of Enclosure 4.7.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
18	(Enclosure 4.7, Step 3.2) IF desired, perform automated calculations using REACT (Reactivity Balance – Mode 3 Verification module)…..	The operator recognizes from the initial conditions that the REACT Program is NOT available, and places NA in Step 3.2.		
*19	(Step 3.3) Manual Calculations: (Step 3.3.1) Mode 2 Boron Concentration: (Step 3.3.1.1) Determine Mode 2 boron concentration with shutdown banks withdrawn, control banks inserted, no xenon at the burnup recorded in Step 3.1.2 and temperature of Step 3.1.4 (Table 15 in the SOR). (Step 3.3.1.2) Record value in Table 4.7.1 Line A	The operator uses Table 15 (Handout 2) and determines Mode 2 boron concentration with shutdown banks withdrawn, control banks inserted, no xenon for 25 EFPD and 557°F is **1877** PPMB. The operator records **1877** on Line A of Table 4.7.1.		
*20	(Step 3.3.2) ARI Differential boron worth: (Step 3.3.2.1) Determine ARI Differential Boron Worth at burnup recorded in Step 3.1.2 and temperature of Step 3.1.4 (Table 1 in the SOR). (Step 3.3.2.2) Record value in Table 4.7.1 Line B	The operator uses Table 1 (Handout 2) and determines that the ARI Differential Boron Worth at 25 EFPD at 557°F is **-6.34** PCM/PPM. The operator records **-6.34** on Line B of Table 4.7.1.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*21	(Step 3.3.3) Mode 2 boron deficit: (Step 3.3.3.1) Record values of Steps 3.1.3.4, 3.1.6 and 3.1.7 in Table 4.7.1. (Step 3.3.3.2) Complete Table 4.7.1, recording "0" for any reference steps N/A.	The operator records **1866 ppm** in Line C Table 4.7.1. The operator records **-150 pcm** in Line D Table 4.7.1. The operator records **10 ppmb** in Line E Table 4.7.1. The operator calculates F on Table 4.7.1 to be **23.66 ppm** (F = D/B or -150 pcm/-6.34 pcm/ppm = 23.66 ppm) The operator calculates Mode 2 Effective Boron Deficit on Table 4.7.1 to be **2.7 ppm** (M2 EBD = C-A-E+F or 1866 ppm -1877 ppm – 10 + 23.66 = 2.7 ppm)		
*22	(Step 3.3.4) IF Mode 2 Effective Boron Deficit from Table 4.7.1 > 0: (Step 3.3.4.1) Sufficient NC boron is present in xenon free condition to prevent entering Mode 2. (Step 3.3.4.2) Mark remainder of Enclosure N/A.	The operator determines that the current NC conditions are sufficient in a xenon free condition to prevent entering Mode 2, and marks all remaining Steps NA.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Admin – JPM A1b RO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

Initial Conditions:

- Unit 1 was shutdown 16 hours ago after having run at 100% power for the previous three weeks.
- A Unit 1 startup is in progress per OP/1/A/6100/001 (Controlling Procedure for Unit Startup) and PT/0/A/4150/047 (1/M Monitoring During Startup).
- However, all control banks have just been reinserted because the extrapolated critical rod position indicated that criticality would occur below the lower ECP band.
- Criticality is now scheduled for 8 hours from now.
- The following Cycle 27 conditions exist currently:
  - EFPD = 25
  - NC Boron = 1966 PPM
  - Xenon Worth = 0 PCM
  - Differential Samarium worth = - 150 PCM
- The OAC and REACT Program are unavailable.
- It is expected that Tavg will be maintained at its current value of 557°F

INITIATING CUE:

The CRS has directed you to perform Enclosure 4.7 (Verification of Keff <0.99 with Shutdown Banks Withdrawn) of OP/0/A/6100/006 (Reactivity Balance Calculation) to determine Mode 2 Boron Deficit.

JPM A2 RO

Facility:	McGuire	Task No.:	
Task Title:	<u>Partial Loss of Annunciators</u>	JPM No.:	<u>2020 Admin – JPM A2 RO</u>
K/A Reference:	GK/A 2.2.43 (3.0)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

<u>Method of testing:</u>

Simulated Performance: ______ Actual Performance: __X__

Classroom __X__ Simulator ______ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-4.

Initial Conditions:	• Unit 1 is operating at 100% power. • Due to a lightning strike several of the Unit 1 Control Room Annunciators have failed. • The crew entered PT/1/A4600/033 (Loss of Control Room Annunciators) and has completed Attachment 2 (Partial Loss of Annunciator Panels) through Step 3.8. • Several Operators are reviewing the Annunciator Response Procedures for each failed annunciator. • All other annunciators have been tested satisfactorily. • The IAE Supervisor has been notified and is investigating.

Initiating Cue:	The CRS has directed you to perform step 3.9 of Attachment 2 for the failed Annunciators on 1AD-13 (Marked in YELLOW on Attached Handout).

- The CRS has directed you to determine:
  - IF any AP or EP that has a Time Critical Task has been affected
  - IF any Technical Specification or Selected Licensee Commitment surveillance has been affected
  - IF any proceduralized Alternate Action must be taken

Task Standard: The operator will determine that there are Alternative Methods procedurally identified for Surveillance associated with three of these annunciators, that one failure impacts the Semi-Daily Surveillance associated with TS SR 3.6.4.1, that one failure impacts the Daily Surveillance associated with SLC 16.7.3, and that one failure impacts an AP/EP Time Critical Task per the attached KEY.

Required Materials: None

General References: PT/1/A/4600/033 (Loss of Control Room Annunciators), Rev 11
PT/1/A/4600/003 A (Semi-Daily Surveillance Items), Rev 170
PT/1/A/4600/003 B (Daily Surveillance Items), Rev 172
OP/1/A/6100/010 N (Annunciator Response For Panel 1AD-13), Rev 80
PT/0/A/4600/113 (McGuire Time Critical Actions/Time Sensitive Actions), Rev 28
AP/0/A/5500/44 (Plant Flooding), Rev 21

Handouts: Handout 1: PT/1/A4600/033 (Loss of Control Room Annunciators) marked up for place-keeping.
Handout 2: Failed Annunciators
Handout 3: Blank Copy of PT/1/A/4600/003 A (Semi-Daily Surveillance Items)
Handout 4: Blank Copy of PT/1/A/4600/003 B (Daily Surveillance Items)

Time Critical Task: NO

Validation Time: 25 minutes

Critical Step Justification	
Step 1	This step is critical because determining that 1AD-13, B1 has no Alternate Method of Surveillance, that an AP/EP Time Critical Action is NOT affected, and that this alarm failure has no bearing on the surveillances of Enclosure 13.1 of PT/1/A/4600/003 A & Enclosure 13.1 of PT/1/A/4600/003 B is necessary to complete the assigned task.
Step 2	This step is critical because determining the Alternate Method of Surveillance and determining that an 1AD-13, B3 alarm failure affects Enclosure 13.1 of PT/1/A/4600/003 A (Semi-Daily Surveillance Items), specifically the surveillance associated with TS SR 3.6.4.1; and has no other impact, is necessary to complete the assigned task.
Step 3	This step is critical because determining the Alternate Method of Surveillance and determining that an 1AD-13, C1 alarm failure affects the performance of an AP/EP Time Critical Task is necessary to complete the assigned task.
Step 4	This step is critical because determining the Alternate Method of Surveillance and determining that an 1AD-13, C4 alarm failure affects Enclosure 13.1 of PT/1/A/4600/003 B (Daily Surveillance Items), specifically the surveillance associated with SLC 16.7.3; and has no other impact, is necessary to complete the assigned task.
Step 5	This step is critical because determining that 1AD-13, E7 has no Alternate Method of Surveillance, that an AP/EP Time Critical Action is NOT affected, and that this alarm failure has no bearing on the surveillances of Enclosure 13.1 of PT/1/A/4600/003 A & Enclosure 13.1 of PT/1/A/4600/003 B is necessary to complete the assigned task.

(Denote Critical Steps with an asterisk)*

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-4.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
NOTE:	**The operator may desire to review the Annunciator Response Procedure for any of the five Annunciators. A copy of OP/1/A/6100/010 N (Annunciator Response For Panel 1AD-13) should be available for this review.**			
*1	(PT/1/A/4600/033, Attachment 2, Step 3.9) Perform Attachment 3, Annunciator Panel Reference to evaluate the following: • Alternate indications available for affected alarms • Impact to Ops PTs (Semi Daily, Daily, etc.) 1AD-13, B1, FWST YARD LINE CONTENTS LO TEMP	The operator addresses Attachment 3 of PT/1/A/4600/033 and recognizes that this Annunciator has no Alternate Method of Surveillance and that an AP/EP Time Critical Action is NOT affected. The operator reviews Enclosure 13.1 of PT/1/A/4600/003 A & Enclosure 13.1 of PT/1/A/4600/003 B and determines that this alarm failure has no bearing on these surveillances. **NOTE:** **The evaluation of the Annunciators may be performed in ANY order.** **NOTE:** **See KEY on Page 11.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*2	(PT/1/A/4600/033, Attachment 2, Step 3.9) Perform Attachment 3, Annunciator Panel Reference to evaluate the following: • Alternate indications available for affected alarms • Impact to Ops PTs (Semi Daily, Daily, etc.) 1AD-13, B3, CONT PRESS ALERT HI	The operator addresses Attachment 3 of PT/1/A/4600/033 and determines that the Alternate Method of Surveillance requires that OAC alarm for M1P4295 be set at +0.2 psig. The operator addresses Attachment 3 of PT/1/A/4600/033 and determines that an AP/EP Time Critical Action is NOT affected. The operator reviews Enclosure 13.1 of PT/1/A/4600/003 A and determines that this alarm failure affects Enclosure 13.1, specifically the surveillance associated with TS SR 3.6.4.1. The operator reviews Enclosure 13.1 of PT/1/A/4600/003 B and determines that this alarm failure has no bearing on these surveillances. **NOTE:** **See KEY on Page 11.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	(PT/1/A/4600/033, Attachment 2, Step 3.9) Perform Attachment 3, Annunciator Panel Reference to evaluate the following: • Alternate indications available for affected alarms • Impact to Ops PTs (Semi Daily, Daily, etc.) 1AD-13, C1, ND & NS ROOM SUMP HI-HI LVL	The operator addresses Attachment 3 of PT/1/A/4600/033 and determines that the Alternate Method of Surveillance requires that the operator monitor the ND/NS sump levels locally. The operator addresses Attachment 3 of PT/1/A/4600/033 and determines that the failure of this alarm will affect the performance of a Time Critical Task in an AP or EP. The operator reviews Enclosure 13.1 of PT/1/A/4600/003 A & Enclosure 13.1 of PT/1/A/4600/003 B and determines that this alarm failure has no bearing on these surveillances. **NOTE:** **See KEY on Page 11.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(PT/1/A/4600/033, Attachment 2, Step 3.9) Perform Attachment 3, Annunciator Panel Reference to evaluate the following: • Alternate indications available for affected alarms • Impact to Ops PTs (Semi Daily, Daily, etc.) 1AD-13, C4, ENVIRONMENT SYSTEM TROUBLE	The operator addresses Attachment 3 of PT/1/A/4600/033 and determines that the Alternate Method of Surveillance requires that the operator verify that the chart recorders readout is updating. The operator addresses Attachment 3 of PT/1/A/4600/033 and determines that an AP/EP Time Critical Action is NOT affected. The operator reviews Enclosure 13.1 of PT/1/A/4600/003 and determines that this alarm failure has no bearing on these surveillances. The operator reviews Enclosure 13.1 of PT/1/A/4600/003 B and determines that this alarm failure impacts the performance of Enclosure 13.1, specifically the surveillance associated with SLC 16.7.3. **NOTE:** **See KEY on Page 11.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
5	(PT/1/A/4600/033, Attachment 2, Step 3.9) Perform Attachment 3, Annunciator Panel Reference to evaluate the following: • Alternate indications available for affected alarms • Impact to Ops PTs (Semi Daily, Daily, etc.) 1AD-13, E7, O.B.E. EXCEEDED	The operator addresses Attachment 3 of PT/1/A/4600/033 and recognizes that this Annunciator has no Alternate Method of Surveillance and that an AP/EP Time Critical Action is NOT affected. The operator reviews Enclosure 13.1 of PT/1/A/4600/003 A & Enclosure 13.1 of PT/1/A/4600/003 B and determines that this alarm failure has no bearing on these surveillances. **NOTE:** **See KEY on Page 11.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Admin – JPM A2 RO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ________________________ Date: ______________

KEY:

Failed Annunciator	AP/EP w/TC Task	TS/SLC Affected	Alternate Action
1AD-13, B1, FWST YARD LINE CONTENTS LO TEMP	NO	None	None
1AD-13, B3, CONT PRESS ALERT HI	NO	TS SR 3.6.4.1	OAC alarm for M1P4295 be set at +0.2 psig
1AD-13, C1, ND & NS ROOM SUMP HI-HI LVL	YES	None	The operator will monitor the ND/NS sump levels locally
1AD-13, C4, ENVIRONMENT SYSTEM TROUBLE	NO	SLC 16.7.3	The operator verify that the chart recorders readout is updating.
1AD-13, E7, O.B.E. EXCEEDED	NO	None	None

RED = Critical

NOTE: Annunciators may be listed in ANY order.

Initial Conditions:

- Unit 1 is operating at 100% power.
- Due to a lightning strike several of the Unit 1 Control Room Annunciators have failed.
- The crew entered PT/1/A4600/033 (Loss of Control Room Annunciators) and has completed Attachment 2 (Partial Loss of Annunciator Panels) through Step 3.8.
- Several Operators are reviewing the Annunciator Response Procedures for each failed annunciator.
- All other annunciators have been tested satisfactorily.
- The IAE Supervisor has been notified and is investigating.

INITIATING CUE:

- The CRS has directed you to perform step 3.9 of Attachment 2 for the failed Annunciators on 1AD-13 (Marked in YELLOW on Attached Handout).
- The CRS has directed you to determine:
  - IF any AP or EP that has a Time Critical Task has been affected
  - IF any Technical Specification or Selected Licensee Commitment surveillance has been affected
  - IF any proceduralized Alternate Action must be taken

Failed Annunciator	**AP/EP w/TC Task**	**TS/SLC Affected**	**Alternate Action**
	YES / NO		
	YES / NO		
	YES / NO		
	YES / NO		
	YES / NO		

(Use Back if More Space Needed)

JPM A3 RO

Facility:	McGuire	Task No.:	
Task Title:	Evaluate Stay Time with Lowered SFP Level	JPM No.:	2020 Admin – JPM A3 RO
K/A Reference:	2.3.7 (3.5)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- A station wide accident has occurred due to an Earthquake.
- Unit 1 is in Mode 6 with a complete core off-load.
- The Unit 1 Spent Fuel Pool level has lowered to 10 feet above the top of the fuel and has stabilized at this level.
- The crew is implementing AP/1/A/5500/41 (Loss of Spent Fuel Cooling or Level) and EP/1/A/5000/G-1 Generic Enclosures), Enclosure 32 (Monitoring Unit 1 SFP Level and Temperature).
- No installed radiation monitors are operable in the Unit 1 Spent Fuel Building.
- A dose limit of 500 mrem has been placed on all personnel performing emergency tasks within the building.
- You have been assigned a repetitive task within Generic Enclosure 32 which will require you to enter the Unit 1 Spent Fuel Building and proceed to the area around the Spent Fuel Pool, and remain there for 8 minutes, before exiting the building.
- The exposure traveling to and from the Unit 1 Spent Fuel Pool area results in no appreciable exposure.

Initiating Cue:	The CRS has directed you to use Enclosure 13 (Spent Fuel Pool Radiation Level Vs. Water Level Above Fuel) of AP/1/A/5500/41 (Loss of Spent Fuel Cooling or Level), and determine the number of times you will be able to perform this repetitive task before you must be replaced by another operator.

Task Standard: The operator will use Enclosure 13 of AP/1/A/5500/41 to determine that the dose rate around the Spent Fuel Pool area is 649 mrem/hour and based on this the operator will determine that the repetitive task can be performed 5 times before another operator will need to perform the task.

Required Materials: Calculator

General References: AP/1/A/5500/41 (Loss of Spent Fuel Pool Cooling or Level), Rev 15
EP/1/A/5000/G-1 (Generic Enclosures), Rev 41
MNS SLC 16.9.21 (Water Level – Spent Fuel Storage Pool), Rev 155
PD-RP-ALL-0001 (Radiation Worker Responsibilities), Rev 11

Handouts: Handout 1: Enclosure 13 (Spent Fuel Pool Radiation Level Vs. Water Level Above Fuel) of AP/1/A/5500/41 (Loss of Spent Fuel Cooling or Level)

Time Critical Task: NO

Validation Time: 7 minutes

Critical Step Justification	
Step 1	This step is critical because using Enclosure 13 and determining that the dose rate around the pool area is 649 mrem/hour is necessary to complete the assigned task.
Step 2	This step is critical because determining the dose received for one performance of the task is necessary to complete the assigned task.
Step 3	This step is critical because determining the number of times the operator will be able to perform this repetitive task before they must be replaced by another operator is necessary to complete the assigned task.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*1	(AP/1/A/5500/41, Enclosure 13) Determine the Dose Rate around the Spent Fuel Pool area with water level at 10 feet.	The operator uses Enclosure 13 and determines that the dose rate around the pool area is **649 mrem/hour**. 6.49E-01R/hr OR $(6.49 \times 10^{-1}$ R/hr$) \times 10^{3}$ mrem/R = 649 mrem/hr		
*2	Determine Dose received each time task is performed	The operator recognizes that the task requires eight minutes. The operator determines that the dose received in that eight-minute period is **86.53 mrem**. Dose = 649 mrem/hr x 1hr/60 minutes x 8 minutes		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	Determine the number of times that the repetitive task can be performed while remaining within allowable RWP dose limit.	The operator recognizes that the maximum allowable dose received is 500 mrem, and that 86.53 mrem will be received on each occasion the task is performed. The operator identifies that the task can be performed **<u>5 times</u>**, before another operator will be required to perform the task. # Task performances = 500 mrem/86.53 mrem/task = 5.78 tasks, or 5 tasks.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Admin – JPM A3 RO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

INITIAL CONDITIONS:

- A station wide accident has occurred due to an Earthquake.
- Unit 1 is in Mode 6 with a complete core off-load.
- The Unit 1 Spent Fuel Pool level has lowered to 10 feet above the top of the fuel and has stabilized at this level.
- The crew is implementing AP/1/A/5500/41 (Loss of Spent Fuel Cooling or Level) and EP/1/A/5000/G-1 Generic Enclosures), Enclosure 32 (Monitoring Unit 1 SFP Level and Temperature).
- No installed radiation monitors are operable in the Unit 1 Spent Fuel Building.
- A dose limit of 500 mrem has been placed on all personnel performing emergency tasks within the building.
- You have been assigned a repetitive task within Generic Enclosure 32 which will require you to enter the Unit 1 Spent Fuel Building and proceed to the area around the Spent Fuel Pool, and remain there for 8 minutes, before exiting the building.
- The exposure traveling to and from the Unit 1 Spent Fuel Pool area results in no appreciable exposure.

INITIATING CUE:

The CRS has directed you to use Enclosure 13 (Spent Fuel Pool Radiation Level Vs. Water Level Above Fuel) of AP/1/A/5500/41 (Loss of Spent Fuel Cooling or Level), and determine the number of times you will be able to perform this repetitive task before you must be replaced by another operator.

<u>JPM A1a SRO</u>

Facility:	McGuire	Task No.:	
Task Title:	Determine Reportability Requirements	JPM No.:	2020 Admin – JPM A1a SRO
K/A Reference:	2.1.18 (3.8)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: ___X___

Classroom ___X___ Simulator ______ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- With Unit 1 at 100% power, the following event occurred at 0400 today:
  - The crew was removing Pzr Heater Groups A, B and D from service when an automatic plant trip on low pressurizer pressure occurred due to an operational error.
  - The crew entered EP/1/A/5000/E-0, Reactor Trip or Safety Injection, and quickly stabilized pressurizer pressure before transitioning to EP/1/A/5000/ES-0.1, Reactor Trip Response, where the plant was stabilized.
- The SM has verified that this event has NOT exceeded an Emergency Action Level (EAL).
- The SM and the STA believe that this event is reportable to the NRC.
- No external persons and/or agencies have been notified of this event, nor have any actions other than those identified been taken.

Initiating Cue: Ten minutes after the event the SM directs you to determine reportability requirements per RP/0/A/5700/010 (NRC Immediate Notification Requirements), including completion of any necessary paperwork (Provide to Examiner when ready to Transmit).

Task Standard:	The operator will identify that this condition requires a 4-hour notification to the NRC in accordance with RP/0/A/5700/010 (NRC Immediate Notification Requirements), and complete Attachment 2 (NRC Event Notification Worksheet) in accordance with the attached Key.
Required Materials:	None
General References:	RP/0/A/5700/010 (NRC Immediate Notification Requirements), Rev. 31 RP/0/A/5700/014 (Emergency Telephone Directory), Rev. 39 AD-OP-ALL-0101 (Event Response and Notifications), Rev. 11
Handouts:	Handout 1: Blank copy of RP/0/A/5700/010 (NRC Immediate Notification Requirements).
Time Critical Task:	NO
Validation Time:	20 minutes

Critical Step Justification	
Step 3	This step is critical because determining that Event Condition 4.1.3.3 is applicable and that this event must be reported as soon as practical and within 4 hours of the occurrence is necessary to complete the assigned task.
Step 6	This step is critical because Completing Attachment 2 of RP/0/A/5700/010 (NRC Immediate Notification Requirements) is necessary to complete the assigned task in accordance with the attached Key.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Step 6.1) Notify the NRC Operations Center in accordance with this procedure.	The operator places initials in block and proceeds.		
2	(Step 6.2) Ensure the Shift Technical Advisor is aware of the pending NRC notification.	The operator recognizes that the STA is aware of the pending NRC notification (Initial Conditions), checks the block and proceeds.		
*3	(Step 6.3) Determine appropriate notification AND time requirements using Attachment 1, Events Requiring NRC Notification.	The operator addresses Attachment 1. The operator recognizes that **Event Condition 4.1.3.3** is applicable and that this event must be reported as soon as practical and within **4 hours** of the occurrence. 4.1.3.3: "Any event **OR** condition that results in actuation of the reactor protection system (RPS) when the reactor is critical except when the actuation results from **AND** is part of a pre-planned sequence during testing **OR** reactor operation."		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
4	(Note prior to Step 6.4) Sections of Attachment 2 that are not applicable should be marked (N/A).	The operator reads the Note, checks the block and proceeds.		
5	(Step 6.4) IF Attachment 2, NRC Event Notification Worksheet being completed for a drill, THEN write: "This is a Drill" on the first line of event description.	The operator records that this is a drill, and proceeds. OR The operator does not record that this is a drill, and proceeds.		
6 * (As shown on KEY)	(Step 6.5) Complete applicable portions of Attachment 2 using information from Attachment 1.	The operator completes Attachment 2 in accordance with the Attached Key. **Cue:** **After the Attachment 2 is presented for transmittal, indicate that another operator will complete the required actions.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Admin – JPM A1a SRO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

KEY:

Attachment 2 NRC Event Notification Worksheet Page 1 of 3

All blocks left blank except as follows:

Notification Time/Date:	(Left Blank)
Unit	**1**
Caller's Name	Operator's Name
NRC Operations Officer Contacted	(Left Blank)
Event Time and Zone	**0400 (time)**
Event Date	**Present Date**
Power/Mode Before	**100%/Mode 1**
Power/Mode After	**0%/Mode 3**
4-Hr Non-Emergency	**Check Mark in "[(50.72(b)(2)(IV)(B)] RPS Actuation – Critical Scram" Block**

Attachment 2 NRC Event Notification Worksheet Page 2 of 3

All blocks left blank except as follows:

Event Description	**The crew was removing Pzr Heater Groups A, B and D from service when an automatic plant trip on low pressurizer pressure occurred due to an operational error. The crew entered EP/1/A/5000/E-0, Reactor Trip or Safety Injection, and quickly stabilized pressurizer pressure before transitioning to EP/1/A/5000/ES-0.1, Reactor Trip Response, where the plant was stabilized (Or Equivalent).**
Notifications: NRC Resident	Will Be is checked
Notifications: State	NO or Will Be is checked
Notifications: Local	NO or Will Be is checked
Notifications: Other Gov Agencies	NO or Will Be is checked
Notifications: Media/Press Release	NO or Will Be is checked
Anything Unusual or NOT understood?	NO is checked
Did all Systems Function as required	YES is checked.
Approved By:	Operator's Name
Time/Date:	Estimated Time and Date

Attachment 2 NRC Event Notification Worksheet Page 3 of 3 - All blocks lined out with NA and Initials.

CRITICAL Information is in BOLD

Initial Conditions:

- With Unit 1 at 100% power, the following event occurred at 0400 today:
  - The crew was removing Pzr Heater Groups A, B and D from service when an automatic plant trip on low pressurizer pressure occurred due to an operational error.
  - The crew entered EP/1/A/5000/E-0, Reactor Trip or Safety Injection, and quickly stabilized pressurizer pressure before transitioning to EP/1/A/5000/ES-0.1, Reactor Trip Response, where the plant was stabilized.
- The SM has verified that this event has NOT exceeded an Emergency Action Level (EAL).
- The SM and the STA believe that this event is reportable to the NRC.
- No external persons and/or agencies have been notified of this event, nor have any actions other than those identified been taken.

INITIATING CUE:

Ten minutes after the event the SM directs you to determine reportability requirements per RP/0/A/5700/010 (NRC Immediate Notification Requirements), including completion of any necessary paperwork (Provide to Examiner when ready to Transmit).

JPM A1b SRO

Facility:	McGuire	Task No.:	
Task Title:	Perform Daily Surveillance Items Checklist	JPM No.:	2020 Admin – JPM A1b SRO
K/A Reference:	2.1.1 (4.2)		

Examinee:		NRC Examiner:	
Facility Evaluator:		Date:	

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- Unit 1 is in Mode 1 at 100% power.
- Fire Hydrant 10 (W of Main Shop) is OOS and all other equipment is operable and/or functional.
- Enclosure 13.1, Daily Surveillance Items Checklist, of PT/1/A/4600/003B, “Daily Surveillance Items,” has been completed.
- Enclosure 13.3, “Cask Monitoring,” is still in progress and will be provided when complete.

Initiating Cue:

- Evaluate the completed Enclosure 13.1 of PT/1/A/4600/003B (Daily Surveillance Items Checklist) per Step 12.
- Identify all Technical Specification/SLC required ACTION, as well as all other actions that must be taken so that an ESOMS entry can be prepared.

Task Standard: The operator will review the completed Enclosure 13.1, Daily Surveillance Items Checklist and associated Equipment Problem Identification Form and verify that the applicable surveillance items meet specified acceptance criteria. For surveillance items NOT meeting Acceptance Criteria, all required action will be identified per the attached KEY.

Required Materials: None

General References: PT/1/A/4600/003B, (Daily Surveillance Items), Rev 172

AD-HU-ALL-0004, (Procedure and Work Instruction Use and Adherence), Rev 10

McGuire Technical Specifications LCO 3.5.4 (Refueling Water Storage Tank (RWST)), Amendment 184/166

McGuire Selected Licensee Commitments (SLC) 16.9.11 (Borated Water Sources (Operating)) Rev 22

McGuire Selected Licensee Commitments (SLC) 16.9.14 (Borated Water Sources (Shutdown)) Rev 177

McGuire Selected Licensee Commitments (SLC) 16.11.2 (Radioactive Liquid Effluent Monitoring Instrumentation) Rev 134

McGuire Selected Licensee Commitments (SLC) 16.11.7 (Radioactive Gaseous Effluent Monitoring Instrumentation) Rev 134

Handouts: Handout 1: Enclosure 13.1 (Daily Surveillance Items Checklist) of PT/1/A/4600/003 B (Daily Surveillance Items) and an associated Equipment Problem Evaluation Form, marked up for this JPM.

Time Critical Task: NO

Validation Time: 25 minutes

Critical Step Justification	
Step 1	This step is critical because assessing the difference between the two VCT level instruments is necessary to ensure that all required action is identified per the attached KEY for surveillance items NOT meeting Acceptance Criteria.
Step 2	This step is critical because assessing the low FWST temperature is necessary to ensure that all required action is identified per the attached KEY for surveillance items NOT meeting Acceptance Criteria.
Step 3	This step is critical because assessing the unsuccessful source check on 1EMF31 is necessary to ensure that all required action is identified per the attached KEY for surveillance items NOT meeting Acceptance Criteria.
Step 4	This step is critical because assessing the low reading on the Unit Vent Flowrate Monitor is necessary to ensure that all required action is identified per the attached KEY for surveillance items NOT meeting Acceptance Criteria.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
NOTE: Equipment problems may be evaluated in ANY order.				
*1	(Step 12.2.2) IF performing Enclosure 13.1 (Daily Surveillance Items Checklist), THEN check each applicable surveillance item in Enclosure 13.1 meets its Acceptance Criteria. (Step 12.2.5) IF a surveillance item was NOT completed due to Unit "Applicable Mode", THEN identify surveillance item by writing "NA" in appropriate initial blank. (Step 12.2.6) IF a surveillance item Acceptance Criteria NOT met, perform the following: (Step 12.2.6.1) Identify surveillance item as a discrepancy in appropriate initials blank. (Step 12.2.6.2) Note surveillance item on a discrepancy sheet (JPM Cue Sheet).	The operator reviews the completed Enclosure 13.1 and Equipment Problem Evaluation Form. The operator recognizes that Control Room indicators 1NVP5760 and 1NVP5763 (VCT Level) are NOT within 5% of each other. The operator recognizes that there are no TS/SLC requirements associated with the VCT level instruments, but that they are required to be within 5% of each other based on SOER 97-1 requirements. **<u>The operator notifies the WCC or directs that a work request be created.</u>**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*2	(Step 12.2.2) IF performing Enclosure 13.1 (Daily Surveillance Items Checklist), THEN check each applicable surveillance item in Enclosure 13.1 meets its Acceptance Criteria. (Step 12.2.5) IF a surveillance item was NOT completed due to Unit "Applicable Mode", THEN identify surveillance item by writing "NA" in appropriate initial blank. (Step 12.2.6) IF a surveillance item Acceptance Criteria NOT met, perform the following: (Step 12.2.6.1) Identify surveillance item as a discrepancy in appropriate initials blank. (Step 12.2.6.2) Note surveillance item on a discrepancy sheet (JPM Cue Sheet).	The operator reviews the completed Enclosure 13.1 and Equipment Problem Evaluation Form. The operator recognizes that FWST Solution Temperature (Minimum) is $\leq$ 70°F as read on 1FWP-5030 (which is operable). The operator addresses TS LCO 3.5.4, Refueling Water Storage Tank, and determines that ACTION A.1 applies. The operator addresses SLC 16.9.11, Borated Water Sources (Operating), and determines that ACTION D.1 applies. The operator addresses SLC 16.9.14, Borated Water Sources (Shutdown), and determines that this SLC does not apply under the current plant conditions. **The operator identifies LCO 3.5.4 ACTION A.1 and SLC 16.9.11 ACTION D.1.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	(Step 12.2.2) IF performing Enclosure 13.1 (Daily Surveillance Items Checklist), THEN check each applicable surveillance item in Enclosure 13.1 meets its Acceptance Criteria. (Step 12.2.5) IF a surveillance item was NOT completed due to Unit "Applicable Mode", THEN identify surveillance item by writing "NA" in appropriate initial blank. (Step 12.2.6) IF a surveillance item Acceptance Criteria NOT met, perform the following: (Step 12.2.6.1) Identify surveillance item as a discrepancy in appropriate initials blank. (Step 12.2.6.2) Note surveillance item on a discrepancy sheet (JPM Cue Sheet).	The operator reviews the completed Enclosure 13.1 and Equipment Problem Evaluation Form. The operator recognizes that the operate light is NOT LIT for 1EMF-31 (Turbine Bldg Sump Disch) the loss of sample flow annunciator is NOT in alarm status, and the source check was unsuccessful. The operator addresses SLC 16.11.2, Radioactive Liquid Effluent Monitoring Instrumentation, and enters Condition B immediately. The operator addresses Table 16.11.2-1, Instrument 2.a and determines that since TR 16.11.2.1 is NOT met and Instrument 2.a is NOT OPERABLE, ACTION D is required. **The operator determines that SLC 16.11.2 ACTION B.1, D.1, D.2 and D.3 are required and notifies the WCC or directs that a work request be created.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(Step 12.2.2) IF performing Enclosure 13.1 (Daily Surveillance Items Checklist), THEN check each applicable surveillance item in Enclosure 13.1 meets its Acceptance Criteria. (Step 12.2.5) IF a surveillance item was NOT completed due to Unit "Applicable Mode", THEN identify surveillance item by writing "NA" in appropriate initial blank. (Step 12.2.6) IF a surveillance item Acceptance Criteria NOT met, perform the following: (Step 12.2.6.1) Identify surveillance item as a discrepancy in appropriate initials blank. (Step 12.2.6.2) Note surveillance item on a discrepancy sheet (JPM Cue Sheet).	The operator reviews the completed Enclosure 13.1 and Equipment Problem Evaluation Form. The operator recognizes that Unit Vent Flow Rate Monitor(1VALP-5120) is reading < 15%. The operator addresses SLC 16.11.7-1 and enters Condition B immediately. The operator addresses Table 16.11.7-1, Instrument 3.d and determines that since TR 16.11.7.3 is NOT met Instrument 3.d is NOT OPERABLE, and that ACTION D is required. **<u>The operator determines that SLC 16.11.7 ACTION B.1, D.1 and D.2 are required.</u>**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Admin – JPM A1b SRO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

KEY:

Problem	**Identify all Technical Specification/SLC required ACTION, as well as all other actions that must be taken**
Control Room indicators 1NVP5760 and 1NVP5763 (VCT Level) are NOT within 5% of each other	The operator notifies the WCC or directs that a work request be created.
FWST Solution Temperature (Minimum) is $\leq$ 70ºF as read on 1FWP-5030	The operator identifies LCO 3.5.4 ACTION A.1 and SLC 16.9.11 ACTION D.1 are required.
Operate light is NOT LIT for 1EMF-31 (Turbine Bldg Sump Disch) the loss of sample flow annunciator is NOT in alarm status, and the source check was unsuccessful	The operator determines that SLC 16.11.2 ACTION B.1, D.1, D.2 and D.3 are required. The operator notifies the WCC or directs that a work request be created.
Unit Vent Flow Rate Monitor(1VALP-5120) is reading < 15%	The operator determines that SLC 16.11.7 ACTION B.1, D.1 and D.2 are required.

Initial Conditions:

- Unit 1 is in Mode 1 at 100% power.
- Fire Hydrant 10 (W of Main Shop) is OOS and all other equipment is operable and/or functional.
- Enclosure 13.1, Daily Surveillance Items Checklist, of PT/1/A/4600/003B, “Daily Surveillance Items,” has been completed.
- Enclosure 13.3, “Cask Monitoring,” is still in progress and will be provided when complete.

INITIATING CUE:

- Evaluate the completed Enclosure 13.1 of PT/1/A/4600/003B (Daily Surveillance Items Checklist) per Step 12.
- Identify all Technical Specification/SLC required ACTION, as well as all other actions that must be taken so that an ESOMS entry can be prepared.

Problem	**Identify all Technical Specification/SLC required ACTION, as well as all other actions that must be taken**

(If additional space is needed use back of page)

<u>JPM A2 SRO</u>

Facility:	McGuire	Task No.:	
Task Title:	Perform a Thermal Margin Determination	JPM No.:	2020 Admin – JPM A2 SRO
K/A Reference:	2.2.18 (3.9)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM) and Handout 1.

Initial Conditions:

- Unit 1 was shutdown 16 days ago for a mid-cycle outage after 200 days of operation.
- Unit 1 is currently in Mode 5.
- No Core Offload will occur.
- The NC system is 125˚F with "A" Train ND in service.
- Preparations are being made to lower NC system level to 67 inches above Hot Leg Centerline per Enclosure 4.1 (Draining the NC System) of OP/1/A/6100/SD-20 (Draining the NC System).

Initiating Cue:

- Complete Attachment 12.6 of OMP 5-8 (Shift Supervision Turnovers) to determine the new thermal margin with NC system level at 67 inches above Hot Leg Centerline (Complete all required paperwork).
- Identify the individuals that must be notified and/or actions that must be taken.

Task Standard: The operator will determine the Thermal Margin and complete Attachment 12.6 (Thermal Margin Determination) and Attachment 12.7 (Shutdown Assessment Status) of OMP 5-8 (Shift Supervision Turnovers) in accordance with the provided KEY.

Required Materials: Calculator

General References: OP/1/A/6100/SD-20 (Draining the NC System), Rev 71
OMP 5-8 (Shift Supervision Turnovers), Rev 74
OP/1/A/6100/022 (Unit 1 Data Book), Rev 481
MCEI-0400-379 (McGuire 1 Cycle 27 Core Operating Limits Report), Rev 1

Handouts: Handout 1: Blank copy of OMP 5-8 (Shift Supervision Turnovers)

Time Critical Task: NO

Validation Time: 15 minutes

NOTE: An Answer KEY is provided on a separate document.

Critical Step Justification	
Step 2	This step is critical because selecting and using Curve 2.10.1 B (Or Curve 2.10.1.B(1)) is necessary to determine the Thermal Margin.
Step 3	This step is critical because documenting the thermal margin time and maximum NC Temperature allowed is necessary to complete Attachment 12.6 (Thermal Margin Determination) of OMP 5-8 (Shift Supervision Turnovers) in accordance with the provided KEY.
Step 4	This step is critical because completing Attachment 12.7 of OMP 5-8 is necessary to complete the assigned task in accordance with the provided KEY.
Step 5	This step is critical because notifying the Containment Closure Coordinator (CCC) of the thermal margin time determined is necessary to complete the assigned task in accordance with the provided KEY.
Step 6	This step is critical because notifying the Shift Technical Advisor (STA) of the thermal margin time determined is necessary to complete the assigned task in accordance with the provided KEY.
Step 7	This step is critical because writing the thermal margin time on MC-6 and updating MLOG is necessary to complete the assigned task in accordance with the provided KEY.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM) and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Attachment 12.6) Applicable to: Unit 1 Unit 2	The operator places a check in the Unit 1 checkbox.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
2 *	(Attachment 12.6, Step 1) Refer to OP/1(2)/A/6100/22, Unit 1 (2) Databook, Enclosure 4.3, Section 2.10 “Thermal Margin Curves,” to determine appropriate section and/or curve to use. SECTION/CURVE USED__________ INITIAL_________	The operator obtains the Core Data Book and locates Section 2.10. The operator recognizes that since the Loops will be drained and the Vessel Head has NOT been removed, the Curves of Section 2.10.1 are applicable. The operator determines that from the Initial Conditions given, Enclosure 4.3 Section/Curve 2.10.1 B or B (1) is to be used, and records this, placing their initial in the appropriate Block. Using Curve 2.10.1 B, the operator intersects the point of 16 days after shutdown and the 140ºF temperature Curve and determines that the new Thermal Margin is .525±.02 hours, or **31.5 ±1.2 minutes.** OR Using Curve 2.10.1 B (1), the operator intersects the point of 16 days after shutdown and the 140ºF temperature Curve and determines that the new Thermal Margin is **32 minutes.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	(Attachment 12.6, Step 2) Document thermal margin time and maximum NC Temperature allowed (for curve used) in the table below and initial.	The operator records the date in the chart on Attachment 12.6. The operator records the time in the chart on Attachment 12.6. The operator records **31.5 ±1.2 minutes** in the “Thermal Margin MIN” block on the chart on Attachment 12.6. The operator records **140°F** in the “Max NC Temp °F” block on the chart on Attachment 12.6.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(Attachment 12.6, Step 3) Communicate Thermal Margin as follows: (Attachment 12.6, Step 3.a) Write thermal margin time and max NC Temp on the “Shutdown Assessment/Status” (Attachment 12.7). Include any data Book 4.3 Section 2.10 support parameters (S/G Lvls, Pzr Lvl, etc.) Initial in Table below.	The operator records **31.5 ±1.2 minutes** in the Thermal Margin Column “TM Minutes” block on Attachment 12.7. The operator records **140ºF** in the Thermal Margin Column “Max NC Temp” block on Attachment 12.7. The operator records **67”** in the Thermal Margin Column “NCS Level” block on Attachment 12.7. The operator places their initial in the “Thermal Margin Data Written on Shutdown Assessment/Status (Attachment 12.7)” block on the chart on Attachment 12.6.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(Attachment 12.6, Step 3.b) Notify the Containment Closure Coordinator (CCC) of the thermal margin time determined. Initial in the table below.	The operator contacts the CCC and notifies that TM is **31.5 ±1.2 minutes**. **Cue:** **The Containment Closure Coordinator has been notified.** The operator places their initial in the "CCC Notified" block on the chart on Attachment 12.6.		
*6	(Attachment 12.6, Step 3.c) Notify the Shift Technical Advisor (STA) of the thermal margin time determined. Initial in the table below.	The operator contacts the STA and notifies that TM is **31.5 ±1.2 minutes**. **Cue:** **The STA has been notified.** The operator places their initial in the "STA Notified" block on the chart on Attachment 12.6.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*7	(Attachment 12.6, Step 3.d) Write thermal margin time on MC-6 and update MLOG on SDS (OAC). Initial in the table below.	The operator directs the OATC to write **31.5 ±1.2 minutes** in the TM Block on MC-6 and enter into MLOG. **Cue:** **MC-6/MLOG has been updated.** The operator places their initial in the “Thermal Margin Time Written on MC-6 and MLOG” block on the chart on Attachment 12.6.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Admin – JPM A2 SRO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

Initial Conditions:

- Unit 1 was shutdown 16 days ago for a mid-cycle outage after 200 days of operation.
- Unit 1 is currently in Mode 5.
- No Core Offload will occur.
- The NC system is 125˚F with “A” Train ND in service.
- Preparations are being made to lower NC system level to 67 inches above Hot Leg Centerline per Enclosure 4.1 (Draining the NC System) of OP/1/A/6100/SD-20 (Draining the NC System).

INITIATING CUE:

- Complete Attachment 12.6 of OMP 5-8 (Shift Supervision Turnovers) to determine the new thermal margin with NC system level at 67 inches above Hot Leg Centerline (Complete all required paperwork).
- Identify the individuals that must be notified and/or actions that must be taken.

New Thermal Margin: ____________________________

Individuals Notified/Actions Taken:

JPM A3 SRO

Facility:	McGuire	Task No.:	
Task Title:	Approve a Liquid Release Permit	JPM No.:	2020 Admin – JPM A3 SRO
K/A Reference:	G KA 2.3.6 (3.8)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue and List of Out-of-Service Equipment (Last Two Pages of this JPM), and Handouts 1-2.

Initial Conditions:

- Unit 1 and Unit 2 are in Mode 1 at 100% power.
- There are no on-going liquid radiation releases.
- Attachment 10 ('B' WMT Release Authorization) of OP/0/B/6200/607 (Liquid Waste Release – WMT ‘B’ with WMT Pump ‘B’) has been initiated.
- Attachment 1 ('B' WMT Release Using 'B' WMT Pump) of OP/0/B/6200/607 (Liquid Waste Release – WMT ‘B’ with WMT Pump ‘B’) is in progress in preparation for release of the B Waste Monitor Tank.
- RP has just delivered the LWR package # 2020067 to the Control Room.
- All available RC Pumps are running.

Initiating Cue:

- You are directed to review and approve LWR Package # 2020067 by performing Steps 9-12 of Attachment 10 (‘B’ WMT Release Authorization) of OP/0/B/6200/607.
- If LWR Package # 2020067 cannot be approved, identify why not.

Task Standard:	The operator will determine that LWR Package # 2020067 cannot be approved because the recommended Release Rate is GREATER THAN the Allowable Release Rate and 0EMF49 has NOT been source checked.
Required Materials:	Calculator
General References:	OP/0/B/6200/607 (Liquid Waste Release – WMT B With WMT Pump B), Rev 12 OP/1/A/6500/001 (Liquid Waste System), Rev 103
Handouts:	Handout 1: Attachment 10 (‘B’ WMT Release Authorization) of OP/0/B/6200/607 (Liquid Waste Release – WMT ‘B’ With WMT Pump ‘B’) marked up through Step 8. Handout 2: LWR Discharge Document (Adjusted such that Recommended Release Rate is > Allowable Release Rate (Reversed), and 0EMF49 Source Check Block is BLANK).
Time Critical Task:	NO
Validation Time:	15 minutes

Critical Step Justification	
Step 1	This step is critical because determining the operability/functionality of release instrumentation is necessary to determine whether or not LWR Package # 2020067 can be approved.
Step 3	This step is critical because evaluating LWR 2020067 is necessary to determine whether or not LWR Package # 2020067 can be approved.
Step 4	This step is critical because identifying the reasons why LWR 2020067 cannot be approved is necessary to complete the task.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue and List of Out-of-Service Equipment (Last Two Pages of this JPM), and Handouts 1-2.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*1	(Attachment 10, Step 9) Determine functionality status of the following components:			
	0WMLP5140 (B WMT Pump Disch Flow) Yes ☐ No ☐	The operator reviews the equipment OOS List and determines that 0WMLP5140 is OPERABLE and checks YES.		
	1WP-35 (WMT & VUCDT to RC Cntrl) Yes ☐ No ☐	The operator reviews the equipment OOS List and determines that 1WP-35 is OPERABLE and checks YES.		
	1WP-37 (Liquid Waste to RC Cntrl) Yes ☐ No ☐	The operator reviews the equipment OOS List and determines that 1WP-37 is OPERABLE and checks YES.		
	0EMF-49 (Liquid Waste Disch Radiation Monitor) Yes ☐ No ☐	The operator reviews the equipment OOS List and determines that 0EMF49 is OPERABLE and checks YES.		
	0WMFS5440 (0EMF49 Outlet Flow) [8.7.4] Yes ☐ No ☐	The operator reviews the equipment OOS List and determines that 0WMFS5440 is OPERABLE and checks YES.		
2	(Step 10) IF any component listed in Step 9 is NON-FUNCTIONAL, THEN…..	The operator recognizes that all required equipment is OPERABLE, and that this step is NA.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	(Step 11) Ensure the following items on LWR Document are complete: • Number of "RC Pumps Running" is greater than OR equal to "RC Pumps Assigned To This Release" • Number of "RC Pumps Running" is greater than OR equal to "Total RC Pumps Required (all concurrent releases)" • "Recommended Release Rate (GPM)" is less than "Allowable Release Rate (GPM)" • 0EMF-49L (Waste Liquid Low Range Radiation Monitor Module) is FUNCTIONAL AND in service. • 0EMF-49 (Liquid Waste Disch Radiation Monitor) source check performed. • "Expected CPM" is less than "TRIP 1 SETPOINT" AND "TRIP 2 SETPOINT". • Review of Special Instructions provided on LWR Permit. [8.7.12]	The operator recognizes that there are 7 RC Pumps operating which is greater than the 1RC pump required by LWR Package # 2020067. The operator recognizes that there are NO concurrent releases. The operator recognizes that the "Recommended Release Rate (gpm)" is **GREATER THAN** "Allowable Release Rate (gpm)" and determines that this must be corrected. The operator reviews the equipment OOS List and determines that 0EMF49 is OPERABLE. The operator reviews LWR Package #202067 and determines that 0EMF49 is in service. The operator reviews LWR paperwork and determines that 0EMF49 has **NOT** been source checked. The operator observes that the "Expected CPM" is less than "Trip 1 Setpoint" and "Trip 2 Setpoint". The operator reviews the Special Instructions provided on the LWR Permit and determines that all Special Instructions are met (None).		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(Step 12) WHEN approved for release, THEN place signature, date, AND time of Control Room Supervisor authorization on LWR Document.	The operator does NOT initial Step 12 and identifies that LWR Package # 2020067 can **NOT** be approved until the "Recommended Release Rate (gpm)" is less than the "Allowable Release Rate (gpm)" and 0EMF49 has been source checked.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

Job Performance Measure No.: 2020 Admin – JPM A3 SRO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

Out-of-Service Equipment

Common Unit Equipment:

Fire Alarm Control Panel (FACP) – 2 (Admin Building) – Ongoing Testing
'A' NB Evaporator Feed Pump – Failed Bearing
0EMF43A (CR Air Intake A Rad Monitor) – Circuit Failure
SKSS Inverter – Ongoing Maintenance
0WMFT5130 (A Waste Monitor Tank Pump Disch Flow) – Failed transmitter
Fire Hydrant 10 (W of Main Shop) – Will Not Operate
0VSWT0001 (A VS Compressor Water Separator Water Trap) – Leaking Petcock

Unit 1:

Glycol Pump B – Ongoing Maintenance
MCB Annunciator 1AD-2, A8 (OTDT Runback / Rod Stop Alert) – Alarm does NOT function
1RNP 5360 (1A Component Cooling HX Outlet Flow) – Failed High
1B LLI Pump – Oil Level in Reduction Gear Low

Unit 2:

2RWS-13 (Raw Water Skid Coupon Rack A Influent) – Packing Leak
Fireworks FDS Zone 24 Smoke Detector (Unit 2 Seal Oil System) – Failed
2EMF44 (Cont Vent Drn Tank Rad Monitor) – Detector Failure
2C RC Pump – Motor Replacement
2TLP5010 (Stm Seal Header Press) – Failed Low

Note: All other equipment is OPERABLE/FUNCTIONAL.

INITIAL CONDITIONS:

- Unit 1 and Unit 2 are in Mode 1 at 100% power.
- There are no on-going liquid radiation releases.
- Attachment 10 ('B' WMT Release Authorization) of OP/0/B/6200/607 (Liquid Waste Release – WMT ‘B’ with WMT Pump ‘B’) has been initiated.
- Attachment 1 ('B' WMT Release Using 'B' WMT Pump) of OP/0/B/6200/607 (Liquid Waste Release – WMT ‘B’ with WMT Pump ‘B’) is in progress in preparation for release of the B Waste Monitor Tank.
- RP has just delivered the LWR package # 2020067 to the Control Room.
- All available RC Pumps are running.

INITIATING CUE:

- You are directed to review and approve LWR Package # 2020067 by performing Steps 9-12 of Attachment 10 (‘B’ WMT Release Authorization) of OP/0/B/6200/607.
- If LWR Package # 2020067 cannot be approved, identify why not.

JPM A4 SRO

Facility:	McGuire	Task No.:	
Task Title:	Classify an Emergency Event	JPM No.:	2020 Admin – JPM A4 SRO
K/A Reference:	G KA 2.4.41 (4.6)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last two Pages of this JPM), and Handouts 1-3.

Initial Conditions: Unit 1 was operating at 100% power and Unit 2 was in No Mode when a Loss of Offsite Power occurred to the site.
The 1A EDG is OOS and unavailable to start.

The following timeline of events is observed:

0800:00	Loss of Offsite Power due an electrical grid disturbance
0800:20	The 1B EDG failed to start automatically
0800:45	An AO is dispatched to manually start the 1B EDG
0801:00	The crew entered EP/1/A/5000/ECA-0.0, Loss of All AC Power.
0806:00	DEC BA reports that the switchyard is unavailable, however that power should be restored to at least the Mecklenburg line within 45 minutes.
0808:00	The AO reports that the 1B EDG has tripped on overspeed and IAE reports restoration will take about 25 minutes.

ALL Critical Safety Function Status Trees are Yellow or Green.

Initiating Cue:	• Classify the Event in accordance with RP/0/A/5700/000 (Classification of Emergency). • If more than one Emergency Action Level (EAL) has been exceeded, identify the EAL resulting in the Highest Emergency Classification. (Raise your hand and alert the Examiner when complete) • Then, prepare a Nuclear Power Plant Emergency Notification Form for the event, and present to the Emergency Coordinator for approval. (Raise your hand and alert the Examiner when complete) **This is a Time Critical JPM**

Task Standard: The operator will declare a SITE AREA EMERGENCY (SAE) based on SS1.1, "Loss of all offsite and all onsite AC power capability to essential 4160V buses 1(2)ETA and 1(2)ETB for ≥15 min;" and complete the Emergency Notification Form in accordance with the provided KEY within the following 15 minutes.

Required Materials: None

General References:
RP/0/A/5700/000 (Classification of Emergency), Rev 30
RP/0/A/5700/001 (Notification of Unusual Event), Rev 36
RP/0/A/5700/002 (Alert), Rev 37
RP/0/A/5700/003 (Site Area Emergency), Rev 37
RP/0/A/5700/004 (General Emergency), Rev 35
RP/0/B/5700/029 (Notifications to Offsite Agencies From the Control Room), Rev 25
EP/1/A/5000/ECA-0.0 (Loss of All AC Power), Rev 44
OMP 4-3 (Use of Emergency And Abnormal Procedures And FLEX Support Guidelines), Rev 48
FAD-MC-EP-EAL-WALLCHARTS, (McGuire Nuclear Station Classification of Emergency) Rev 2
Nuclear Power Plant Emergency Notification Form

Handouts:
Handout 1: RP/0/A/5700/000 (Classification of Emergency)
Handout 2: RP/0/B/5700/029 (Notifications to Offsite Agencies From the Control Room)
Handout 3: EAL Wallchart, Rev 2
Handout 4: Blank copies of Nuclear Power Plant Emergency Notification Forms or the Book of Pre-Printed Forms

Time Critical Task: YES – 15 minutes to make classification, and THEN 15 minutes to complete ENF.

Validation Time: 30 minutes

Critical Step Justification	
Step 5	This step is critical because using the EAL Wallchart is necessary to obtain the correct emergency classification.
Step 6	This step is critical because recording the classification time is necessary to establish the correct notification time.
Step 12	This step is critical because recording the correct Message Number is necessary to complete the Emergency Notification Form in accordance with the provided KEY within the 15 minutes.
Step 13	This step is critical because recording the correct Phone Number is necessary to complete the Emergency Notification Form in accordance with the provided KEY within the 15 minutes.
Step 14	This step is critical because checking the DRILL or the ACTUAL DECLARATION checkbox is necessary to complete the Emergency Notification Form in accordance with the provided KEY within the 15 minutes.
Step 16	This step is critical because checking the SAE checkbox is necessary to complete the Emergency Notification Form in accordance with the provided KEY within the 15 minutes.
Step 17	This step is critical because recording the correct EAL #, Declaration Date and Time and EAL DESCRIPTION is necessary to complete the Emergency Notification Form in accordance with the provided KEY within the 15 minutes.
Step 19	This step is critical because checking the NONE checkbox in Line 5 is necessary to complete the Emergency Notification Form in accordance with the provided KEY within the 15 minutes.
Step 20	This step is critical because checking the NONE checkbox in Line 6 is necessary to complete the Emergency Notification Form in accordance with the provided KEY within the 15 minutes.
Step 22	This step is critical because completing Lines 1-6 of the SAE ENF accordance with the provided KEY within 15 Minutes of the SAE Declaration time is necessary to complete the assigned task.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last two Pages of this JPM), and Handouts 1-3.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(RP/0/A/5700/000, Step 6.1.1) Determine operating MODE that existed at time event occurred AND prior to any protection system OR operator action initiated in response to event.	Using the Timeline of Events the operator determines that Unit 1 was in Mode 1 and Unit 2 is in No Mode at the start of the event.		
2	(Step 6.1.2) IF valid Security Condition OR Hostile Action, THEN…….	Using the Timeline of Events the operator determines that a valid Security Condition OR Hostile Action does NOT exist.		
3	(Notes prior to Step 6.1.3) • EAL Wallchart created from MNS EPLAN Section D per NEI 99-01 rev. 006. • Wallchart ID is FAD-MC-EP-EAL-WALLCHARTS located on bottom right corner of EAL Wallchart beside Duke Energy emblem.	The operator reads the Notes and proceeds.		
4	(Step 6.1.3) Verify EAL Wallchart has current revision of Classification of Emergency, FAD-MC-EP-EAL-WALLCHARTS, Classification of Emergency, Rev. 002	The operator locates the Rev number located on bottom right corner of EAL Wallchart beside Duke Energy emblem and determines that the Wall Chart is Revision 2 (Handout 3) and proceeds and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(Step 6.1.4) Perform Classification per EAL Wallchart.	The operator reviews the EAL Wall Chart, and determines the following: The operator determines that an **SAE** exists on Unit 1, based on **SS1.1,** Loss of all offsite and all onsite AC power capability to essential 4160V buses 1(2) ETA and 1(2) ETB for ≥ 15 min. The operator applies Note 1: "The Emergency Coordinator/EOF Director should declare the event promptly upon determining that time limit has been exceeded, or will likely be exceeded," and determines that the SAE should be declared now based on projections for restoration of power.		
*6	(Step 6.1.5) IF Emergency Action Level threshold has been exceeded, THEN declare the appropriate Emergency Classification. Event Declaration time:	The operator determines that an **SAE** exists, based on based on **SS1.1**. The operator records the event declaration time in the space provided.		

Examiner Note: Record Time Critical Stop Time __________

NOTE that this time is also the Start Time for the 2nd Time Critical action of completing the ENF SS1.1.

Provide the operator with Handout 4 (BLANK ENF or the Book of Pre-Printed Forms from which the operator can select the appropriate form).

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
7	(RP/0/A/5700/000, Step 6.1.6) Implement the applicable Emergency Response Procedure (RP) for that classification and continue with subsequent steps of this procedure. • Notification of Unusual Event RP/0/A/5700/001 • Alert RP/0/A/5700/002 • Site Area Emergency RP/0/A/5700/003 • General Emergency RP/0/A/5700/004.	The operator proceeds to RP/0/A/5700/003.		
8	(RP/0/A/5700/003, Note prior to Step 6.1.1) The following actions have been separated into position specific attachments to enhance timely completion and consistent execution. Site Assembly is required to be complete within 30 minutes of the declaration of Alert, Site Area Emergency or General Emergency.	The operator reads the Notes and proceeds.		
9	(Step 6.1.1) Assign the following actions: Notify the Offsite Agency Communicator to make initial notifications to the offsite agencies per RP/0/B/5700/029, Notifications to Offsite Agencies from the Control Room:	The operator proceeds to RP/0/B/5700/029.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
10	(RP/0/B/5700/029, Step 6.1.1) Complete ENF by using one of the following: • Preprinted ENF. OR • Blank ENF.	The operator recognizes that an ENF has been provided, and proceeds.		
11	(Note prior to Step 6.1.2) Messages are sequentially numbered throughout the drill or event beginning with message number 1 and continues until termination of the drill or event.	The operator reads the Note and proceeds.		
*12	(Step 6.1.2) Record message number.	The operator records the Message Number as “1,” per provided KEY.		
*13	(Step 6.1.3) Ensure "(704) 875-6044" recorded as confirmation telephone number.	The operator records the Phone Number as “"(704) 875-6044,” or ensures that it already exists, per provided KEY.		
*14	(Step 6.1.4) Complete Line 1 by checking 'DRILL' OR 'ACTUAL DECLARATION'.	The operator checks the DRILL or the ACTUAL DECLARATION checkbox, per provided KEY.		
15	(Step 6.1.5) Complete Line 2 by verifying that MCGUIRE is printed on the form.	The operator ensures that the AFFECTED SITE states “McGuire,” per provided KEY.		
*16	(Step 6.1.6) Complete Line 3 by checking correct emergency classification.	The operator checks the SAE checkbox, per provided KEY.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*17	(Step 6.1.7) Complete Line 4 by recording the following: • EAL #. • Declaration Date and Time. • EAL DESCRIPTION.	The operator records the EAL Number as "SS1.1," the Declaration Date and Time as the current Date and Time, and the EAL Description as "Loss of all offsite and all onsite AC power capability to essential 4160V buses 1(2)ETA and 1(2)ETB for ≥ 15 min.," (Or Equivalent) per provided KEY.		
18	(Note prior to Step 6.1.8) The "Release to the Environment" being evaluated in Step 8 must be caused by the emergency.	The operator reads the Note and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*19	(Step 6.1.8) Complete Line 5 as follows: IF any of the following exists, THEN check 'IS OCCURRING' OR 'HAS OCCURRED' as appropriate: • EMF 38, 39 or 40 readings indicate an increase AND containment pressure greater than 0.3 psig. • EMF 38, 39 or 40 readings indicate an increase AND a known leak path exists from containment. • EMF 35, 36 or 37 readings indicate an increase in activity. • EMF 33 or other alternate means indicate Steam Generator tube leakage. • A known release path exists. Alternate methods of release determination are as follows: • Greater than 0.3 psig containment pressure with a LOCA. • Positive field monitoring team results. • Known Steam Generator Tube Rupture. IF NO emergency release exists, THEN check 'NONE'	The operator checks the NONE checkbox, per provided KEY.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*20	(Step 6.1.9) Complete Line 6 as follows: • IF Notification of Unusual Event, Alert, OR Site Area Emergency, THEN check 'NONE' • Go to Step 10	The operator checks the NONE checkbox per provided KEY and goes to Step 6.10.		
21	(Step 6.1.10) Complete Line 12 by recording any additional 'REMARKS' as directed by the Emergency Coordinator.	The operator leaves blank and proceeds, per provided KEY.		
*22	(Step 6.1.11) Complete Line 13 by ensuring the Emergency Coordinator performs the following: • Sign 'APPROVED BY' • Enter 'TITLE' • Record date and time.	The operator completes the SAE ENF accordance with the provided KEY (Separate Document) within 15 Minutes of the SAE Declaration time. The operator presents the completed ENF Form to the Emergency Coordinator. **NOTE:** The critical nature of this action is that the form is completed within 15 minutes.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

Critical TIME 1: ______________

Critical TIME 2: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2020 Admin – JPM A4 SRO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

Initial Conditions:

Unit 1 was operating at 100% power and Unit 2 was in No Mode when a Loss of Offsite Power occurred to the site.

The 1A EDG is OOS and unavailable to start.

The following timeline of events is observed:

0800:00	Loss of Offsite Power due an electrical grid disturbance
0800:20	The 1B EDG failed to start automatically
0800:45	An AO is dispatched to manually start the 1B EDG
0801:00	The crew entered EP/1/A/5000/ECA-0.0, Loss of All AC Power.
0806:00	DEC BA reports that the switchyard is unavailable, however that power should be restored to at least the Mecklenburg line within 45 minutes.
0808:00	The AO reports that the 1B EDG has tripped on overspeed and IAE reports restoration will take about 25 minutes.

ALL Critical Safety Function Status Trees are Yellow or Green.

INITIATING CUE:

- Classify the Event in accordance with RP/0/A/5700/000 (Classification of Emergency).
- If more than one Emergency Action Level (EAL) has been exceeded, identify the EAL resulting in the Highest Emergency Classification. (Raise your hand and alert the Examiner when complete)
- Then, prepare a Nuclear Power Plant Emergency Notification Form for the event, and present to the Emergency Coordinator for approval. (Raise your hand and alert the Examiner when complete)

This is a Time Critical JPM