ES-401 **PWR Examination Outline** **Form ES-401-2**

Facility: St Lucie RO Exam Date of Exam: March 2019

Tier	Group	RO K/A Category Points												SRO-Only Points				
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2		G*		Total
1. Emergency and Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	18					6
	2	2	2	2				1	1			1	9					4
	Tier Totals	5	5	5				4	4			4	27					10
2. Plant Systems	1	2	3	2	3	2	3	2	3	3	3	2	28					5
	2	1	1	1	1	1	1	1	1	1	0	1	10					3
	Tier Totals	3	4	3	4	3	4	3	4	4	3	3	38					8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	3	4	7
		3			3			1			3							

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 Form ES-401-2 Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)									
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						Knowledge of the operational implications of the following concepts as they apply to the (Reactor Trip Recovery) EK 1.1: Components, capacity, and function of emergency systems	2.9	
000008 (APE 8) Pressurizer Vapor Space Accident / 3					X		Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: AA 2.17: Steam dump valve controller (position)	2.5	1
000009 (EPE 9) Small Break LOCA / 3				X			Ability to operate and monitor the following as they apply to a small break LOCA: EA 1.17: PRT	3.4	2
000011 (EPE 11) Large Break LOCA / 3			X				Knowledge of the reasons for the following responses as the apply to the Large Break LOCA: EK 3.13: Hot-leg injection/recirculation	3.8	3
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4			X				Knowledge of the reasons for the following responses as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow) : AK 3.03: Sequence of events for manually tripping reactor and RCP as a result of an RCP malfunction	3.7	4
000022 (APE 22) Loss of Reactor Coolant Makeup / 2			X				Knowledge of the reasons for the following responses as they apply to the Loss of Reactor Coolant Makeup: AK3.02: Actions contained in SOPs and EOPs for RCPs, loss of makeup, loss of charging, and abnormal charging	3.5	5
000025 (APE 25) Loss of Residual Heat Removal System / 4					X		Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: AA2.06: Existence of proper RHR overpressure protection	3.2	
000026 (APE 26) Loss of Component Cooling Water / 8						X	Loss of Component Cooling Water (CCW) G 2.4.50: Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	4.2	
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3		X					Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: AK 2.03: Controllers and positioners	2.6	
000029 (EPE 29) Anticipated Transient Without Scram / 1		X					Knowledge of the interrelations between the and the following an ATWS: AK 2.06: Breakers, relays, and disconnects	2.9	
000038 (EPE 38) Steam Generator Tube Rupture / 3				X			Ability to operate and monitor the following as they apply to a SGTR: EA 1.07: PRT tank temperature, pressure, and setpoints	2.5	

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4		X					Knowledge of the interrelations between the (Excess Steam Demand) and the following: EK 2.1: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.3	
000054 (APE 54; CE E06) Loss of Main Feedwater /4	X						Knowledge of the operational implications of the following concepts as they apply to the (Loss of Feedwater) EK 1.3: Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Feedwater).	3.2	
000055 (EPE 55) Station Blackout / 6						X	Loss of Offsite and Onsite Power (Station Blackout) G 2.2.44: 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.	4.2	
000056 (APE 56) Loss of Offsite Power / 6						X	Loss of Offsite Power G 2.4.41: Knowledge of the emergency action level thresholds and classifications.	2.9	
000057 (APE 57) Loss of Vital AC Instrument Bus / 6					X		Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: AA 2.17: System and component status, using local or remote controls	3.1	
000058 (APE 58) Loss of DC Power / 6	X						Knowledge of the operational implications of the following concepts as they apply to Loss of DC Power: AK 1.01: Battery charger equipment and instrumentation	2.8	
000062 (APE 62) Loss of Nuclear Service Water / 4									
000065 (APE 65) Loss of Instrument Air / 8									
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6				X			Ability to operate and/or monitor the following as they apply to Generator Voltage and Electric Grid Disturbances: AA 1.01: Grid frequency and voltage	3.6	
(W E04) LOCA Outside Containment / 3									
(W E11) Loss of Emergency Coolant Recirculation / 4									
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4									
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)									
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					X		Ability to determine and interpret the following as they apply to the Dropped Control Rod: AA 2.03: Dropped rod, using in-core/ex-core instrumentation, in-core or loop temperature measurements	3.6	
000005 (APE 5) Inoperable/Stuck Control Rod / 1									
000024 (APE 24) Emergency Boration / 1	X						Knowledge of the operational implications of the following concepts as they apply to Emergency Boration: AK1.02: Relationship between boron addition and reactor power	3.6	
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									
000037 (APE 37) Steam Generator Tube Leak / 3			X				Knowledge of the reasons for the following responses as they apply to the Steam Generator Tube Leak: AK 3.01: Comparison of makeup flow and letdown flow for various modes of operation	3.1	
000051 (APE 51) Loss of Condenser Vacuum / 4			X				Knowledge of the reasons for the following responses as they apply to the Loss of Condenser Vacuum: AK 3.01: Loss of steam dump capability upon loss of condenser vacuum	2.8	
000059 (APE 59) Accidental Liquid Radwaste Release / 9									
000060 (APE 60) Accidental Gaseous Radwaste Release / 9									
000061 (APE 61) Area Radiation Monitoring System Alarms / 7		X					Knowledge of the interrelations between the Area Radiation Monitoring (ARM) System Alarms and the following: AK 2.01: Detectors at each ARM system location	2.5	
000067 (APE 67) Plant Fire On Site / 8									
000068 (APE 68; BW A06) Control Room Evacuation / 8		X					Knowledge of the interrelations between the Control Room Evacuation and the following: AK 2.01: Auxiliary shutdown panel layout	3.9	
000069 (APE 69; W E14) Loss of Containment Integrity / 5									

ES-401	PWR Examination Outline							Form ES-401-2
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)								
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4	X						Knowledge of the operational implications of the following concepts as they apply to the Inadequate Core Cooling : EK 1.02: Potential consequences of uncovering the core	4.6	
000076 (APE 76) High Reactor Coolant Activity / 9									
000078 (APE 78*) RCS Leak / 3									
(W E01 & E02) Rediagnosis & SI Termination / 3									
(W E13) Steam Generator Overpressure / 4									
(W E15) Containment Flooding / 5									
(W E16) High Containment Radiation /9									
(BW A01) Plant Runback / 1									
(BW A02 & A03) Loss of NNI-X/Y/7									
(BW A04) Turbine Trip / 4									
(BW A05) Emergency Diesel Actuation / 6									
(BW A07) Flooding / 8									
(BW E03) Inadequate Subcooling Margin / 4									
(BW E08; W E03) LOCA Cooldown—Depressurization / 4									
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4									
(BW E13 & E14) EOP Rules and Enclosures									
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4									
(CE A16) Excess RCS Leakage / 2									
(CE E09) Functional Recovery						X	Functional Recovery G 2.4.6: Knowledge of EOP mitigation strategies.	3.7	
(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4				X			Ability to operate and / or monitor the following as they apply to the (Natural Circulation Operations) AA 1.2: Operating behavior characteristics of the facility.	3.1	
K/A Category Point Totals:	2	2	2	1	1	1	Group Point Total:		9

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-2	
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			Ability to monitor automatic operation of the RCPS, including: A 3.05: RCP lube oil and bearing lift pumps	2.7	
003 (SF4P RCP) Reactor Coolant Pump											X	Reactor Coolant Pump G 2.4.21: 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.	4.0	
004 (SF1; SF2 CVCS) Chemical and Volume Control			X									Knowledge of the effect that a loss or malfunction of the CVCS will have on the following: K 3.07: PZR level and pressure	3.8	
004 (SF1; SF2 CVCS) Chemical and Volume Control								X				Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A 2.24: Isolation of both letdown filters at one time: down-stream relief lifts	2.8	
005 (SF4P RHR) Residual Heat Removal								X				Ability to (a) predict the impacts of the following malfunctions or operations on the RHRS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A 2.01: Failure modes for pressure, flow, pump motor amps, motor temperature, and tank level instrumentation	2.7	
006 (SF2; SF3 ECCS) Emergency Core Cooling					X							Knowledge of the operational implications of the following concepts as they apply to ECCS: K 5.05: Effects of pressure on a solid system	3.4	
007 (SF5 PRTS) Pressurizer Relief/Quench Tank											X	Pressurizer Relief/Quench Tank G 2.1.20: Ability to interpret and execute procedure steps.	4.6	
008 (SF8 CCW) Component Cooling Water		X										Knowledge of bus power supplies to the following: K 2.02: CCW pump, including emergency backup	3.0	
008 (SF8 CCW) Component Cooling Water				X								Knowledge of CCWS design feature(s) and/or interlock(s) which provide for the following: K 4.02: Operation of the surge tank, including the associated valves and controls	2.9	

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
010 (SF3 PZR PCS) Pressurizer Pressure Control						X						Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: K 6.03: PZR sprays and heaters	3.2	
010 (SF3 PZR PCS) Pressurizer Pressure Control						X						Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: K 6.04: PRT	2.9	
012 (SF7 RPS) Reactor Protection							X					Ability to predict and/or monitor Changes in parameters (to prevent exceeding design limits) associated with operating the RPS controls including: A 1.01: Trip setpoint adjustment	2.9	
013 (SF2 ESFAS) Engineered Safety Features Actuation					X							Knowledge of the operational implications of the following concepts as they apply to the ESFAS: K 5.01: Definitions of safety train and ESF channel	2.8	
022 (SF5 CCS) Containment Cooling		X										Knowledge of power supplies to the following: K 2.01: Containment cooling fans	3.0	
025 (SF5 ICE) Ice Condenser														
026 (SF5 CSS) Containment Spray			X									Knowledge of the effect that a loss or malfunction of the CSS will have on the following: K 3.02: Recirculation spray system	4.2	
039 (SF4S MSS) Main and Reheat Steam										X		Ability to manually operate and/or monitor in the control room: A 4.04: Emergency feedwater pump turbines	3.8	
059 (SF4S MFW) Main Feedwater	X											Knowledge of the physical connections and/or cause effect relationships between the MFW and the following systems: K 1.03: S/GS	3.1	
061 (SF4S AFW) Auxiliary/Emergency Feedwater								X				Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A 2.01: Startup of MFW pump during AFW operation	2.5	
062 (SF6 ED AC) AC Electrical Distribution				X								Knowledge of ac distribution system design feature(s) and/or interlock(s) which provide for the following: K 4.03: Interlocks between automatic bus transfer and breakers	2.8	
063 (SF6 ED DC) DC Electrical Distribution	X											Knowledge of the physical connections and/or cause effect relationships between the DC electrical system and the following systems: K 1.03: Battery charger and battery	2.9	

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
063 (SF6 ED DC) DC Electrical Distribution										X		Ability to manually operate and/or monitor in the control room: A 4.01: Major breakers and control power fuses	2.8	
064 (SF6 EDG) Emergency Diesel Generator						X						Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: K 6.07: Air receivers	2.7	
073 (SF7 PRM) Process Radiation Monitoring				X								Knowledge of PRM system design feature(s) and/or interlock(s) which provide for the following: K 4.02: Letdown isolation on high-RCS activity	3.3	
073 (SF7 PRM) Process Radiation Monitoring							X					Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRM system controls including: A 1.01: Radiation levels	3.2	
076 (SF4S SW) Service Water		X										Knowledge of bus power supplies to the following: K 2.01: Service water	2.7	
076 (SF4S SW) Service Water										X		Ability to manually operate and/or monitor in the control room: A 4.02: SWS valves	2.6	
078 (SF8 IAS) Instrument Air									X			Ability to monitor automatic operation of the IAS, including: A 3.01: Air pressure	3.1	
103 (SF5 CNT) Containment									X			Ability to monitor automatic operation of the containment system, including: A 3.01: Containment isolation	3.9	
053 (SF1; SF4P ICS*) Integrated Control														
K/A Category Point Totals:	2	3	2	3	2	3	2	3	3	3	2	Group Point Total:		28

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														
002 (SF2; SF4P RCS) Reactor Coolant					X							Knowledge of the operational implications of the following concepts as they apply to the RCS: K 5.09: Relationship of pressure and temperature for water saturation and subcooling conditions	3.7	
011 (SF2 PZR LCS) Pressurizer Level Control									X			Ability to monitor automatic operation of the PZR LCS, including: A 3.03: Charging and letdown	3.2	
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation		X										Knowledge of bus power supplies to the following: K 2.01: NIS channels, components, and interconnections	3.3	
016 (SF7 NNI) Nonnuclear Instrumentation														
017 (SF7 ITM) In-Core Temperature Monitor	X											Knowledge of the physical connections and/or cause effect relationships between the ITM system and the following systems: K 1.01: Plant computer	3.2	
027 (SF5 CIRS) Containment Iodine Removal								X				Ability to (a) predict the impacts of the following malfunctions or operations on the CIRS; and (b) based on those predictions, use Procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A 2.01: High temperature in the filter system	3.0	
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control														
029 (SF8 CPS) Containment Purge														
033 (SF8 SFPCS) Spent Fuel Pool Cooling			X									Knowledge of the effect that a loss or malfunction of the Spent Fuel Pool Cooling System will have on the following: K 3.03: Spent fuel temperature	3.0	
034 (SF8 FHS) Fuel-Handling Equipment						X						Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System: K 6.02: Radiation monitoring systems	2.6	
035 (SF 4P SG) Steam Generator														
041 (SF4S SDS) Steam Dump/Turbine Bypass Control							X					Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SDS controls including: A 1.02: Steam pressure	3.1	
045 (SF 4S MTG) Main Turbine Generator														
055 (SF4S CARS) Condenser Air Removal														
056 (SF4S CDS) Condensate														
068 (SF9 LRS) Liquid Radwaste														

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	#
071 (SF9 WGS) Waste Gas Disposal											X	Waste Gas Disposal G 2.1.7: Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.		
072 (SF7 ARM) Area Radiation Monitoring														
075 (SF8 CW) Circulating Water				X								Knowledge of circulating water system design feature(s) and interlock(s) which provide for the following: K 4.01: Heat sink	2.5	
079 (SF8 SAS**) Station Air														
086 Fire Protection														
050 (SF 9 CRV*) Control Room Ventilation														
K/A Category Point Totals:	1	1	1	1	1	1	1	1	1	0	1	Group Point Total:		10/3

Facility:		Date of Exam:				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.26	Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen).	3.4			
	2.1.38	Knowledge of the station's requirements for verbal communications when implementing procedures.	3.7			
	2.1.40	Knowledge of refueling administrative requirements.	2.8			
	2.1.					
	2.1.					
	2.1.					
	Subtotal					
2. Equipment Control	2.2.3	Knowledge of the design, procedural, and operational differences between units.	3.8			
	2.2.41	Ability to obtain and interpret station electrical and mechanical drawings.	3.5			
	2.2.6	Knowledge of the process for making changes to procedures.	3.0			
	2.2.					
	2.2.					
	2.2.					
	Subtotal					
3. Radiation Control	2.3.5	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9			
	2.3.					
	2.3.					
	2.3.					
	2.3.					
	2.3.					
	Subtotal					
4. Emergency Procedures/Plan	2.4.2	Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.	4.5			
	2.4.22	Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.	3.6			
	2.4.39	Knowledge of RO responsibilities in emergency plan implementation.	3.9			
	2.4.					
	2.4.					
	2.4.					
	Subtotal					
Tier 3 Point Total				10		7

Tier/Group	Randomly Selected K/A	Reason for Rejection

Facility: St Lucie SRO Exam Date of Exam: March 2019

Tier	Group	RO K/A Category Points												SRO-Only Points						
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2		G*		Total		
1. Emergency and Abnormal Plant Evolutions	1				N/A					N/A			18	3		3		6		
	2												9	2		2		4		
	Tier Totals												27	5		5		10		
2. Plant Systems	1												28	2		3		5		
	2												10		2	1		3		
	Tier Totals												38	4		4		8		
3. Generic Knowledge and Abilities Categories		1		2		3		4		10				1	2	3	4	7		
														2	2	1	2			

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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							Form ES-401-2	
	Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)								
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		Ability to determine or interpret the following as they apply to a reactor trip: EA 2.03: Reactor trip breaker position	4.4	
000008 (APE 8) Pressurizer Vapor Space Accident / 3									
000009 (EPE 9) Small Break LOCA / 3									
000011 (EPE 11) Large Break LOCA / 3									
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4									
000022 (APE 22) Loss of Reactor Coolant Makeup / 2						X	Loss of Reactor Coolant Makeup G 2.2.12: Knowledge of surveillance procedures.	4.1	
000025 (APE 25) Loss of Residual Heat Removal System / 4					X		Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: AA 2.06: Existence of proper RHR overpressure protection	3.4	
000026 (APE 26) Loss of Component Cooling Water / 8									
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3									
000029 (EPE 29) Anticipated Transient Without Scram / 1									
000038 (EPE 38) Steam Generator Tube Rupture / 3						X	Steam Generator Tube Rupture / 3 G 2.1.19: Ability to use plant computers to evaluate system or component status.	3.8	
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4									
000054 (APE 54; CE E06) Loss of Main Feedwater /4									
000055 (EPE 55) Station Blackout / 6									
000056 (APE 56) Loss of Offsite Power / 6									
000057 (APE 57) Loss of Vital AC Instrument Bus / 6									
000058 (APE 58) Loss of DC Power / 6									
000062 (APE 62) Loss of Nuclear Service Water / 4					X		Ability to determine and interpret the following as they apply to the Loss of Nuclear Service Water: AA 2.01: Location of a leak in the SWS	3.5	
000065 (APE 65) Loss of Instrument Air / 8						X	Loss of Instrument Air / 8 G 2.4.8: Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	4.5	
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6									
(W E04) LOCA Outside Containment / 3									

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
(W E11) Loss of Emergency Coolant Recirculation / 4									
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4									
K/A Category Totals:					3	3	Group Point Total:		6

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)									
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					X		Ability to determine and interpret the following as they apply to the Pressurizer Level Control Malfunctions: AA 2.01: PZR level indicators and alarms	3.6	
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7						X	Loss of Source Range Nuclear Instrumentation / 7 G 2.1.27: Knowledge of system purpose and/or function.	4.0	
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7									
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8					X		Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: AA 2.01: ARM system indications	3.9	
000037 (APE 37) Steam Generator Tube Leak / 3									
000051 (APE 51) Loss of Condenser Vacuum / 4									
000059 (APE 59) Accidental Liquid Radwaste Release / 9									
000060 (APE 60) Accidental Gaseous Radwaste Release / 9									
000061 (APE 61) Area Radiation Monitoring System Alarms / 7									
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									
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4									
000076 (APE 76) High Reactor Coolant Activity / 9									
000078 (APE 78*) RCS Leak / 3									
(W E01 & E02) Rediagnosis & SI Termination / 3									
(W E13) Steam Generator Overpressure / 4									
(W E15) Containment Flooding / 5									
(W E16) High Containment Radiation /9									
(BW A01) Plant Runback / 1									
(BW A02 & A03) Loss of NNI-X/Y/7									
(BW A04) Turbine Trip / 4									
(BW A05) Emergency Diesel Actuation / 6									
(BW A07) Flooding / 8									
(BW E03) Inadequate Subcooling Margin / 4									
(BW E08; W E03) LOCA Cooldown—Depressurization / 4									
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4									
(BW E13 & E14) EOP Rules and Enclosures									

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4									
(CE A16) Excess RCS Leakage / 2						X	Excess RCS Leakage / 2 G 2.4.45: Ability to prioritize and interpret the significance of each annunciator or alarm.	4.3	
(CE E09) Functional Recovery									
(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4									
K/A Category Point Totals:					2	2	Group Point Total:		4

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)												Form ES-401-2	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump														
003 (SF4P RCP) Reactor Coolant Pump														
004 (SF1; SF2 CVCS) Chemical and Volume Control														
005 (SF4P RHR) Residual Heat Removal														
006 (SF2; SF3 ECCS) Emergency Core Cooling														
007 (SF5 PRTS) Pressurizer Relief/Quench Tank														
008 (SF8 CCW) Component Cooling Water														
010 (SF3 PZR PCS) Pressurizer Pressure Control														
012 (SF7 RPS) Reactor Protection								X				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: A 2.05: Faulty or erratic operation of detectors and function generators	3.2	
013 (SF2 ESFAS) Engineered Safety Features Actuation								X				Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based Ability on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations; A 2.06: Inadvertent ESFAS actuation	4.0	
022 (SF5 CCS) Containment Cooling														
025 (SF5 ICE) Ice Condenser														
026 (SF5 CSS) Containment Spray											X	Containment Spray G 2.4.46: Ability to verify that the alarms are consistent with the plant conditions.	4.2	
039 (SF4S MSS) Main and Reheat Steam														
059 (SF4S MFW) Main Feedwater											X	Main Feedwater G 2.1.7: Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.7	
061 (SF4S AFW) Auxiliary/Emergency Feedwater														
062 (SF6 ED AC) AC Electrical Distribution														

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)												Form ES-401-2	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
063 (SF6 ED DC) DC Electrical Distribution														
064 (SF6 EDG) Emergency Diesel Generator														
073 (SF7 PRM) Process Radiation Monitoring														
076 (SF4S SW) Service Water														
078 (SF8 IAS) Instrument Air														
103 (SF5 CNT) Containment											X	Containment G 2.2.38: Knowledge of conditions and limitations in the facility license.	4.5	
053 (SF1; SF4P ICS*) Integrated Control														
K/A Category Point Totals:								2			3	Group Point Total:		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				Ability to (a) predict the impacts of the following malfunction or operations on the CRDS- and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A 2.06: Effects of transient xenon on reactivity	3.7	
002 (SF2; SF4P RCS) Reactor Coolant														
011 (SF2 PZR LCS) Pressurizer Level Control														
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation														
016 (SF7 NNI) Nonnuclear Instrumentation											X	Nonnuclear Instrumentation G 2.2.3: Knowledge of the design, procedural, and operational differences between units.	3.9	
017 (SF7 ITM) In-Core Temperature Monitor														
027 (SF5 CIRS) Containment Iodine Removal														
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control														
029 (SF8 CPS) Containment Purge														
033 (SF8 SFPCS) Spent Fuel Pool Cooling														
034 (SF8 FHS) Fuel-Handling Equipment														
035 (SF 4P SG) Steam Generator														
041 (SF4S SDS) Steam Dump/Turbine Bypass Control														
045 (SF 4S MTG) Main Turbine Generator								X				Ability to (a) predict the impacts of the following malfunctions or operation on the MT/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A 2.17: Malfunction of electrohydraulic control	2.9	
055 (SF4S CARS) Condenser Air Removal														
056 (SF4S CDS) Condensate														
068 (SF9 LRS) Liquid Radwaste														
071 (SF9 WGS) Waste Gas Disposal														
072 (SF7 ARM) Area Radiation Monitoring														
075 (SF8 CW) Circulating Water														
079 (SF8 SAS**) Station Air														
086 Fire Protection														
050 (SF 9 CRV*) Control Room Ventilation														

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	#
K/A Category Point Totals:								2			1	Group Point Total:		3

Facility: St Lucie SRO Draft Date of Exam: March 2019

Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.30	Ability to locate and operate components, including local controls.			4.0	
	2.1.37	Knowledge of procedures, guidelines, or limitations associated with reactivity management.			4.6	
	2.1.					
	2.1.					
	2.1.					
	2.1.					
	Subtotal					
2. Equipment Control	2.2.25	Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.			4.2	
	2.2.38	Knowledge of conditions and limitations in the facility license.			4.5	
	2.2.					
	2.2.					
	2.2.					
	2.2.					
	Subtotal					
3. Radiation Control	2.3.11	Ability to control radiation releases.			4.3	
	2.3.					
	2.3.					
	2.3.					
	2.3.					
	2.3.					
	Subtotal					
4. Emergency Procedures/Plan	2.4.32	Knowledge of operator response to loss of all annunciators.			4.0	
	2.4.43	Knowledge of emergency communications systems and techniques.			3.8	
	2.4.					
	2.4.					
	2.4.					
	2.4.					
	Subtotal					
Tier 3 Point Total				10		7

Tier/Group	Randomly Selected K/A	Reason for Rejection

ES-301	Administrative Topics Outline	Form ES-301-1

Facility:	St. Lucie	Date of Examination:	3/18/19
Examination Level: RO ☒ SRO ☐		Operating Test Number:	L-19-1

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R N	**A-1 R:** Calc Boron for withdrawal of dropped CEA
Conduct of Operations	R D	**A-2 R:** Calculate Time to Boil
Equipment Control	R N	**A-3 R:** Perform 2C ICW Quarterly Pump Code Run
Radiation Control	R D	**A-4 R:** Exposure limits, normal
Emergency Plan		

NOTE: All items (five 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 and Criteria:
(C)ontrol room, (S)imulator, or Class(R)oom
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs and RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1, randomly selected)

JPM Summary Description

A-1R: Calc Boron for withdrawal of dropped CEA

Task 2.1.25 RCO (3.9) Ability to interpret reference materials, such as graphs, curves, tables, etc

This is a new JPM. The applicant will be required to calculate the amount of boric acid required to withdraw a dropped CEA on Unit-1.

A-2R: Calculate Time to Boil

Task 2.1.37 RCO (4.3) Knowledge of procedures, guidelines, or limitations associated with reactivity management.

This is a Bank JPM. The applicant will determine the time to boil on Unit-1 following a loss of shutdown cooling.

A-3R: Perform 2C ICW Quarterly Pump Code Run

Task 2.2.12 RCO (3.7) Knowledge of surveillance procedures.

This is a new JPM. The applicant is required to perform the data entry for the 2C Intake Cooling Water pump code run and evaluate the results, IAW 2-OSP-21.01C Attachment 2, and determine that the pump is in the ALERT status.

A-4R: Exposure limits, normal conditions

Task 2.3.7 RCO (3.5) Ability to comply with radiation work permit requirements during normal or abnormal conditions.

This is a Bank JPM. Given the dose records of four employees and radiation levels for specific job, the applicant will be required to determine the dose for a specific job and determine out of four employees which employee(s) would be allowed perform the job without the Site Vice President's approval.

ES-301	Administrative Topics Outline	Form ES-301-1

Facility:	St. Lucie	Date of Examination:	3/18/19
Examination Level: RO ☐ SRO ☒		Operating Test Number:	L-19-1

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R N	**A -1S:** Calculate Boron required for withdrawal of a dropped CEA & T.S.
Conduct of Operations	R D	**A -2S:** Calculate Time to Boil and T.S.
Equipment Control	R N	**A -3S:** Perform 2C ICW Quarterly Pump Code Run & operability determination.
Radiation Control	R N	**A -4S**: Gas Release Permit Review
Emergency Plan	R D	**A -5S:** EALS & Notification for a security event.

NOTE: All items (five 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 and Criteria:
(C)ontrol room, (S)imulator, or Class(R)oom
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs and RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1, randomly selected)

JPM Summary Description

A-1S: Calc Boron for withdrawal of dropped CEA & T.S.

Task 2.1.25 SRO (4.2) Ability to interpret reference materials, such as graphs, curves, tables, etc.

This is a new JPM. The applicant will be required to calculate the amount of boric acid required to withdrawal a dropped CEA on Unit-1 and determine Tech spec applicability.

A-2S: Calculate Time to Boil and T.S.

Task 2.1.37 SRO (4.6) Knowledge of procedures, guidelines, or limitations associated with reactivity management.

This is a Bank JPM. The applicant will determine the time to boil on Unit-1 following a loss of shutdown cooling and determine applicable Tech Specs

A-3S: Perform 2C ICW Quarterly Pump Code Run & T.S.

Task 2.2.37 SRO (4.6) Ability to determine operability and/or availability of safety related equipment.

This is a new JPM. The applicant is required to perform the data entry for the 2C Intake Cooling Water pump code run and evaluate the results, IAW 2-OSP-21.01C Attachment 2, and determine that the pump is in the ALERT status and evaluate pump Operability.

A-4S: Gas Release Permit Review

Task 2.3.4 SRO (3.7) Knowledge of radiation exposure limits under normal or emergency conditions.

This is a new JPM. The applicant will review a radioactive Gas release permit and determine if the permit is acceptable to perform the release.

A-5S: Determine Emergency Classification and Notification

Task 2.4.41 SRO (4.6) Knowledge of the emergency action level thresholds and classifications.

This is a Bank JPM. The applicant is required to evaluate given plant parameters to determine Emergency Classification and notification as necessary following a security event.

ES-301	Control Room/In-Plant Systems Outline	Form ES-301-2

Facility:	St. Lucie	Date of Examination:	3/18/19
Exam Level: RO ☒ SRO-I ☐ SRO-U ☐		Operating Test Number:	L-19-1

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U		
System/JPM Title	Type Code*	Safety Function
a. ALL (S-1) Emergency Borate using Alternate Path	A N L S	1
b. ALL (C-2) Bypass/Trip ESFAS Channel w/broken bypass switch	A N EN C	2
c. RO & SRO-I (S-3) Verify SIAS w/ Failed actuation modules	A M L EN S	3
d. RO & SRO-I (S-4) Restore AFW using 2C AFW after electric OS	M L S	4
e. RO & SRO-I (S-5) Operate hydrogen purge system U2	D L S	5
f. ALL (S-6) Verify Offsite Power	N S	6
g. RO & SRO-I (S-7) Respond to Hi rad alarm spent fuel U2	A M S	7
h. RO ONLY (S-8) Align 2C CCW pp to the 'B' CCW HDR U2	D S	8
In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U		
i. ALL (P-1) RELEASE 1A WMST U1	D R	7
j. RO & SRO-I (P-2) Restore IA with the 2A IA compressor	N E	8
k. ALL (P-3) Align U2 CST to 1A AFW	P E D L	4

* 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	4–6/4–6 /2–3
(C)ontrol room	
(D)irect from bank	≤ 9/≤ 8/≤ 4
(E)mergency or abnormal in-plant	≥ 1/≥ 1/≥ 1
(EN)gineered safety feature	≥ 1/≥ 1/≥ 1 (control room system)
(L)ow-Power/Shutdown	≥ 1/≥ 1/≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2/≥ 2/≥ 1
(P)revious 2 exams	≤ 3/≤ 3/≤ 2 (randomly selected)
(R)CA	≥ 1/≥ 1/≥ 1
(S)imulator	

JPM SUMMARY

a: S-1 Emergency Boration using Alternate Path

004 A2.14 / Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Emergency boration (3.8/3.9)

This is a New / Alternate Path JPM; Unit 2 will be tripped with a LOOP. The applicant will be directed to perform the Operator immediate actions for 2-EOP-01, Standard Post Trip Actions. 3 CEAs fail to insert into the core. The applicant will initiate Emergency Boration using 2-AOP-02.02 Emergency Boration using the Hard Card. Upon starting either Boric Acid pump the 2A EDG will trip rendering both Boric Acid pumps OOS. The applicant will recognize the failure and implement the contingency steps to align the gravity feed valves to the charging pump suction. ALL applicants will perform this JPM.

b: C-2 RESPOND/BYPASS/TRIP A FAILED ESFAS CHANNEL

013 K1.09 Knowledge of the physical connections and/or cause effect relationships between the ESFAS and the following systems: CIRS 3.3/3.7

This is a New/Alternate Path JPM performed in the Unit 1 Control Room. Refueling Water Tank Level instrument LIS-07-2B will be failed high. The applicant will be directed to Bypass LIS-07-2B using 1-AOP-99.01 section 4.2.16 to meet the requirements of Tech Spec 3.3.2. When the applicant attempts to turn the bypass key it will not rotate, the applicant will then be required place the channel in trip. ALL applicants will perform this JPM.

c: S-3 Verify SIAS w/ Failed actuation modules

013 A2.01 / Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based Ability on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations; LOCA (4.6 4.8)

This is a Modified /Alternate Path JPM; Unit-2 will be in 2-EOP-03 LOCA; The applicant will be directed to perform Steps 5 and 6 of 2-EOP-03, Loss of Coolant Accident. During the evolution the applicant will identify failed SIAS actuation and take action to manually actuate SIAS, 2A HPSI Pp failure to start and take action to manually start 2A HPSI Pp, HCV-3625 failed to open and take action to manually open HCV-3625 and the failure of the 2A Main Feedwater Pp to stop and take action to manually stop the 2A Main Feedwater Pump. RO & SRO-I applicants will perform this JPM.

d: S-4 RESTORE AFW FLOW TO THE 2A AND 2B S/Gs USING 2C AFW PUMP

061 A2.04 / Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: pump failure or improper operation (3.4/3.8)

This is a Modified Bank JPM; Unit 2 will be in Mode 3 NOP/NOT preparing for startup, valve SE-09-2 will have just closed on a loss of power. The NPO reports a high pitched noise coming from the 2B AFW pump motor, electrical maintenance has asked for the 2B AFW to be secured. The applicant will be directed to establish AFW to the 2A and 2B Steam Generators with the 2C AFW pump IAW 2-NOP-09.02 Auxiliary Feedwater step 4.3.6 and then secure the 2B AFW pump. When the applicant throttles either MV-09-11 or MV-09-12, the 2C AFW pump will trip on Electrical Overspeed. The applicant will enter 2-AOP-09.02 AUXILIARY FEEDWATER

and take actions to start the 2C AFW pump and restore flow to the A&B S/Gs. RO & SRO-I applicants will perform this JPM.

e: S-5 OPERATE THE HYDROGEN PURGE SYSTEM - UNIT2

0028 A4.01/ Ability to manually operate and / or monitor in the control room: HRPS controls (4.0/4.0)

This is a Bank JPM; Unit 2 will have experienced a LOCA and will be implementing 2-EOP-03 LOCA. Containment Hydrogen is reported as being 4% and the Tech Support center has requested that the Hydrogen Purge system be placed in service. The applicant will place the Hydrogen Purge system in service IAW 2-EOP-99 app. N. RO & SRO-I applicants will perform this JPM.

f: S-6 VERIFY OFFSITE POWER

062 K1.04 / Knowledge of the physical connections and/or cause-effect relationship between the ac distribution system and the following system; Offsite power sources. (3.7/4.2)

This is a New JPM performed on Unit -2 simulator. Unit-2 will be 100% power, the 2A EDG will have been declared Out of Service. The applicant will verify offsite power IAW 2-NOP-99.07 to meet Tech Spec requirements. ALL applicants will perform this JPM.

g: S-7 RESPOND TO HIGH RADIATION ALARM ON SPENT FUEL MONITORS U-2

072 K1.01/ Knowledge of the physical connections and/or cause-effect relationship between the ARM system and the following system: Plant ventilation systems (3.1/3.5)

This is a Modified /Alternate Path JPM; On Unit-2 simulator. Unit-2 will be 100% power, the Spent Fuel Area RAD Monitors are in High alarm, 2-AOP-26.02 is being implemented. The applicant will verify proper operation and line up of the Fuel Handling Building Ventilation and take action to correct any anomalies. RO & SRO-I applicants will perform this JPM.

h: S-8 ALIGN 2C CCW PUMP TO SUPPLY THE B CCW HEADER-UNIT-2

008 A2.01 / 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: Loss of CCW pump (3.3/3.6)

This is a Bank JPM; Unit 2 simulator. Unit-2 will be 100% power, the 2B CCW will have tripped. The applicant will start the 2C CCW pump on the 2B header IAW 2-AOP-14.01 Component Cooling Water Abnormal Operation. RO applicants will perform this JPM.

i: P-1 RELEASE 1A WASTE MONITOR TANK

068-K4.01 / Knowledge of design feature(s) and/or interlock(s)
which provide for the following: Safety and environmental precautions for handling hot, acidic, and radioactive liquids (3.4/4.1)

This is a Bank JPM;
The 1A Waste Monitor Tank level is 81%, the Unit Supervisor will direct the applicant to place the 1A WMT on recirc, and then release its contents using the 1A Waste Monitor Pump, IAW section 4.2 of 1-NOP-06.01, Controlled Liquid Release to the Circulating Water Discharge.

They will begin with 1-NOP-06.15, Oxygen Waste System, Oxygenated Waste System Step 4.4.1.2. ALL applicants will perform this JPM.

j: P-2 RESTORE INSTRUMENT AIR USING THE 2A IA COMPRESSOR

078-K4.02 / Knowledge of IAS design feature(s) and/or interlock(s) which provide for the following: Cross-over to other air systems (3.2/3.5)

This is a NEW JPM;
Unit 2 will have had a LOOP, the applicant will be directed to align and start the 2A Instrument Air Compressor.

RO & SRO-I applicants will perform this JPM.

k: P-3 ALIGN UNIT 2 CST TO SUPPLY 1A AFW PUMP

061A1.03 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the AFW controls including: Interactions when multi-unit systems are cross tied (3.1/3.6)

This is a Bank JPM;
The Unit 1 CST will be unavailable due to being damaged from a vertical tornado missile. The Unit 2 CST will be available. The Unit 1 Unit Supervisor will direct the applicant to line up the Unit 2 CST to supply the 1A AFW Pump IAW 1-AOP-09.02, Auxiliary Feedwater, Attachment 5
ALL applicants will perform this JPM.

ES-301	Control Room/In-Plant Systems Outline	Form ES-301-2

Facility:	St. Lucie	Date of Examination:	3/18/19
Exam Level: RO ☐ SRO-I ☒ SRO-U ☐		Operating Test Number:	L-19-1

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U		
System/JPM Title	Type Code*	Safety Function
a. ALL (S-1) Emergency Borate using Alternate Path	A N L S	1
b. ALL (C-2) Bypass/Trip ESFAS Channel w/broken bypass switch	A N EN C	2
c. RO & SRO-I (S-3) Verify SIAS w/ Failed actuation modules	A M L S EN	3
d. RO & SRO-I (S-4) Restore AFW using 2C AFW after electric OS	M L S	4
e. RO & SRO-I (S-5) Operate hydrogen purge system U2	D L S	5
f. ALL (S-6) Verify Offsite Power	N S	6
g. RO & SRO-I (S-7) Respond to Hi rad alarm spent fuel U2	A M S	7
h. NOT SELECTED FOR SRO-I EXAM		
In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U		
i. ALL (P-1) RELEASE 1A WMST U1	D R	7
j. RO & SRO-I (P-2) Restore IA with the 2A IA compressor	N E	8
k. ALL (P-3) Align U2 CST to 1A AFW	P E D L	4

* 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	4–6/4–6 /2–3
(C)ontrol room	
(D)irect from bank	≤ 9/≤ 8/≤ 4
(E)mergency or abnormal in-plant	≥ 1/≥ 1/≥ 1
(EN)gineered safety feature	≥ 1/≥ 1/≥ 1 (control room system)
(L)ow-Power/Shutdown	≥ 1/≥ 1/≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2/≥ 2/≥ 1
(P)revious 2 exams	≤ 3/≤ 3/≤ 2 (randomly selected)
(R)CA	≥ 1/≥ 1/≥ 1
(S)imulator	

JPM SUMMARY

a: S-1 Emergency Boration using Alternate Path

004 A2.14 / Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Emergency boration (3.8/3.9)

This is a New / Alternate Path JPM; Unit 2 will be tripped with a LOOP. The applicant will be directed to perform the Operator immediate actions for 2-EOP-01, Standard Post Trip Actions. 3 CEAs fail to insert into the core. The applicant will initiate Emergency Boration using 2-AOP-02.02 Emergency Boration using the Hard Card. Upon starting either Boric Acid pump the 2A EDG will trip rendering both Boric Acid pumps OOS. The applicant will recognize the failure and implement the contingency steps to align the gravity feed valves to the charging pump suction. ALL applicants will perform this JPM.

b: C-2 RESPOND/BYPASS/TRIP A FAILED ESFAS CHANNEL

013 K1.09 Knowledge of the physical connections and/or cause effect relationships between the ESFAS and the following systems: CIRS 3.3/3.7

This is a New/Alternate Path JPM performed in the Unit 1 Control Room. Refueling Water Tank Level instrument LIS-07-2B will be failed high. The applicant will be directed to Bypass LIS-07-2B using 1-AOP-99.01 section 4.2.16 to meet the requirements of Tech Spec 3.3.2. When the applicant attempts to turn the bypass key it will not rotate, the applicant will then be required place the channel in trip. ALL applicants will perform this JPM.

c: S-3 Verify SIAS w/ Failed actuation modules

013 A2.01 / Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based Ability on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations; LOCA (4.6 /4.8)

This is a Modified /Alternate Path JPM; Unit-2 will be in 2-EOP-03 LOCA; The applicant will be directed to perform Steps 5 and 6 of 2-EOP-03, Loss of Coolant Accident. During the evolution the applicant will identify failed SIAS actuation and take action to manually actuate SIAS, 2A HPSI Pp failure to start and take action to manually start 2A HPSI Pp, HCV-3625 failed to open and take action to manually open HCV-3625 and the failure of the 2A Main Feedwater Pp to stop and take action to manually stop the 2A Main Feedwater Pump. RO & SRO-I applicants will perform this JPM.

d: S-4 RESTORE AFW FLOW TO THE 2A AND 2B S/Gs USING 2C AFW PUMP

061 A2.04 / Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: pump failure or improper operation (3.4/3.8)

This is a Modified Bank JPM; Unit 2 will be in Mode 3 NOP/NOT preparing for startup, valve SE-09-2 will have just closed on a loss of power. The NPO reports a high pitched noise coming from the 2B AFW pump motor, electrical maintenance has asked for the 2B AFW to be secured. The applicant will be directed to establish AFW to the 2A and 2B Steam Generators with the 2C AFW pump IAW 2-NOP-09.02 Auxiliary Feedwater step 4.3.6 and then secure the 2B AFW pump. When the applicant throttles either MV-09-11 or MV-09-12, the 2C AFW pump will trip on Electrical Overspeed. The applicant will enter 2-AOP-09.02 AUXILIARY FEEDWATER

and take actions to start the 2C AFW pump and restore flow to the A&B S/Gs. RO & SRO-I applicants will perform this JPM.

e: S-5 OPERATE THE HYDROGEN PURGE SYSTEM - UNIT2

0028 A4.01/ Ability to manually operate and / or monitor in the control room: HRPS controls (4.0/4.0)

This is a Bank JPM; Unit 2 will have experienced a LOCA and will be implementing 2-EOP-03 LOCA. Containment Hydrogen is reported as being 4% and the Tech Support center has requested that the Hydrogen Purge system be placed in service. The applicant will place the Hydrogen Purge system in service IAW 2-EOP-99 app. N. RO & SRO-I applicants will perform this JPM.

f: S-6 VERIFY OFFSITE POWER

062 K1.04 / Knowledge of the physical connections and/or cause-effect relationship between the ac distribution system and the following system; Offsite power sources. (3.7/4.2)

This is a New JPM performed on Unit -2 simulator. Unit-2 will be 100% power, the 2A EDG will have been declared Out of Service. The applicant will verify offsite power IAW 2-NOP-99.07 to meet Tech Spec requirements. ALL applicants will perform this JPM.

g: S-7 RESPOND TO HIGH RADIATION ALARM ON SPENT FUEL MONITORS U-2

072 K1.01/ Knowledge of the physical connections and/or cause-effect relationship between the ARM system and the following system: Plant ventilation systems (3.1/3.5)

This is a Modified /Alternate Path JPM; On Unit-2 simulator. Unit-2 will be 100% power, the Spent Fuel Area RAD Monitors are in High alarm, 2-AOP-26.02 is being implemented. The applicant will verify proper operation and line up of the Fuel Handling Building Ventilation and take action to correct any anomalies. RO & SRO-I applicants will perform this JPM.

i: P-1 RELEASE 1A WASTE MONITOR TANK

068-K4.01 / Knowledge of design feature(s) and/or interlock(s)
which provide for the following: Safety and environmental precautions for handling hot, acidic, and radioactive liquids (3.4/4.1)

This is a Bank JPM;
The 1A Waste Monitor Tank level is 81%, the Unit Supervisor will direct the applicant to place the 1A WMT on recirc, and then release its contents using the 1A Waste Monitor Pump, IAW section 4.2 of 1-NOP-06.01, Controlled Liquid Release to the Circulating Water Discharge. They will begin with 1-NOP-06.15, Oxygen Waste System, Oxygenated Waste System Step 4.4.1.2. ALL applicants will perform this JPM.

j: P-2 RESTORE INSTRUMENT AIR USING THE 2A IA COMPRESSOR

078-K4.02 / Knowledge of IAS design feature(s) and/or interlock(s) which provide for the following: Cross-over to other air systems (3.2/3.5)

This is a NEW JPM;
Unit 2 will have had a LOOP, the applicant will be directed to align and start the 2A Instrument Air Compressor.

RO & SRO-I applicants will perform this JPM.

k: P-3 ALIGN UNIT 2 CST TO SUPPLY 1A AFW PUMP

061A1.03 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the AFW controls including: Interactions when multi-unit systems are cross tied (3.1/3.6)

This is a Bank JPM;
The Unit 1 CST will be unavailable due to being damaged from a vertical tornado missile. The Unit 2 CST will be available. The Unit 1 Unit Supervisor will direct the applicant to line up the Unit 2 CST to supply the 1A AFW Pump IAW 1-AOP-09.02, Auxiliary Feedwater, Attachment 5
ALL applicants will perform this JPM.

ES-301	Control Room/In-Plant Systems Outline	Form ES-301-2

Facility:	St. Lucie	Date of Examination:	3/18/19
Exam Level: RO ☐ SRO-I ☐ SRO-U ☒		Operating Test Number:	L-19-1

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U		
System/JPM Title	Type Code*	Safety Function
a. ALL (S-1) Emergency Borate using Alternate Path	A N L S	1
b. ALL (C-2) Bypass/Trip ESFAS Channel w/broken bypass switch	A N EN C	2
c. NOT SELECTED FOR SRO-U EXAM		
d. NOT SELECTED FOR SRO-U EXAM		
e. NOT SELECTED FOR SRO-U EXAM		
f. ALL (S-6) Verify Offsite Power	N S	6
g. NOT SELECTED FOR SRO-U EXAM		
h. NOT SELECTED FOR SRO-U EXAM		
In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U		
i. ALL (P-1) RELEASE 1A WMST U1	D R	7
j. NOT SELECTED FOR SRO-U EXAM		
k. ALL (P-3) Align U2 CST to 1A AFW	P E D L	4

* 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	4–6/4–6 /2–3
(C)ontrol room	
(D)irect from bank	≤ 9/≤ 8/≤ 4
(E)mergency or abnormal in-plant	≥ 1/≥ 1/≥ 1
(EN)gineered safety feature	≥ 1/≥ 1/≥ 1 (control room system)
(L)ow-Power/Shutdown	≥ 1/≥ 1/≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2/≥ 2/≥ 1
(P)revious 2 exams	≤ 3/≤ 3/≤ 2 (randomly selected)
(R)CA	≥ 1/≥ 1/≥ 1
(S)imulator	

JPM SUMMARY

a: S-1 Emergency Boration using Alternate Path

004 A2.14 / Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Emergency boration (3.8/3.9)

This is a New / Alternate Path JPM; Unit 2 will be tripped with a LOOP. The applicant will be directed to perform the Operator immediate actions for 2-EOP-01, Standard Post Trip Actions. 3 CEAs fail to insert into the core. The applicant will initiate Emergency Boration using 2-AOP-02.02 Emergency Boration using the Hard Card. Upon starting either Boric Acid pump the 2A EDG will trip rendering both Boric Acid pumps OOS. The applicant will recognize the failure and implement the contingency steps to align the gravity feed valves to the charging pump suction. ALL applicants will perform this JPM.

b: C-2 RESPOND/BYPASS/TRIP A FAILED ESFAS CHANNEL

013 K1.09 Knowledge of the physical connections and/or cause effect relationships between the ESFAS and the following systems: CIRS 3.3/3.7

This is a New/Alternate Path JPM performed in the Unit 1 Control Room. Refueling Water Tank Level instrument LIS-07-2B will be failed high. The applicant will be directed to Bypass LIS-07-2B using 1-AOP-99.01 section 4.2.16 to meet the requirements of Tech Spec 3.3.2. When the applicant attempts to turn the bypass key it will not rotate, the applicant will then be required place the channel in trip. ALL applicants will perform this JPM.

f: S-6 VERIFY OFFSITE POWER

062 K1.04 / Knowledge of the physical connections and/or cause-effect relationship between the ac distribution system and the following system; Offsite power sources. (3.7/4.2)

This is a New JPM performed on Unit -2 simulator. Unit-2 will be 100% power, the 2A EDG will have been declared Out of Service. The applicant will verify offsite power IAW 2-NOP-99.07 to meet Tech Spec requirements. ALL applicants will perform this JPM.

i: P-1 RELEASE 1A WASTE MONITOR TANK

068-K4.01 / Knowledge of design feature(s) and/or interlock(s)
which provide for the following: Safety and environmental precautions for handling hot, acidic, and radioactive liquids (3.4/4.1)

This is a Bank JPM;
The 1A Waste Monitor Tank level is 81%, the Unit Supervisor will direct the applicant to place the 1A WMT on recirc, and then release its contents using the 1A Waste Monitor Pump, IAW section 4.2 of 1-NOP-06.01, Controlled Liquid Release to the Circulating Water Discharge. They will begin with 1-NOP-06.15, Oxygen Waste System, Oxygenated Waste System Step 4.4.1.2. ALL applicants will perform this JPM.

k: P-3 ALIGN UNIT 2 CST TO SUPPLY 1A AFW PUMP

061A1.03 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the AFW controls including: Interactions when multi-unit systems are cross tied (3.1/3.6)

This is a Bank JPM;
The Unit 1 CST will be unavailable due to being damaged from a vertical tornado missile. The Unit 2 CST will be available. The Unit 1 Unit Supervisor will direct the applicant to line up the Unit 2 CST to supply the 1A AFW Pump IAW 1-AOP-09.02, Auxiliary Feedwater, Attachment 5
ALL applicants will perform this JPM.

1.

008 AA2.17 Pressurizer Vapor Space Accident / Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: Steam dump valve controller (position)

Given the following conditions:

- Unit 1 is at 100% power
- PCV-8801, SBCS Control Valve is Out of Service

Subsequently:

- Pressurizer pressure is 1100 psia and LOWERING
- Subcooling is lost
- Pressurizer level is 59% and RISING
- Containment pressure is 3.0 psig and RISING slowly

Which ONE of the following completes the statements below?

Unit 1 is experiencing a ____(1)____ Leak.

In accordance with OPS-539, RCS Cooldown Guidance, the crew is required to operate the SBCS with PCV-8802 ____(2)____ during the subsequent cooldown.

A.	(1)	RCS Cold Leg
	(2)	50% open
B.	(1)	RCS Cold Leg
	(2)	full open
C.	(1)	Pressurizer Steam Space
	(2)	50% open
D.	(1)	Pressurizer Steam Space
	(2)	full open

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: This is an indication of a Pzr steam space leak as indicated by the lowering RCS pressure and Rising Pzr Level. It is plausible that the applicant does not recognize that rising Pzr level with the lowering RCS pressure and Rising Containment Pressure is not a RCS Cold Leg Leak. Plausible since and RCS Cold Leg Break would present some of the symptoms given, i.e. lowering RCS pressure and subcooling, as well as rising containment pressure Part 2 correct: See C
B.	Incorrect:	Part 1 incorrect: See A. Part 2 incorrect: In accordance with OPS-539: If using SBCS for recovery of subcooling 1. Place the SBCS in manual operation. 2. Fully open PCV-8801. If PCV-8801 is unavailable, use the next available SBCS valve at approximately 50% open. It is plausible that the applicant believes that since PCV-8801 is to be full open the 2nd valve would also be full open. ADV operation is a Unit difference which also leads to the plausibility of this choice.
C.	Correct:	Part 1 correct: This is an indication of a Pzr steam space leak as indicated by the lowering RCS pressure and Rising Pzr Level. Part 2 correct: In accordance with OPS-539: If using SBCS for recovery of subcooling 1. Place the SBCS in manual operation. 2. Fully open PCV-8801. If PCV-8801 is unavailable, use the next available SBCS valve at approximately 50% open.
D.	Incorrect:	Part 1 correct: See C Part 2 incorrect: See B

Question Number: 1

Tier: 1 Group: 1

K/A: 008 AA2.17 Pressurizer Vapor Space Accident / Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: Steam dump valve controller (position)

Importance Rating: 2.5 2.7

10 CFR Part 55: (CFR 43.5 / 45.13)

10CFR55.43.b: N/A

K/A Match: K/A is matched because the applicant is required to identify the PZR Steam Space Accident and Steam Dump controller position.

Technical Reference: OPS-539

Proposed references to be provided: None

Learning Objective: PSL OPS 0702824-05.b

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

When cooling down the RCS: (continued)

7. Report lowest Tcold and cooldown rate to the US every 12 minutes (US acknowledges Tcold and cooldown rate by initialing Table 1 every 12 minutes).

8. Inform the US when subcooling is gained, lost, or being challenged. Record the time when subcooling is gained or lost and circle the new cooldown limit in effect on Table 1.

9. If subcooling has been lost and subsequently regained, then the previous (and more limiting) cooldown limit shall be reinstated. If the original cooldown limit is exceeded, RCS temperature should be stabilized until enough time passes to allow recommencement of the RCS cooldown.

If using SBCS for recovery of subcooling or during a Steam Generator Tube Rupture cooldown to Thot less than 510°F:

1. Place the SBCS in manual operation.

2. Fully open PCV-8801. If PCV-8801 is unavailable, use the next available SBCS valve at approximately 50% open.

3. Once T-hot is less than 510°F for a Steam Generator Tube Rupture, adjust the position of SBCS to ensure that the cooldown limit will not be exceeded.

4. Once the affected steam generator is no longer being steamed by closing its MSIV IAW with App R of EOP-99, the US will inform the RCO that the 30 degree in any one hour cooldown limit applies, and the SBCS should be adjusted accordingly.

If using ADVs for recovery of subcooling or during a Steam Generator Tube Rupture cooldown to Thot less than 510°F:

1. Place an ADV on each Steam Generator in service, preferably in Auto-Manual (if available) or Manual-Manual.

2. For Unit 1, open the ADV on each Steam Generator to 50% open.

3. For Unit 2, fully open one ADV on each Steam Generator.

4. Once Thot is less than 510°F for a Steam Generator Tube Rupture, adjust the position of ADVs to ensure that the cooldown limit will not be exceeded.

5. Once the affected steam generator is no longer being steamed by closing its ADV(s) IAW with App R of EOP-99, the US will inform the RCO that the 30 degree in any one hour cooldown limit applies, and the ADVs should be adjusted accordingly.

2.2.1 Reactor Power

A small break LOCA will lead to a reactor trip on thermal margin/low pressure. The trip causes reactor power to decrease (Figure 8). Additionally, negative reactivity is inserted by moderator voiding and boron addition via makeup from the charging pumps and safety injection.

2.2.2 RCS Temperature

Following the reactor trip, both T_{hot} (Figure 9) and T_{cold} (Figure 10) decrease initially for all size LOCAs. The reasons for the decrease are: the heat input is reduced and the heat is being removed via the break and by the S/Gs.

2.2.3 Pressurizer Pressure

The pressurizer pressure initially decreases due to both the loss of coolant and the reduction of reactor power following the trip (Figure 11).

2.2.4 Pressurizer Level

Pressurizer level will normally decrease, but depending on where the break is located, it can increase (Figure 12). For breaks not located in the pressurizer, the pressurizer will empty and, depending on the size of the break, it may not refill throughout the course of the event. Breaks located in the pressurizer may lead to an increased level since water from the hot leg flows into the pressurizer during voiding in the RVUH and RCS loop. A break on or near the pressurizer level instruments may cause the instrument to grossly misrepresent pressurizer level either high or low.

2.

009 EA1.17 Small Break LOCA / Ability to operate and monitor the following as they apply to a Small break LOCA: PRT

Given the following conditions:

- Unit 2 is at 100% power
- A PORV is leaking
- Quench tank pressure is 40 psig and RISING

Subsequently:

- A Small Break LOCA into the Containment occurs
- Containment Pressure is 3.0 psig and RISING

The quench tank rupture disc is DESIGNED to blow at ____(1)____.

The Small Break LOCA into the Containment will result in the rupture disc blowing at a ____(2)____ absolute pressure.

A.	(1)	70 psig
	(2)	LOWER
B.	(1)	70 psig
	(2)	HIGHER
C.	(1)	85 psig
	(2)	LOWER
D.	(1)	85 psig
	(2)	HIGHER

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect This is plausible since 70 psig is the setpoint of the relief valve Part 2 correct: See analysis D.
B.	Incorrect:	Part 1 incorrect See analysis A. Part 2 incorrect Lower is plausible because the applicant may believe the pressure added by the SBLOCA will cause the rupture disc to blow at a lower tank pressure.
C.	Incorrect:	Part 1 correct: See analysis D. Part 2 incorrect Lower is plausible because the applicant may believe the pressure added by the SBLOCA will cause the rupture disc to blow at a lower tank pressure.
D.	Correct:	Part 1 correct: Rupture Disc setpoint is 85 psig Part 2 correct: Due to the SBLOCA, the pressure in the containment will rise therefore the tank pressure will be higher to achieve the 85 psid for the rupture.

Question Number: 2

Tier: 1 Group: 1

K/A: 009 EA1.17 Small Break LOCA / Ability to operate and monitor the following as they apply to a small break LOCA: PRT

Importance Rating: 3.4 3.4

10 CFR Part 55: (CFR 41.7 / 45.5 / 45.6)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to be able to monitor the PRT during a SBLOCA

Technical Reference: PSL OPS 0711201

Proposed references to be provided: None

Learning Objective: PSL OPS 0711201-4

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

The containment and quench tank vent paths are provided for use during post-accident conditions, and serve as backups to each other:

- for low gas generation rates, the quench tank path is used. It allows for controlled venting of non-condensable gases in that such gases can be discharged from the quench tank into the gaseous waste disposal system

- the vent to containment atmosphere, which is provided for high gas generation rates, terminates in an area where good air mixing and maximum cooling exist.

In the unlikely event large quantities of gas are generated, combined with a failure in the vent path to containment atmosphere, gases can be discharged to the quench tank. A rupture disc on the quench tank will fail at ~100 [85] psig, and release the gases to the containment atmosphere at approximately the same location as the vent to containment path.

The path to the containment via the accumulator and charcoal filter is part of a leakage detection and collection system. A pressure transmitter, PT-1117 [PT-1140] installed downstream of the pressurizer and reactor vessel vents will detect any leakage past the solenoid isolation valves. The pressure transmitter supplies a pressure indicator PI-1117 [PI-1140], on the Control Room Auxiliary Console. Procedures require monitoring of these pressure indicators whenever the solenoid valves are manipulated to detect leakage. Leakage past the solenoid valves can be discharged to an accumulator. The accumulator allows for expansion and condensation of any steam leakage.

Potentially contaminated fluids are drained from the accumulator directly to a floor drain that discharges to the containment graduated sump where the leakage can be measured. This arrangement ensures that any RCGVS leakage is identifiable. This is necessary to satisfy the RCS leakage Technical Specification, which allows continued power operation for unidentified RCS leakage of up to 1 gpm and identified RCS leak rates of up to 10 gpm.

3.

011 EK3.13 Large Break LOCA / Knowledge of the reasons for the following responses as the apply to the Large Break LOCA: Hot Leg injection/recirculation

Which ONE of the following completes the statement below?

1-EOP-03, Loss of Coolant Accident (LOCA), directs the operator to align for simultaneous Hot and Cold Leg Injection which realigns the ECCS flow to _____.

A.	prevent boron precipitation
B.	cool the reactor vessel upper guide structure
C.	pass through the SDC heat exchangers to remove decay heat
D.	lower Core Exit Thermocouple temperature to acceptable values

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	states ECCS flow is realigned to reverse flow through the core to address the consequences of boron stratification/plate out.
B.	Incorrect:	The transfer to hot leg recirc does put flow on top of the core but not to cool the upper internals. Plausible due to aligning the flow to the core outlet and reversing flow the knowledge of known flowpaths in core specific to cooling upper internals.
C.	Incorrect:	While the charging pumps and ECCS flow when supplied from the RWT does not go through any heat exchanger, when aligning for hot leg recirc, the containment spray pump is aligned to the HPSI pump suction (Unit 1 only). This provides flow that has been cooled by the SDC heat exchanger to improve the head supplied to the HPSI pump. Plausible if confused in the alignment of the cooling flow, with the alignment of flow through the SDC heat exchangers. Plausible since the alignment actually recircs the containment sump water without any cooling.
D.	Incorrect:	Plausible due to Hot leg cooling will put cool water to the region of the CETs thus cooling the CETs however this is not the basis for doing so

Question Number: 3

Tier: 1 Group: 1

K/A: 011 EK3.13 Large Break LOCA / Knowledge of the reasons for the following responses as the apply to the Large Break LOCA: Hot Leg injection/recirculation

Importance Rating: 3.8 4.2

10 CFR Part 55: (CFR 41.5 / 41.10 / 45.6 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the reasons for Hot Leg injection during a LBLOCA

Technical Reference: 1-EOP-03 PTSG

Proposed references to be provided: None

Learning Objective: PSL OPS 0702824 - 5

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

EOP DEVIATIONS AND JUSTIFICATIONS

EOP Title: Loss of Coolant Accident

EOP Procedure No.: 1 - EOP - 03 **Revision No.** 41

Corresponding EPG Title: Loss of Coolant Accident Recovery

EPG Revision No.: 6.0

Technical Justifications for Deviations:

1. The intent of this step is to avoid concentrating boric acid in the reactor vessel and possible boron precipitation in the core, which could restrict coolant flow through the core. This phenomena may occur if there is a large break in the hot leg and reactor vessel level can not be regained. The EPG also states that the time frame is plant specific and depends on source tank boron concentration assumed in the analysis. Four (4) to six (6) hours was analyzed and chosen for both PSL units to: (1) meet the intent of the EPG and (2) for human factor considerations. The intent of the EPG is maintained.

2. The EOP step provides more detail of indication to check if adequate level exists in the reactor vessel. The EOP step is technically equivalent to the EPG step. The intent of the EPG is maintained.

3. Appendix O of 1-EOP-99, provides plant specific instructions for aligning hot and cold leg injection. There are 4 different options available. The EOP step is technically equivalent to the EPG step. The intent of the EPG is maintained.

Amplifying Bases Information:

PSL-ENG-SEIS-01-046, Unit 1 PSTG EOP Setpoint Document

CEN-152, BD-E-3 LOCA Basis, EPG Step: 45, Check if simultaneous hot and cold leg injection is required

PSL-ENG-SEFJ-99-018, Update FSAR for Revised Boron Precipitation Analysis

Appendix O, 1-EOP-99, Simultaneous Hot and Cold Leg Injection

UFSAR Chapter 6 Appendix 6C, Boron Precipitation

CR 2005-18331, Reload St. Lucie Unit 1 Cycle 20 Reland PCM 05060

EOP DEVIATIONS AND JUSTIFICATIONS

EOP Title: Loss of Coolant Accident

EOP Procedure No.: 1 - EOP - 03 **Revision No.** 41

Corresponding EPG Title: Loss of Coolant Accident Recovery

EPG Revision No.: 6.0

Technical Justifications for Deviations:

1. This is a plant specific step to align the Containment Spray system to the suction of the HPSI pumps. This is performed in accordance with FSAR Section 6.3.2.1.2. As stated in the FSAR, "The RAS also acts to shutdown the low pressure safety injection pumps and closes the isolation valves in the pump recirculation line (V-3659 and V-3660). Recirculation flow is normally provided by at least one high pressure safety injection pump. Plant procedures require that, just prior to RAS, a portion of the cooled water from the containment spray system be directed to the high pressure pump suction. This is not necessary to meet core cooling requirements. Therefore, the step is needed to help ensure operability and maintainability of the HPSI pumps. The guidance and justification for this alignment is provided for in PSL-1FSM-98-001. The 6-8 feet is an administrative level which allows time for restoration of power to the minimum flow recirculation valves. These valves must close on a RAS to prevent pumping the water from the containment sump to the RWT. The valve numbers were given for human factor considerations.

Amplifying Bases Information:

FSAR Section 6.3.2.1.2, System Operation in Recirculation Mode

FSAR Section 6.3.2.2.4, High Pressure Safety Injection Pumps

PSL-1FSM-98-001, LPSI, Containment Spray Pumps NPSH from the Containment Sump

The operator has adequate instrumentation to monitor natural circulation for the single phase liquid natural circulation process. The RCS temperature instrumentation, and loop Delta-T can be used along with other information to confirm that the single phase natural circulation process is effective. The natural circulation processes involving two-phase cooling are complex and varied enough so that RCS loop Delta-T may not be a meaningful indication of adequate natural circulation cooling.

For cases where two-phase natural circulation cooling is the heat removal process, the operator relies upon maintaining the steam generator heat removal process and the strict rules that require the Safety Injection System to remain operating to restore inventory control. In addition, the core exit thermocouple temperatures are important in monitoring heat removal during two-phase natural circulation cooling. As long as these temperatures remain within acceptable limits they indicate that heat removal and inventory functions are being satisfied.

As represented in Figure 4, for larger break sizes, a greater fraction of the core decay heat is removed from the RCS by the break flow. Thus, less dependence is placed on heat transfer across the S/Gs. At approximately a 0.1 ft^2 (4.5" ID pipe) break size, the break flow will remove all of the core decay heat. In this case the primary side temperature and saturation pressure need not be higher than the corresponding secondary side values to effect heat transfer. The primary side temperature and pressure will then drop in accordance with the heat balance resulting from decay heat input to the RCS and break flow removal of RCS heat. For this condition some heat may actually flow across the S/Gs from secondary to primary.

1.3.2 Large Break LOCA

The event characteristics for a large break LOCA are different from those of a small break LOCA. Following a large break in the primary system piping, a large amount of RCS fluid will flow through the break into the containment building. The break flow will carry the majority of the stored fluid energy. Heat transfer to the secondary side is not significant and, in fact, will only occur for a brief time.

Because of the high removal of mass and energy through the break, the RCS pressure will rapidly fall below the secondary saturation pressure and will continue to drop to about the containment pressure. An example of the transient RCS pressure for a large break (double-ended cold leg) is shown in Figure 5. It is seen from this figure that the pressure decreases to an equilibrium position with the containment atmosphere in about 25 seconds. This time is too short for the operators to assess the situation and to take corrective action. The automatic engineered safety response will act to replenish the core with cooling water. The operator's role will be to verify automatic actions, assure that all RCPs are turned off and later in the event realign the HPSI pumps to provide long-term core cooling and prevent boron precipitation. A representation of the RCS heat removal process following a large cold leg break is shown in Figure 6.

The double-ended hot leg has a larger area than does the double-ended cold discharge leg break. The transient depressurization should occur even faster for the double-ended hot leg break. A schematic of the RCS heat removal process for a large hot leg break is shown in Figure 7.

Generally, for large break LOCAs the core voids very rapidly. This voiding causes a Departure from Nucleate Boiling (DNB) and an increase in clad temperature which is initially at about the fluid temperature. The temperature excursions are, depending on thermal hydraulic conditions, followed by a rewet of the clad surface. The rewetting decreases the clad temperature back to about saturation. The temperature excursion(s) and rewet(s) are ultimately terminated by safety injection.

For large breaks, inventory control is regained through the injection of water into the RCS by the Safety Injection Tanks (SITs) and Low Pressure Safety Injection (LPSI) pumps. It is maintained in the long-term through the recirculation of sump water through the RCS by the HPSI pumps.

RCS pressure control is initially lost as the RCS depressurizes because of the loss of inventory out the break. For large breaks, the RCS depressurizes in 1-seconds to 3 minutes to pressures typically below 300 psia. In the case of the

Safety Functions: Potential Impact of LOCA Events EO-9

Reactivity Control – maintained by CEA insertion on the trip, boration by SI system on SIAS, and moderator voiding.

RCS Inventory Control - as RCS leaks out, PZR level drops, and Rx Vessel Head voids.

1) Small break LOCA
    1) HPSI and charging eventually restore PZR inventory.
    2) It is maintained in the long-term by injection from these pumps.
2) Large break LOCA
    1) SITs and LPSI recover core, but RCS remains empty
    2) It is maintained in the long-term through recirculation of sump water through the RCS by the HPSI pumps
    3) Continuous injection is required to make up for the loss out the break and to prevent boron precipitation.

4. 015 AK3.03 RCP Malfunctions / Knowledge of the reasons for the following responses as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): Sequence of events for manually tripping reactor and RCP as a result of an RCP malfunction

Given the following conditions:

- Unit 1 is in Mode 2 performing a Reactor Startup
- Critical Rod Height Data is being taken
- Reactor Power is 5 X 10^{-4}%
- The Board RCO notes:
  - RCP 1A1 amps are 160
  - RCP 1A2 amps are 425
  - RCP 1B1 amps are 415
  - RCP 1B2 amps are 420

Which ONE of the following completes the statements below?

The Reactor ____(1)____ AUTOMATICALLY TRIP.

In accordance with ADM-11.16, Transient Procedure Use and Adherence, IF the Reactor DOES trip, the crew is required to FIRST ____(2)____.

A.	(1)	will
	(2)	trip the RCP
B.	(1)	will NOT
	(2)	trip the RCP
C.	(1)	will
	(2)	VERIFY the Reactor Trip
D.	(1)	will NOT
	(2)	VERIFY the Reactor Trip

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is correct ï see explanation in Analysis C Part 2 is incorrect but plausible ï The RCP indicates a malfunction. The pump would be tripped to protect the motor BUT after the reactor is tripped and verified tripped.
B.	Incorrect:	Part 1 is incorrect but plausible ï the Zero Power Mode Bypass, which defeats the Low RCS Flow trip to allow Reactor Trip Breaker closure with less than 4 RCPs running to support CEA testing. This is plausible because the ZPMB will un-bypass automatically at 1% but still could be active for this power level. Additionally the applicant may not understand that the ZPMB switch is aligned for normal plant operation during the 1-GOP-302 Precritical Checklist. If the ZPMB was not in OFF the Low RCS Flow Trip would be defeated during these specific plant conditions. Part 2 is incorrect ï See explanation in Analysis A
C.	Correct:	Part 1 is correct ï the indications provided indicate a sheared shaft (low amps). This would result in a Low RCS flow. At less than ~95% RCS flow, a loss of flow trip would be generated resulting in an automatic reactor trip. Part 2 is correct ï Per ADM-11.16, Transient Procedure Use and Adherence: On a Reactor Trip, the Board RCO **immediately** performs the following actions from memory: a. Confirms reactor power is lowering and startup rate is negative. b. Reports ñReactor Trippedò c. Reports óall CEAs are fully insertedôif able to immediately determine via rod bottom lights or reports óAssessing CEAsô
D.	Incorrect:	Part 1 is incorrect but plausible ï see explanation in Analysis B Part 2 is correct ï see explanation in Analysis C

Question Number: 4

Tier: 1 Group: 1

K/A: 015 AK3.03 RCP Malfunctions / Knowledge of the reasons for the following responses as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): Sequence of events for manually tripping reactor and RCP as a result of an RCP malfunction

Importance Rating: 3.7 4.0

10 CFR Part 55: ((CFR 41.5 / 41.10 / 45.6 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the indications of a sheared shaft and the actions required.

Technical Reference: ADM-11.16, Transient Procedure Use and Adherence

Proposed references to be provided: None

Learning Objective: PSL OPS 0702858

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: #28 on 2017 PSL RO EXAM

CWP input, or sequence of events recording. Input to the PORV open circuit from High pressurizer pressure will be blocked from the bypassed channel.

Automatic bypass

The following trips are affected by automatic bypass:

- High startup rate
  - Bypassed below 10^{-4}% and above 15%

- LPD
  - Bypassed below 15%

- Loss of load
  - Bypassed below 15%

The 10^{-4}% bypass is accomplished in the wide range logarithmic nuclear instrument. The trip unit is automatically bypassed by removing (shorting out) the startup rate input signal from the wide range logarithmic instrument. The 15% bypass is accomplished by the Linear Power Range Safety Channel. In this case an automatic -15vdc bypass signal is supplied directly to the trip unit to prevent it from tripping. Refer to Figure 6.

Removal of a power range safety channel or a logarithmic channel results in removal of the bypasses associated with the channel. An annunciator is actuated whenever a bypass is in effect.

Zero Power Mode Bypass (ZPMB)

This key bypass is required when the plant is shutdown to permit rod drop testing or maintenance.

- This bypass is manually initiated when it is desired to raise the CEAs for drop testing or for low power physics testing when the RCS is depressurized and there is no RCP flow.

- The following are affected by this bypass:

  - ΔT power signal to CPC-2
  - RCS Low Flow Trip
  - TM/LP Trip

ZPMB:

- Automatic removal of this bypass occurs above 1% [0.5%] as sensed by wide range logarithmic neutron flux power.

The initiation of these bypasses is controlled by four key lock switches, one located on each RPS Auxiliary Logic Assembly. Refer to Figure 28. In order for the bypass to be fully effective, all four key switches must be turned. This method of initiation was chosen to allow for complete channel separation. Operation of the pretrip alarm is unaffected by the bypass switch.

Figure 29 shows a simplified sketch of the ZPMB circuitry. Actuation of the switch applies +15V to the base of the transistor that drives the trip relays in the trip unit. The trip unit remains untripped regardless of the input signal level, as long as the +15 volts is applied to the transistor base. Normally open contacts in series with the bypass switch allow auto bypass removal. If the trip unit is removed while in ZPMB the ZPMB will be lost, the trip unit will de-energize, and the channel will trip.

To prevent erroneous ΔT power signals when coolant temperature is below the normal operating range, a block of ΔT power to CPC-2 is incorporated into RPS. This block is accomplished by actuation of the ZPMB switch. Refer to Figure 30. This switch energizes a relay in the Auxiliary Logic Assembly that blocks the ΔT power signal to a maximum selector (which selects the greater of ΔT power or nuclear power) in CPC-2. This block, when in effect, is annunciated on the RPSCIP. The block is automatically removed when wide range logarithmic neutron flux power increases above 1% [0.5]% power.

The CWP associated with the TM/LP pre-trip is not blocked by the ZPMB circuitry

Low Steam Generator Pressure Trip Bypass

To allow CEA testing while shutdown, a manual key-operated bypass is provided on the Auxiliary Logic Assembly for all four RPS channels.

- The S/G low pressure trip may be bypassed below **700 [720] psia**.

By placing the key-operated switch in the bypass position, the low pressure trip is prevented by the application of a constant +15V signal. The bypass is removed regardless of the manual switch position if either steam generator pressure exceeds **700 [720] psia**.

ATTACHMENT 4
Reactor Precritical Checklist
(Page 3 of 4)

4. **VERIFY** Reactor Protection System status as follows:

	Required Position / Condition	Place check mark if in Required Position / Condition unless otherwise noted CHANNEL A	B	C	D
Wide Range Log Safety Drawers					
Log Cal Switch	OPR				
WR Trip Lights: ZPMB	ON				
LOG	OFF				
LOG Trouble	OFF				
Log Test Potentiometer	Fully CCW				
Rate Test Switch	OPR				
Rate Test Potentiometer	Fully CCW				
Output Test Select Switch	OFF				
Test Enable Key Switch	NORMAL				
Linear Safety Channel Drawers					
Meter Select	CAL. AVG				
Average Control	(U+L)/2				
PR Trip Lights: LIN 1	OFF				
LIN 2	OFF				
Linear Trouble	OFF				
Power On Light	ON				
PR Test Switch	OPR				
PR Test Potentiometers: Test Upper	Fully CCW				
Test Lower	Fully CCW				
RPS Calibration and Indication Panel					
Delta T Power Calculator Test Switch	OPERATE				
TM/LP Test Switch	OFF				
Delta T Power Test Switch	OFF				
DVM Meter Input Switch	DELTA T POWER				
RPS Logic Matrix Drawer					
Logic Matrix Relay Status Light (4 or 8)	ON				
Matrix Relay Trip Select Switch/Switches (1 or 2)	OFF				
Channel Trip Select Switch/Switches (1 or 2)	OFF				
RPS Auxiliary Logic Drawer					
Zero Power Mode Bypass Switch	OFF				
Lo SG Pressure Bypass Switch	OFF				
Auctioneering Input Integrity Test Switch	OFF				
Matrix Power Supply Lights (12)	ON				

ATTACHMENT 6
CEDM Operability Verification Prior to Reactor Startup
(Page 4 of 4)

18. **VERIFY** all CEA bottom lights are ON. (Section 7.1.3, Management Directive 2)

19. IF the ZERO POWER MODE BYPASS keys were used, THEN **PERFORM** the following:

A. **PLACE** the ZPMB bypasses to OFF

B. **REMOVE** the following ZPMB keys:

- CHANNEL A, ZERO POWER MODE BYPASS (Key 93)
- CHANNEL B, ZERO POWER MODE BYPASS (Key 94)
- CHANNEL C, ZERO POWER MODE BYPASS (Key 95)
- CHANNEL D, ZERO POWER MODE BYPASS (Key 96)

C. **RETURN** keys to the US key locker.

_____/____ _____/_____ _____/_____ _____/_____
Ch A / IV Ch B / IV Ch C / IV Ch D / IV

20. IF the LO SG PRESS BYPASS keys were used, THEN **PERFORM** the following:

A. **PLACE** LO SG PRESS BYPASS switches to OFF

B. **REMOVE** the following LO SG PRESS BYPASS keys:

- CHANNEL A, LO SG PRESS BYPASS (Key 97)
- CHANNEL B, LO SG PRESS BYPASS (Key 98)
- CHANNEL C, LO SG PRESS BYPASS (Key 99)
- CHANNEL D, LO SG PRESS BYPASS (Key 100)

C. **RETURN** keys to the US key locker.

_____/____ _____/_____ _____/_____ _____/_____
Ch A / IV Ch B / IV Ch C / IV Ch D / IV

4.3 EOP Use and Adherence (continued)

1. (continued)

H. EOP Implementation Strategy

NOTE

Conduct of Operations EOP Implementation Strategy is developed as departmental philosophy. All Reactor Control Operators (RCO) receive the same training, therefore the Board RCO and the Desk RCO are equally qualified, and either can perform all actions stipulated in EOP Implementation Strategy as mandated by plant conditions.

(1) On a Reactor Trip, the Board RCO immediately performs the following actions from memory:

a. Confirms reactor power is lowering and startup rate is negative.

b. Reports ñReactor Trippedò

c. Reports ó<u>all</u> CEAs are fully insertedôif able to immediately determine via rod bottom lights or reports óAssessing CEAsôif required to further diagnose the status of CEAs. Once determined, the status of CEAs shall be reported to the US along with any required contingency actions. These contingencies (e.g., manually tripping the Reactor, emergency boration, etc.) are Immediate Actions that do **NOT** need US concurrence, but should be communicated to the US as soon as possible (e.g., I have two CEAs **NOT** fully inserted and I am beginning emergency boration).

d. If a dilution is in progress, then the dilution flow should be secured by closing FCV-2210X.

(2) On a Reactor Trip, the Desk RCO immediately performs the following from memory:

a. Verifies all governor and throttle valves closed.

b. Report ñTurbine Trippedòonce the Board RCO has reported ñReactor Trippedò

ORIGINAL QUESTION FROM 2017 NRC EXAM

28. 003A2.03 Reactor Coolant Pump System (RCPS): Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Problems associated with RCP motors, including faulty motors and current, and winding and bearing temperature problems

Given the following conditions:

- Unit 1 is in Mode 2 performing a Reactor Startup
- Critical Rod Height Data is being taken
- Reactor Power is 5 X 10^{-4}%
- The Board RCO notes:
  - RCP 1A1 amps are 160
  - RCP 1A2 amps are 425
  - RCP 1B1 amps are 415
  - RCP 1B2 amps are 420

Which ONE of the following completes the statements below?

The Reactor ____(1)____ AUTOMATICALLY TRIP.

In accordance with ADM-11.16, Transient Procedure Use and Adherence, IF the Reactor DOES trip, the crew is required to FIRST ____(2)____.

A.	(1)	will
	(2)	trip the RCP
B.	(1)	will NOT
	(2)	trip the RCP
C.	(1)	will
	(2)	VERIFY the Reactor Trip
D.	(1)	will NOT
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CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is correct ï see explanation in Analysis C Part 2 is incorrect but plausible ï The RCP indicates a malfunction. The pump would be tripped to protect the motor BUT after the reactor is tripped and verified tripped.
B.	Incorrect:	Part 1 is incorrect but plausible ï the Zero Power Mode Bypass, which defeats the Low RCS Flow trip to allow Reactor Trip Breaker closure with less than 4 RCPs running to support CEA testing. This is plausible because the ZPMB will un-bypass automatically at 1% but still could be active for this power level. Additionally the applicant may not understand that the ZPMB switch is aligned for normal plant operation during the 1-GOP-302 Precritical Checklist. If the ZPMB was not in OFF the Low RCS Flow Trip would be defeated during these specific plant conditions. Part 2 is incorrect ï See explanation in Analysis A
C.	Correct:	Part 1 is correct ï the indications provided indicate a sheared shaft (low amps). This would result in a Low RCS flow. At less than ~95% RCS flow, a loss of flow trip would be generated resulting in an automatic reactor trip. Part 2 is correct ï Per ADM-11.16, Transient Procedure Use and Adherence: On a Reactor Trip, the Board RCO **immediately** performs the following actions from memory: a. Confirms reactor power is lowering and startup rate is negative. b. Reports ñReactor Trippedò c. Reports óall CEAs are fully insertedôif able to immediately determine via rod bottom lights or reports óAssessing CEAsô
D.	Incorrect:	Part 1 is incorrect but plausible ï see explanation in Analysis B Part 2 is correct ï see explanation in Analysis C

Question Number: 28

Tier: 2 Group: 1

K/A: 003A2.03 Reactor Coolant Pump System (RCPS): Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Problems associated with RCP motors, including faulty motors and current, and winding and bearing temperature problems

Importance Rating: 3.7 3.9

10 CFR Part 55: (CFR 41.5)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the indications of a sheared shaft and the actions required.

Technical Reference: ADM-11.16, Transient Procedure Use and Adherence

Proposed references to be provided: None

Learning Objective: PSL OPS 0702858

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: New question for the 2017NRC RO Exam

Comments:

5.

022 AK3.02 Loss of Rx Coolant Makeup / Knowledge of the reasons for the following responses as they apply to the Loss of Reactor Coolant Makeup: Actions contained in SOPs and EOPs for RCPs, loss of makeup, loss of charging, and abnormal charging

Given the following conditions:

- Unit 2 is at 100% power
- The SNPO reports a Charging Line break in the flowpath before it reaches V2429, Charging Pump Disch at Penetr #27 Isol
- Letdown has automatically isolated
- The crew has entered 2-AOP-02.03, Charging and Letdown

Which ONE of the following completes the statements below?

In accordance with 2-AOP-02.03, a MINIMUM of ____(1)____ Charging pump(s) is/are AVAILABLE to be aligned to the ñÀòHPSI header.

Letdown will NOT be available while charging through the ñÀòHPSI header due to ____(2)____ the regenerative HX

A.	(1)	ONE
	(2)	high D/P across
B.	(1)	ONE
	(2)	loss of cooling flow through
C.	(1)	THREE
	(2)	high D/P across
D.	(1)	THREE
	(2)	loss of cooling flow through

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: Per 2-AOP-02.03 and based on the location of the leak, the procedure will direct alignment of charging to the Aux HPSI header, SINCE the break is upstream of V2429, the procedure directs the alignment of one (2C) charging pump. Part 2 incorrect: High DP across the RHX, on the letdown side would result in the inability to restore letdown. Letdown will automatically isolate on high temperature (loss of cooling via charging) or high DP across Hx (letdown line break). Plausible if the applicant confuses the break location with a high DP issue.
B.	Correct:	Part 1 correct: See Analysis ñAò Part 2 correct: Alignment to the Aux HPSI header will bypass charging flow through the RHX, therefore cannot restore letdown due to no cooling.
C.	Incorrect:	Part 1 incorrect: Plausible if the location of the line break was downstream of V2429, the AOP would direct the alignment of all three charging pumps so any can be used for makeup. Part 2 incorrect: See analysis ñAò
D.	Incorrect:	Part 1 incorrect: See analysis ñCò Part 2 correct: See analysis ñBò

Question Number: 5

Tier: 1 Group: 1

K/A: 022 AK3.02 Loss of Rx Coolant Makeup / Knowledge of the reasons for the following responses as they apply to the Loss of Reactor Coolant Makeup: Actions contained in SOPs and EOPs for RCPs, loss of makeup, loss of charging, and abnormal charging

Importance Rating: 3.5 3.8

10 CFR Part 55: (CFR 41.5,41.10 / 45.6 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the status of the charging pumps and letdown during a loss of makeup

Technical Reference: 2-AOP-02.03

Proposed references to be provided: None

Learning Objective: PSL OPS 0702859 - 3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: New question for the 2019 NRC Exam

Comments:

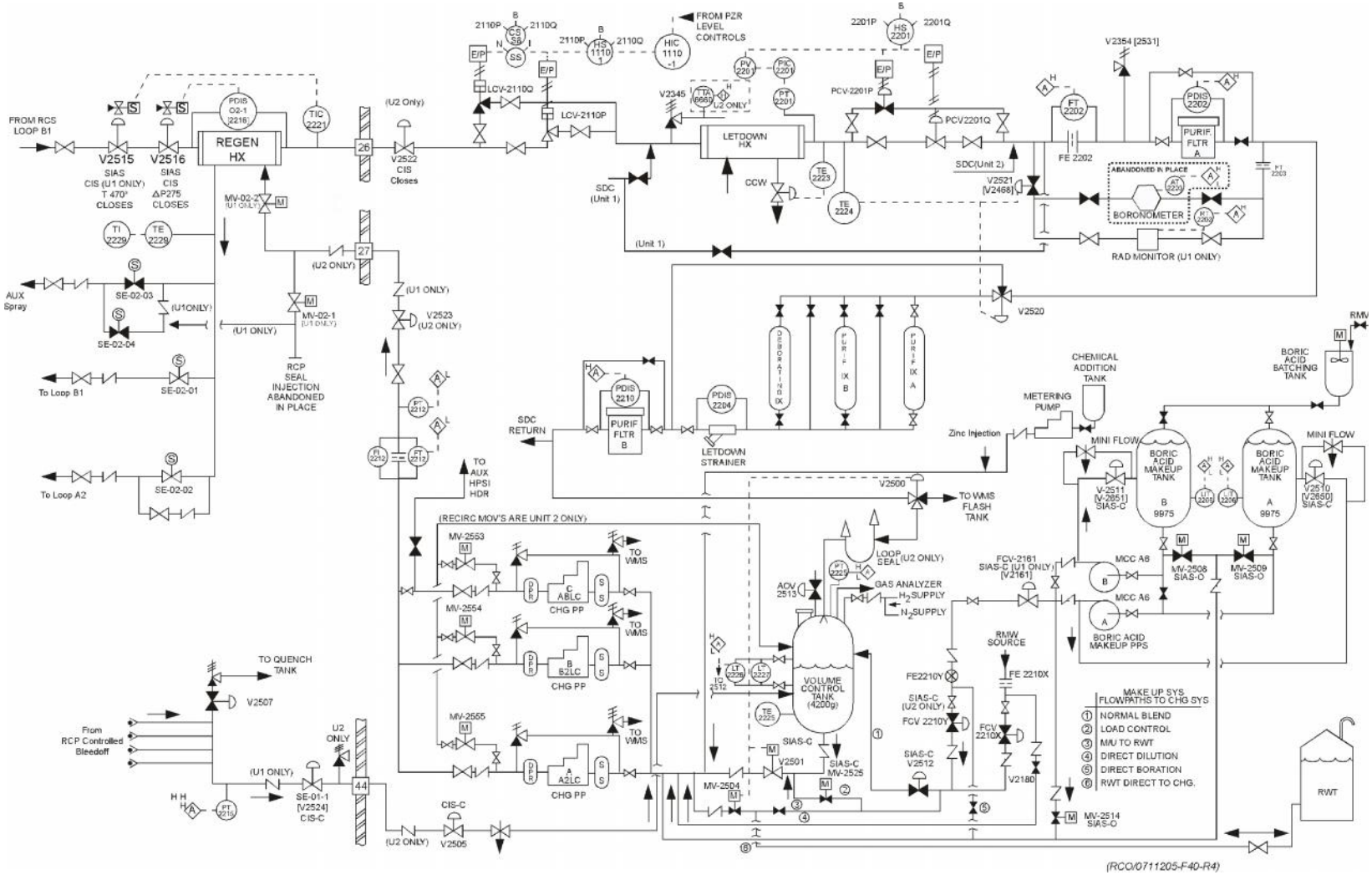

FROM RCS LOOP B1
V2515
SIAS CIS (U1 ONLY) T 470° CLOSES
V2516
SIAS CIS ΔP275 CLOSES
REGEN HX
TIC 2221
V2522 CIS Closes
LCV-2110Q
LCV-2110P
FROM PZR LEVEL CONTROLS
HIC 1110 -1
LETDOWN HX
PCV-2201P
PCV2201Q
V2354 [2531]
PDIS 2202
PURIF FLTR A
FE 2202
ABANDONED IN PLACE
BORONOMETER
RAD MONITOR (U1 ONLY)
SDC (Unit 1)
SDC(Unit 2)
V2521 [V2468]
V2520
CCW
TE 2223
TE 2224
AUX Spray
SE-02-03
SE-02-04
SE-02-01
SE-02-02
To Loop B1
To Loop A2
RCP SEAL INJECTION ABANDONED IN PLACE
MV-02-1
V2523
SDC RETURN
PDIS 2210
PURIF FLTR B
PDIS 2204
LETDOWN STRAINER
DEBORATING IX
PURIF IX B
PURIF IX A
CHEMICAL ADDITION TANK
METERING PUMP
Zinc Injection
BORIC ACID BATCHING TANK
MINI FLOW
BORIC ACID MAKEUP TANK B 9975
BORIC ACID MAKEUP TANK A 9975
V-2511 (V-2651) SIAS-C
V2510 (V2650) SIAS-C
TO AUX HPSI HDR
TO WMS FLASH TANK
V2500
(RECIRC MOV'S ARE UNIT 2 ONLY)
MV-2553
MV-2554
MV-2555
TO WMS
C A B1LC
B B2LC
A A2LC
CHG PP
LOOP SEAL (U2 ONLY)
GAS ANALYZER
H_2 SUPPLY
N_2 SUPPLY
AOV 2513
VOLUME CONTROL TANK (4200g)
FCV-2161 SIAS-C (U1 ONLY) [V2161]
MCC A8
MCC A6
MV-2508 SIAS-O
MV-2509 SIAS-O
BORIC ACID MAKEUP PPS
RMW SOURCE
FE 2210X
FCV 2210Y
SIAS-C (U2 ONLY)
SIAS-C V2512
SIAS-C MV-2525
SIAS-C V2501
MV-2504
V2180
MV-2514 SIAS-O
RWT
MAKE UP SYS FLOWPATHS TO CHG SYS
① NORMAL BLEND
② LOAD CONTROL
③ MU TO RWT
④ DIRECT DILUTION
⑤ DIRECT BORATION
⑥ RWT DIRECT TO CHG.
TO QUENCH TANK
V2507
From RCP Controlled Bleedoff
SE-01-1 [V2524] CIS-C
CIS-C
V2505
(U2 Only)
(U1 ONLY)
(U2 ONLY)
(RCO/0711205-F40-R4)

FIGURE 1

ATTACHMENT 2
Alternate Charging Flow Path to RCS Through the A HPSI Header
(Page 1 of 11)

NOTE

Letdown will **NOT** be available while charging through A HPSI header due to loss of cooling flow through the regenerative heat exchanger.

CAUTION

- Use of this flowpath has the potential for lifting V3417, 2A HPSI PUMP DISCH HDR RELIEF, once a charging pump is started.
- When all charging pumps are in the STOP position, Tech Spec. 3.0.3 is applicable.

1. IF charging flow is lost due to a rupture or component failure downstream of V2429, CHARGING PUMP DISCH AT PENETR # 27 ISOL, THEN **PERFORM** the following:

A. **STOP** the charging pumps one at a time.

B. **MAINTAIN** charging pump control switches in the STOP position.

C. **PLACE** PUMP 2A (2A HPSI PUMP) in STOP.

NOTE

Closure of V3656, PUMP 2A DISCHARGE VALVE, will render the A HPSI Header inoperable.

D. **CLOSE** V3656, PUMP 2A DISCHARGE VALVE.

ATTACHMENT 2
Alternate Charging Flow Path to RCS Through the A HPSI Header
(Page 2 of 11)

1. (continued)

NOTE

During a fire event local manual operation of the A HPSI Header Isolation valves may be required. If A Train is the protected train, HCV-3617, HEADER A TO LOOP 2A2 VALVE, should be used. If B Train is the protected train, HCV-3637, HEADER A TO LOOP 2B1 VALVE, should be used.
(Section 6.1.3, Management Directive 1)

E. **OPEN** one of the following valves: (RTGB-206)

- HCV-3617, HEADER A TO LOOP 2A2 VALVE.
- HCV-3627, HEADER A TO LOOP 2A1 VALVE.
- HCV-3637, HEADER A TO LOOP 2B1 VALVE.
- HCV-3647, HEADER A TO LOOP 2B2 VALVE.

F. **PERFORM** the following:

(1) OPEN V3519, CHARGING PUMP TO A HPSI HDR ISOL. (RAB/-3/S-RA1Z/E-RAG, -0.5' ECCS Pump Room, west of the 2A HPSI Pump)

(2) OPEN V2340, CHARGING PUMP DISCH HDR TO AUX HPSI HDR ISOl. (RAB/7/N-RA2/E-RAE, -0.5' south side of the 2C Charging Pump cubicle)

ATTACHMENT 2
Alternate Charging Flow Path to RCS Through the A HPSI Header
(Page 3 of 11)

1. (continued)

NOTE

V2429, CHARGING PUMP DISCH AT PENETR # 27 ISOL, must be closed if this attachment is used during a fire event due to potential spurious operation of V2523, CHARGING LINE.

G. **CLOSE** one of the following:

- V2523, CHARGING LINE. (RTGB-205, Key 42)
- V2429, CHARGING PUMP DISCH AT PENETR # 27 ISOL. (RAB/34/N-RA1/W-RAE, 19.5' Pipe Penetration Room in overhead)

H. **ENSURE** RCS Pressure is being maintained less than or equal to 2250 psia.

CAUTION

Use of this flowpath will result in a boron addition to the RCS. Up to 650 gallons of highly borated water may be contained in the Auxiliary HPSI header line being used. RCS temperature must be closely monitored during this evolution.

I. **START** the selected charging pump.

NOTE

RCS pressure must **NOT** exceed 2250 psia at any time a charging pump is discharging into the HPSI header.

J. IF RCS pressure exceeds 2250 psia, THEN **STOP** the charging pump.

ATTACHMENT 2
Alternate Charging Flow Path to RCS Through the A HPSI Header
(Page 7 of 11)

1. (continued)

R. **RESTORE** charging and letdown if required.

NOTE

2C Charging Pump will be required to perform this lineup.

CAUTION

When all charging pumps are in the STOP position, Tech Spec 3.0.3 is applicable.

2. IF charging flow is lost due to a rupture or component failure upstream of V2429, CHARGING PUMP DISCH AT PENETR # 27 ISOL, THEN **PERFORM** the following:

A. **STOP** the charging pumps one at a time.

B. **MAINTAIN** charging pump control switches in the STOP position while realigning the system.

C. **PLACE** PUMP 2A (2A HPSI PUMP) in STOP.

CAUTION

Closure of V3656, PUMP 2A DISCHARGE VALVE, will render A HPSI Header inoperable.

D. **CLOSE** V3656, PUMP 2A DISCHARGE VALVE. (RTGB-206)

E. **CLOSE** V2338, 2C CHARGING PUMP DISCH TO COMMON DISCH HDR ISOL. (RAB/7/N-RA3/E-RAE)

F. **OPEN** one of the following valves: (RTGB-206)

(1) HCV-3617, HEADER A TO LOOP 2A2 VALVE.

(2) HCV-3627, HEADER A TO LOOP 2A1 VALVE.

(3) HCV-3637, HEADER A TO LOOP 2B1 VALVE.

(4) HCV-3647, HEADER A TO LOOP 2B2 VALVE.

ATTACHMENT 2
Alternate Charging Flow Path to RCS Through the A HPSI Header
(Page 8 of 11)

2. (continued)

G. **PERFORM** the following:

(1) OPEN V3519, CHARGING PUMP TO A HPSI HDR ISOL. (RAB/-3/S-RA1Z/E-RAG, -0.5' ECCS Pump Room, west of the 2A HPSI Pump)

(2) OPEN V2340, CHARGING PUMP DISCH HDR TO AUX HPSI HDR ISOl. (RAB/7/N-RA2/E-RAE, -0.5' south side of the 2C Charging Pump cubicle)

H. **ENSURE** RCS pressure is being maintained less than or equal to 2250 psia.

CAUTION

Use of this flowpath will result in a boron addition to the RCS. Up to 650 gallons of highly borated water may be contained in the Auxiliary HPSI header line being used. RCS temperature must be closely monitored during this evolution.

I. **START** the 2C Charging pump.

NOTE

RCS pressure must **NOT** exceed 2250 psia at any time a charging pump is discharging into the HPSI header.

J. IF RCS pressure exceeds 2250 psia, THEN **STOP** the charging pump.

6. 025 AA2.02 / Loss of RHR System / Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: Leakage of reactor coolant from RHR into closed cooling water system or into reactor building atmosphere

Given the following conditions:

- Unit 2 is in Mode 4 on Shutdown Cooling (SDC)
- 2A Shutdown Cooling Loop is in service
- 2B1/2B2 RCPs are in operation
- 2B LPSI Pump is out of service under an ECO
- RCS cooldown is in progress per 2-GOP-305, Reactor Plan Cooldown ï Hot Standby to Cold Shutdown

Subsequently:

- A tube leak occurs in the 2A SDC Heat Exchanger
- 2-AOP-14.01, CCW ABNORMAL OPERATIONS has been entered

Which ONE of the following completes the statements below?

CCW Surge Tank level will ____(1)____.

After the 2A SDC Heat Exchanger is isolated, a flow path from the 2A LPSI pump ____(2)____ available through the 2B SDC Heat Exchanger.

A.	(1)	RISE
	(2)	IS
B.	(1)	RISE
	(2)	IS NOT
C.	(1)	LOWER
	(2)	IS
D.	(1)	LOWER
	(2)	IS NOT

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is correct. see analysis ñBò Part 2 incorrect ï but plausible. On Unit 1, either LPSI pump can flow water through either SDC heat exchanger. Normally both heat exchangers if only one pump is running when on shutdown cooling.
B.	Correct:	Part 1 Correct: For the given plant conditions, the minimum RCS pressure for RCP operation is ~245 psia. Normal CCW system pressure is approximately 110 psia. RCS leakage would go into the CCW system causing CCW surge tank level to rise. 2-AOP-14.01 will address both high or low level alarms in the CCW surge tank. Part 2 is Correct. There is NO pump discharge cross-tie between trains. For a similar condition on Unit 1, either LPSI pump can flow water through either SDC heat exchanger. There is a pump suction cross-tie (V3545) so the LPSI pump can have its suction aligned to either ñAò or ñBò hot leg.
C.	Incorrect:	Part 1 is incorrect ï but plausible. The applicant must know the pressure differences between the system under varying operating conditions. If the applicant incorrectly believes CCW system pressure is greater than RCS pressure, then CCW surge tank level will lower. Part 2 is incorrect but plausible. See analysis ñAò
D.	Incorrect:	Part 1 correct, see analysis ñCò Part 2 correct but plausible, see analysis ñAò

Question Number: 6

Tier: 1 Group: 1

K/A: 025 AA2.02 / Loss of RHR System / Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: Leakage of reactor coolant from RHR into closed cooling water system or into reactor building atmosphere

Importance Rating: 3.4 3.8

10 CFR Part 55: (CFR 43.5 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the indications of RCS from RHR into CCW and the flow path.

Technical Reference: PSL OPS 0711209, 2-AOP-14.01

Proposed references to be provided: None

Learning Objective: PSL OPS 07022209-7

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

DETAILED DESCRIPTION

CCW SURGE TANK

The CCW surge tank is connected to the suction of the CCW pumps and is designed to accommodate volumetric thermal changes in the system and to maintain NPSH at each pump suction. The tank is normally vented to atmosphere to prevent damage to the tank from both over-pressure and vacuum conditions. The cylindrical tank is horizontally mounted and has a volume of 2000 gallons. The surge tank is located east of the control room and north of the control room A/C units. Although both essential headers share the surge tank, a 30òhigh baffle divides the lower portion of the tank into two separate compartments; each associated with one of the essential headers. Each essential header is supplied from one compartment through separate surge lines.

Demineralized makeup water is added to the surge tank through an automatic level control system by the demineralized water system. A backup water supply is also available from the fire water system. (Refer to Figure 3 and Table1

- Air-operated valve LCV-14-1 is used to control makeup flow. Automatic makeup water is:
  - **added** when the surge tank level falls below **36"** as sensed by LS-14-3 (This setpoint is based on the requirement that the surge tank level be maintained for fluid contraction and expansion and to ensure that the pumps have the required NPSH)
  - **stopped** when surge tank level increases to **48"** as sensed by LS-14-4. (This setpoint is based on the requirement to maintain level below the top of the tank which is 66òfrom the tank bottom)
- Alarms associated with CCW surge tank levels are actuated at:
  - **High at 54"** as sensed by LS-14-5 (CCW SURGE TANK LEVEL HIGH) This setpoint is set to alert the operator of a potential leakage of radioactive water into the CCW system, air intrusion, OR a failure of the makeup system to terminate makeup flow.
  - **Low at 29"** as sensed by LS-14-1A (COMPARTMENT A LEVEL LOW)
  - **Low at 29"** as sensed by LS-14-1B (COMPARTMENT B LEVEL LOW). This

alarm can alert the operator to an abnormal condition such as a failure of the makeup system to begin makeup flow and/or a leak or rupture in the CCW system. The abnormal procedure cautions the operator that the fire water system should be used as a makeup source as a last resort.

- Each side of the surge tank has a water level sight glass for local indication.
- Unit 2 has two additional level switches associated with the CCW surge tank:

  - **at 29"** LS-14-6A causes the following ó Aô side ñ Nô header valves to **CLOSE**:
    HCV-14-8A, ó Aô side supply
    HCV-14-9, ó Aô side return

  - **at 29"** LS-14-6B causes the following ñ Bô side ñ Nô header valves to **CLOSE**:
    HCV-14-8B, ñ Bô side supply
    HCV-14-10, ñ Bô side return

    A **leak** in one of the **essential** headers would affect the level in both compartments of the surge tank due to their being cross-connected via the ñ Nô header. After both sides ñ Nô header valves close, the side without the leak would have its low level alarm clear. The ñ Nô header supply and return valves for that õgoodò side could then be re-opened.

    A **leak** in the ñ **N**ô header would also affect the level in both compartments of the surge tank. After both sides ñ Nô headers valves close, both low level alarms would clear, indicating that the leak was in the ñ Nô header.

- Overflow or draining from the CCW surge tank is collected by the Reactor Auxiliary Building drain system and is routed to the Chemical Drain Tank.

- The CCW surge tank is vented:
  - Normally to atmosphere via RCV-14-1
  - CCW Surge Tank Vent RCV-41-1 diverts from atmosphere to the Chemical Drain Tank on high radioactivity in the CCW system as detected by at least one in line process radiation monitor.

CCW Surge Tank High Level Abnormal Condition

Three conditions could cause a high level in the CCW Surge Tank, radioactive leakage into the CCW system, air/gas intrusion, or failure of the demineralized makeup water system to function properly. The abnormal procedural guidance provides for:

- The CCW radiation monitors are checked for abnormal trends for high levels in the CCW surge tank. If high radiation is indicated, the abnormal procedure for CCW excessive activity is entered.

- If excessive makeup flow is indicated, the makeup supply from the demineralized water system is isolated.

- If condition is not one of the above, air/gas intrusion should be considered. Co-symptoms are CCW pump amperage fluctuations, low flow to smaller components, high temperature alarms on smaller components. The abnormal procedure will direct system venting per the AOP.

CCW Surge Tank Low Level Abnormal Condition

Two conditions could cause a low level in the CCW surge tank; a failure of the makeup system to supply demineralized water or a rupture in one of the CCW headers. The abnormal procedural guidance provides for:

- Ensuring the makeup system is working properly
- Looking for and isolating leaks

CCW PUMPS

There are three centrifugal, horizontal split, double suction pumps rated at 8500 gpm at 177 (~77 psig) feet of discharge head located on the CCW platform east of the RAB [CCW platform in the CCW building]. In accident conditions the óAô pump supplies the óAô header and the óBô pump supplies the óBô header. The óCô pump is normally aligned to the óBô [óAô] header with its motor-operated suction and discharge valves and power supplies aligned to that side. Train separation is always met such that before aligning the óCô pump to the other train, it is first isolated from the current train. (See Figures 1,2 and 4.) When the óCô CCW pump is being used to satisfy the requirements of either the óAô or óBô CCW pump, the alignment of the suction and discharge valves MV-14-1,

electrical 4160 VAC, 480 VAC, and 125 VDC buses. To align to the óAô header, MV-14-1 and MV-14-3 are open. To align to the óBô header, MV-14-2 and MV-14-4 are open. The óCô CCW Pump Valves MISALIGNED alarm occurs when the electrical 4160 AB bus for the óCô pump is not aligned to the same side (A 3or B3 4160 V AC bus) as the header (A or B) to which the suction and discharge valves are aligned..

The power supply for MV-14-1, MV-14-2, MV-14-3, and MV-14-4 are powered by 480 VAC MCC 1AB [2AB]. A thermal overload condition will stop valve travel on Unit 1 only and provide an overload alarm. On Unit 2 a thermal overload condition will provide an alarm only.

These valves are normally operated from RTBG 106 [206]. Local control of these valves is available at the local pushbutton stations on the CCW platforms. For control room inaccessibility concerns, local control at the MCC is possible when the NORMAL/ISOLATE switch is placed in the ISOLATE position.

Header Alarms

- HEADER HIGH FLOW at 9500 gpm
- HEADER LOW FLOW at 4000 gpm
- HEADER PRESSURE LOW at 60 psig
- CCW NORMAL HEADER ISOLATION VALVES HCV-14-8A/9 SIAS OVRD when the control switch is taken to OVERRIDE
- CCW NORMAL HEADER ISOLATION VALVES HCV-14-8B/10 SIAS OVRD when the control switch is taken to OVERRIDE

CCW RADIATION MONITORS

There are two CCW radiation monitors as shown in Figures 9,10, and 11.
They function to monitor CCW radiation levels from the control room during operation of the CCW system to detect leakage of radioactive water into the normally non-radioactive component cooling water. They provide a high radiation isolation signal to isolate the CCW Surge Tank via closing of the its vent to atmosphere diverting it to the chemical drain tank of the liquid waste management system. The sample is drawn downstream of the CCW HX and is returned to the suction of the respective side CCW pump.

On Unit 2, a protective feature was added to prevent the loss of CCW should a seismic

event rupture the radiation monitor sample lines. Solenoid valves SE-26-1 and SE-26-2, which are the sample line isolation valves, close upon a downstream sample line pressure decrease such as the result of a sample line break. In order to re-open these valves, the operator must reset the solenoids on the respective side RM-23 radiation panels in the Unit 2 control room by pushing the reset buttons. On a loss of offsite power, pressure may drop enough to require both valves to be reset.

These radiation monitors are discussed in more detail in Lesson Texts 0711410 and 0711411, Unit 1 and Unit 2 Radiation Monitoring Systems, respectively.

Sources of radioactive leakage into the CCW system are:

- RCP seal coolers and thermal barrier heat exchangers
- Letdown heat exchanger
- Sample heat exchangers
- Shutdown cooling heat exchangers
- HPSI pumps seal coolers
- LPSI pumps seal coolers (Unit 1 only)
- Containment Spray pumps seal coolers

SHUTDOWN COOLING HEAT EXCHANGERS

The CCW supply to the shutdown cooling heat exchangers is shown on Figure 12. Normal on-line configuration is that these heat exchangers are aligned in a standby mode with CCW flow isolated. CCW flow through the heat exchangers is initiated by opening HCV-14-3A and HCV-14-3B, respectively. These valves are air-operated, fail open, butterfly valves. An SIAS opens the valves. Each shutdown cooling heat exchanger is supplied with 3900-4900 gpm of CCW during shutdown cooling, refueling, and accident conditions. This flow balance is accomplished following each refueling outage. The HCV valves can be remotely opened by a control switch on RTGB 106 and are automatically opened on an SIAS.

If CCW is lost to a shutdown cooling heat exchanger, then SHUTDOWN COOLING WATER FLOW must be terminated to the affected heat exchanger prior to restoring CCW flow.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.12 Abnormal CCW Surge Tank Level (continued)

NOTE

- CCW Surge Tank level high alarm occurs at 4 feet 6 inches from bottom of tank.
- The following are potential sources of liquid or gas ingress:
  - RCP Seal Coolers
  - Letdown Heat Exchanger
  - Shutdown Cooling Heat Exchangers
  - Primary Sample Heat Exchangers
  - Steam Generator Blowdown Sample Heat Exchangers
  - Waste Gas Compressors
  - Control Room Air Conditioning

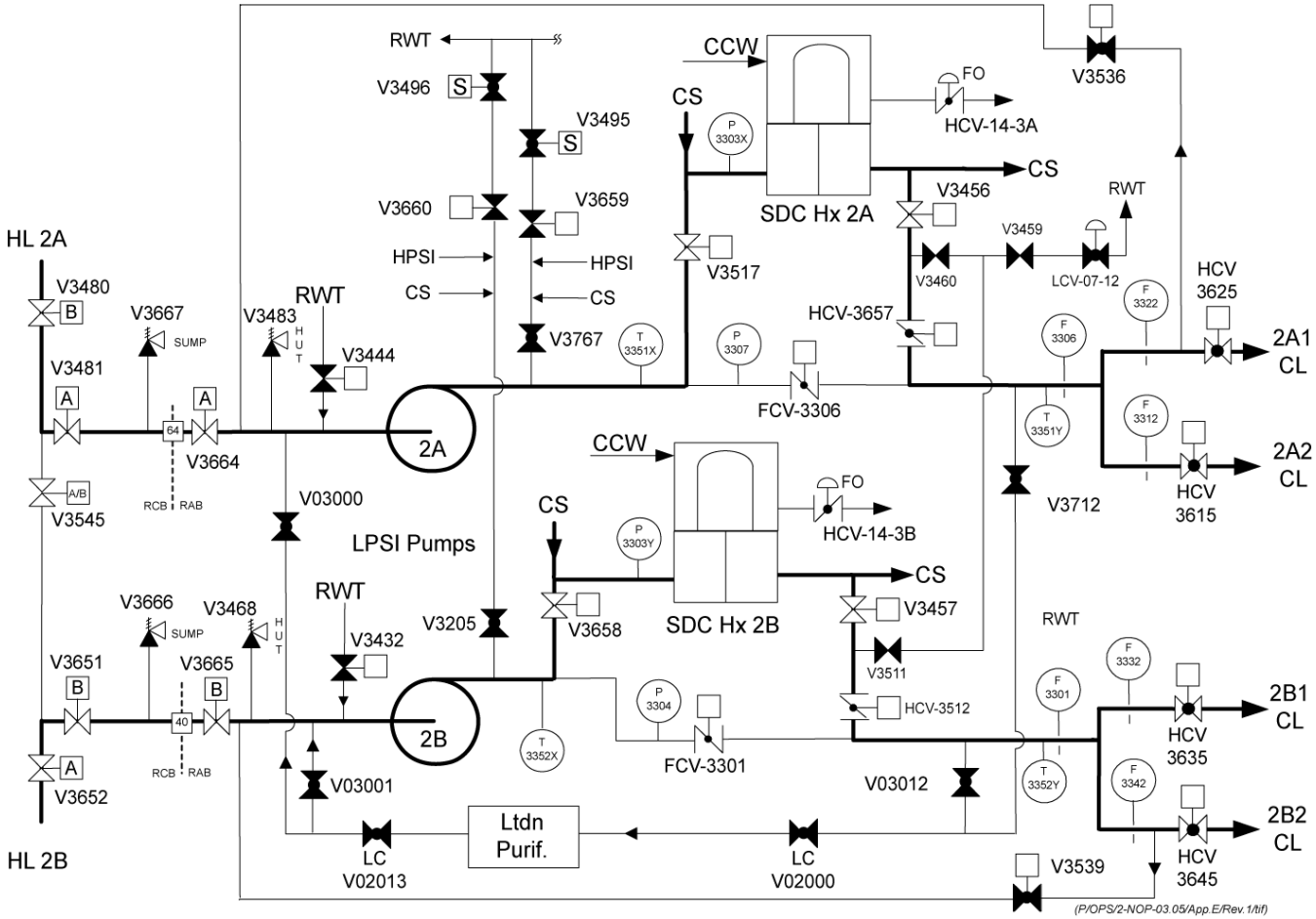
☐ **3.** **VERIFY** abnormal rising level in CCW Surge Tank.

3.1 **GO TO** Section 4.2.12, Step 17.

4. **REQUEST** Chemistry sample CCW system to assist in determining source of in-leakage. (Section 6.1.3, Management Directive 4)

☐ **5.** **REQUEST** System Engineering support to determine cause of CCW Surge Tank high level. (Section 6.1.3, Management Directive 4)

ATTACHMENT 4
Unit 2 SDC System Schematic
(Page 1 of 1)



Unit 2 Shutdown Cooling Operator Aid 02-14-02 Rev. 0

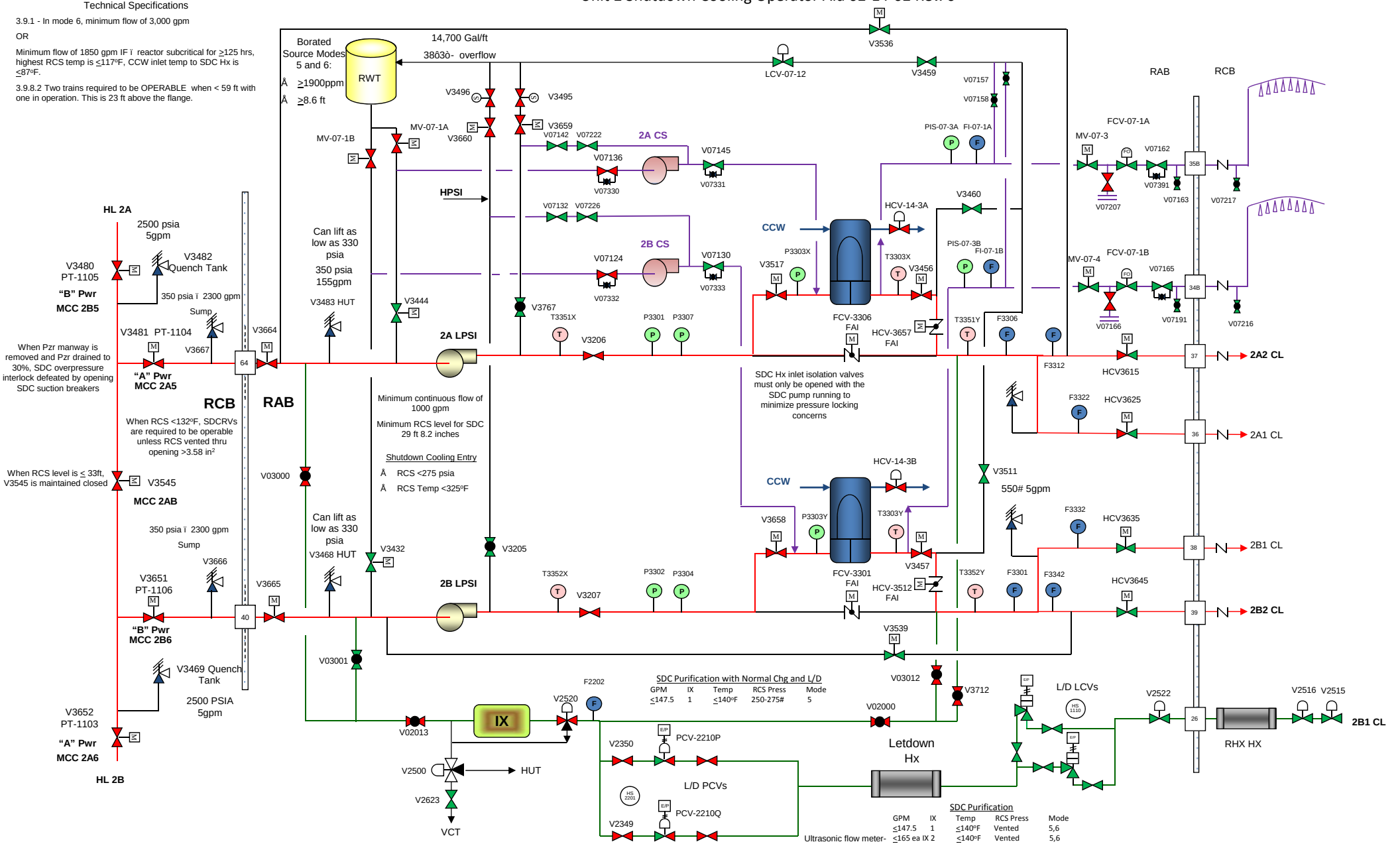
Technical Specifications

3.9.1 - In mode 6, minimum flow of 3,000 gpm

OR

Minimum flow of 1850 gpm IF ï reactor subcritical for ≥125 hrs, highest RCS temp is ≤117ºF, CCW inlet temp to SDC Hx is ≤87ºF.

3.9.8.2 Two trains required to be OPERABLE when < 59 ft with one in operation. This is 23 ft above the flange.

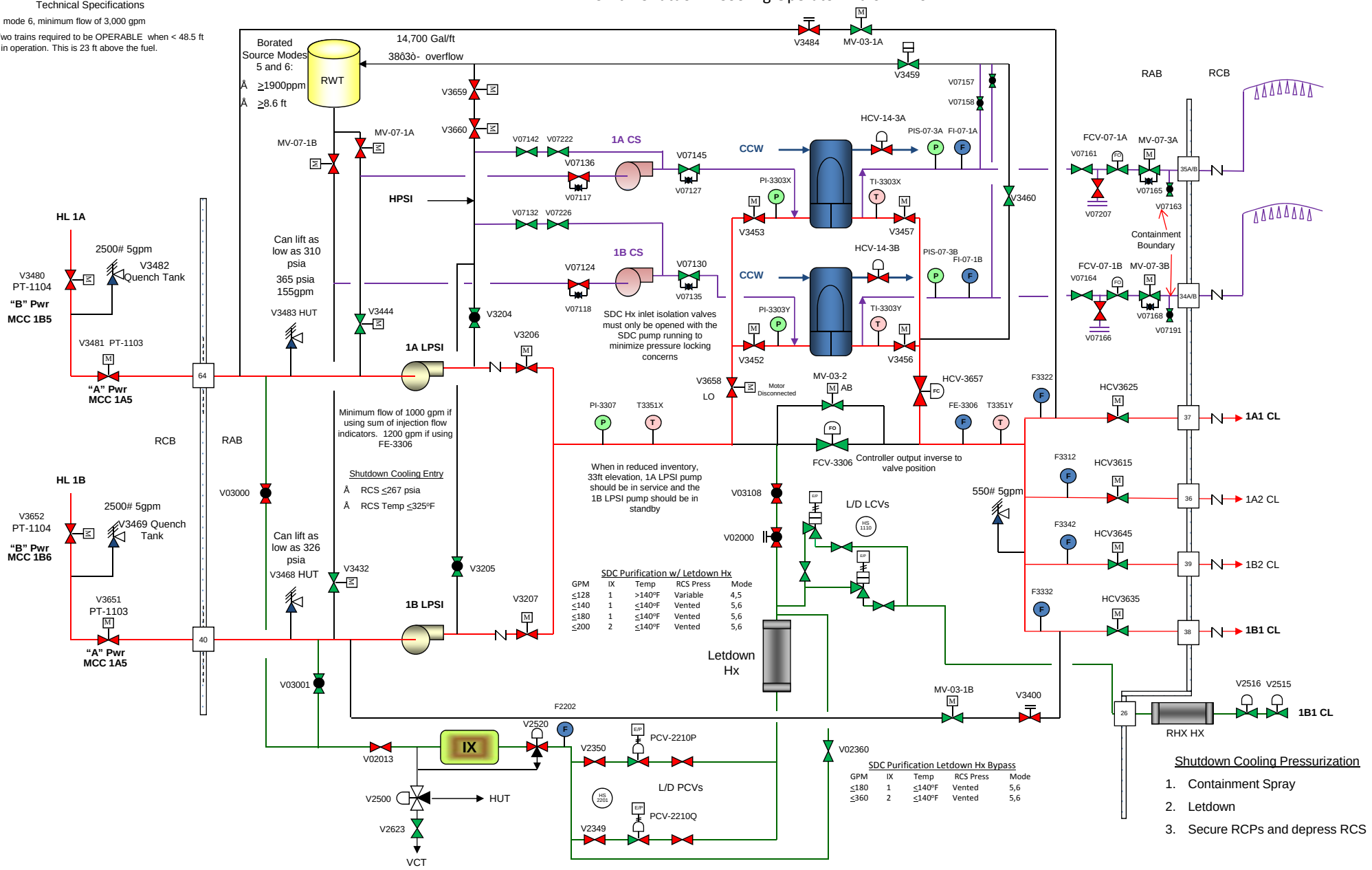


Unit 1 Shutdown Cooling Operator Aid 01-14-01

Technical Specifications

3.9.1 - In mode 6, minimum flow of 3,000 gpm

3.9.8.2 Two trains required to be OPERABLE when < 48.5 ft with one in operation. This is 23 ft above the fuel.



7.

026 G2.4.50 Loss of CCW / Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.

Given the following conditions:

00:00:00	Unit 2 is at 100% power HVS-1A, 1B and 1C CNTMT Fan Coolers are running in FAST
00:01:00	Annunciator T-4, CNTMT Fan CLR HVS-1A CCW Flow Low, ALARMS SNPO Reports FIS-14-12A, HVS-1A CCW Flow indicates 1000 gpm
00:15:00	SNPO Reports FIS-14-12A, HVS-1A CCW Flow indicates 0 gpm

Which ONE of the following completes the statements below?

At time 00:01:00, Annunciator T-4, ____(1)____ valid.

At time 00:15:00, HVS-1D, CNTMT Fan Cooler will be started in FAST speed by placing the control switch in ____(2)____ in accordance with 2-ARP-01-T4.

A.	(1)	is
	(2)	TEST
B.	(1)	is
	(2)	START
C.	(1)	is NOT
	(2)	TEST
D.	(1)	is NOT
	(2)	START

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: See explanation B Part 2 incorrect: It is plausible that the applicant think that starting the containment fan cooler by placing the switch in TEST is correct because this is the position used for starting the fan in SLOW speed as referenced in 2-NOP-25.04, Step 5.1.5.
B.	Correct:	Part 1 correct: The setpoint for this alarm is 1250 gpm as referenced by 2-ARP-01-T4. Part 2 correct: Starting the containment fan cooler by placing the switch in START is correct because this is the position used for starting the fan in FAST speed as referenced in 2-NOP-25.04, Step 4.1.4.
C.	Incorrect:	Part 1 incorrect: The setpoint for this alarm is 1250 gpm as referenced by 2-ARP-01-T4. It is plausible that the applicant does not know the setpoint and believe the alarm to not valid. Part 2 incorrect: See explanation A
D.	Incorrect:	Part 1 incorrect: See explanation C Part 2 correct: See explanation B

Question Number: 7

Tier: 1 Group: 1

K/A: 026 G2.4.50 Loss of CCW / Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.

Importance Rating: 3.7 4.0

10 CFR Part 55: (CFR 41.5,41.10 / 45.6 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to verify system alarm setpoints and operate controls in the ARP

Technical Reference: 2-ARP-010T4, 2-NOP-25.04.

Proposed references to be provided: None

Learning Objective: PSL OPS 07022210 - 16

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

CAUSES: Any of the following:

- Loss of CCW flow to the system
- Loss of CCW flow to the header
- Loss of CCW to HVS-1A
- Instrument malfunction of the flow indicating switch

CNTMT FAN CLR HVS-1A CCW FLOW LOW

T-4

DEVICE: FIS-14-12A

SETPOINT: 1250 gpm

LOCATION: RAB/25/N-RA2/RAG

ALARM CONFIRMATION

1. None

OPERATOR ACTIONS

NOTE

Normal CCW flow to the cooler should be from 1340 to 1450 gpm.

1. **VERIFY** a CCW Pump running.
2. **VERIFY** the following Containment Isolation Valves OPEN:
   - MV-14-9, COOLER A CCW VALVE
   - MV-14-10, COOLER A CCW VALVE
3. IF CCW Pumps are **NOT** running, THEN **IMPLEMENT** 2-AOP-14.01, Component Cooling Water Abnormal Operations.
4. Locally **PERFORM** the following:
   A. **CHECK** FIS-14-12A, CCW FROM HVS-1A CNTMT FAN COOLER FLOW, flowrate. (RAB/25/N-RA2/RAG)
   B. IF less than 1250 gpm, THEN **PERFORM** the following:
      (1) **CHECK** flowrate of the remaining Containment Fan Coolers: (RAB/25/N-RA2/RAG)
      - FIS-14-12B, CCW FROM HVS-1B CNTMT FAN COOLER FLOW
      - FIS-14-12C, CCW FROM HVS-1C CNTMT FAN COOLER FLOW
      - FIS-14-12D, CCW FROM HVS-1D CNTMT FAN COOLER FLOW

      (2) **VERIFY** valve lineup to HVS-1A is correct per 2-NOP-14.01, Component Cooling Water System Initial Alignment.
5. IF CCW flow to HVS-1A, CONTAINMENT COOLER A, can **NOT** be restored, THEN **PERFORM** the following per 2-NOP-25.04, Containment Fan Cooler Operations:
   A. **START** the idle Containment Fan Cooler.
   B. **STOP** HVS-1A, CONTAINMENT COOLER A.
   C. **REVIEW** Technical Specification 3.6.2.1, Containment Spray and Cooling Systems.

REFERENCES:

1. CWD 2998-B-327 sheet 218
2. P&ID 2998-G-083 sheet 1

4.0 INSTRUCTIONS

4.1 Starting Containment Fan Coolers In Fast Speed

1. **ENSURE** one of the following is met prior to performing this section:

- **NO** fans are currently running.
- Additional fans are to be started in FAST speed.

2. **REVIEW** Section 2.0, PRECAUTIONS AND LIMITATIONS.

3. **REVIEW** Section 3.0, PREREQUISITES AND INITIAL CONDITIONS.

> **NOTE**
>
> Momentary Ovrld/Trip and Flow Low/Vibration High alarms are considered normal when starting or stopping a Containment Fan Cooler.

4. As directed by the US/SM, **START** any of the following in FAST speed, in the order listed, by placing the control switch in START: (HVCB)

A. HVS-1D, CONTAINMENT COOLER 1D

B. HVS-1C, CONTAINMENT COOLER 1C

C. HVS-1B, CONTAINMENT COOLER 1B

D. HVS-1A, CONTAINMENT COOLER 1A

5.1 Starting Containment Fan Coolers In Slow Speed (continued)

NOTE

HVS-1C, CONTAINMENT COOLER 1C, and then HVS-1D, CONTAINMENT COOLER 1D should be the last fans placed in SLOW speed to avoid locking in the low flow annunciator.

5. WHEN the following conditions exist:

- As directed by the US/SM
- Fan has been running in FAST speed for at least 10 seconds (Section 7.1.3, Management Directive 4)

THEN **PLACE** the control switch in TEST with spring return to AUTO, in the order listed.

A. HVS-1A, CONTAINMENT COOLER 1A

B. HVS-1B, CONTAINMENT COOLER 1B

C. HVS-1C, CONTAINMENT COOLER 1C

D. HVS-1D, CONTAINMENT COOLER 1D

8. 027AK2.03 Pressurizer Pressure Control System Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and positioners

Given the following conditions:

- Unit 1 is at 100% power
- PIC-1110X, Pressurizer Pressure Controller is selected
- Pressurizer pressure is being maintained at 2250 psia with Pressurizer Backup Heaters B1, B2 and B5 ON with a 10% output to the Pressurizer Proportional Heaters

Subsequently:

- PIC-1110X, Pressurizer Pressure controller OUTPUT slowly drifts HIGH due to a PT-1110X malfunction

Which ONE of the following describes the response of the OUTPUT on HIC-1100, Main Spray controller AND the effect on ACTUAL Pressurizer pressure?

HIC-1100, Main Spray Controller OUTPUT ____(1)____.

ACTUAL Pressurizer pressure ____(2)____.

A.	(1)	RISES
	(2)	RISES
B.	(1)	RISES
	(2)	LOWERS
C.	(1)	LOWERS
	(2)	LOWERS
D.	(1)	LOWERS
	(2)	RISES

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: See analysis B. Part 2 incorrect: Plausible because the applicant may have the misconception that has output of the controller drifts high; it may maintain heaters on therefore actual pressurizer pressure will be rising.
B.	Correct:	Part 1 correct: As PIC-1110X drifts high, HIC-1100 output increases (proportional heater output goes to minimum and sprays eventually begin to open). Part 2 correct: Because sprays open, actual pressure lowers.
C.	Incorrect:	Part 1 incorrect: Plausible because the applicant may have the misconception that has output of the controller drifts high; it may send an inverse signal to HIC-1100 which would result in the controller output lowering. This is plausible due to other plant controllers being inversely proportional to demanded valve position (e.g., Shutdown Cooling FCV-3306 and Letdown TIC-2223). Part 2 correct: See analysis B.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 incorrect: See analysis A. This is plausible due to other plant controllers being inversely proportional to demanded valve position (e.g., Shutdown Cooling FCV-3306 and Letdown TIC-2223).

Question Number: 8

Tier: 1 Group: 1

K/A: 027AK2.03 Pressurizer Pressure Control System Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and positioners

Importance Rating: 2.6 2.8

10 CFR Part 55: (CFR 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how the PPCS system responds to a controller malfunction.

Technical Reference: PSL OPS 0711206

Proposed references to be provided: None

Learning Objective: PSL OPS 0702206-18

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: Bank question from the 2017 NRC Exam for the 2019 NRC RO Exam

Comments:

Analog Pressure Control

Pressurizer pressure controllers, PIC-1100X & Y, are proportional controllers, located on RTGB-103 [203], which provide a 4 to 20 mA DC current output signal. The controller develops an analog output signal to control the proportional heaters and the spray valves. Refer to Figure 30. (This discussion assumes the associated NORMAL/ISOLATE selector switches at the isolation panels are in NORMAL.)

- The pressure setpoint is manually adjustable by means of a RAISE/LOWER pushbutton on the controller, normally set at **2250 psia**.

- The analog output control signal of PIC-1100X & Y, in percent of maximum, is determined by pressure deviation from setpoint.

- When actual pressure is at setpoint, the output signal of PIC-1100X(Y) is **16.6%**.
  - With 16.6% control signal applied to the SCRs, the heaters produce ~50% of their maximum thermal output.

- Controller output is indicated by a horizontal output [bar graph] meter on the controller.

- Actual pressure and pressure setpoint are displayed on the vertical portion of the controller.

By design, approximately 150 kW thermal input is required to offset Pressurizer heat losses to ambient and the Pressurizer cooldown caused by continuous bypass spray. For normal steady state operations, sufficient backup heater banks will be energized to maintain proportional heaters at ~50% output.

> Since the pressure setpoint is normally 2250 psia, analog control points are frequently given in psia. Refer to Figure 30.

As actual pressure deviates from setpoint, controller output (and heater thermal output) vary in a linear fashion: (Refer to Figures 31 and 32.)

- At -25 psi from setpoint, controller output is 0% and proportional heater output is maximum.

- At +25 psi from setpoint, controller output is 33.3% and proportional heater thermal output reaches zero.

- There is a 25 psi dead band of no heater or spray operation from +25 psi to +50 psi. [Unit 2 does not have this dead band.]

Note: the PIC-1100X (and Y) are unique in that their setpoint can be lowered to a value that is less than the operating range of the pressurizer pressure input (PT1100X or Y) to the controller. The range of the transmitter is 1500-2500 psia. When the setpoint is lowered to < 1500 psia, there is no longer any useful pressure input to the controller, i.e., there is no feedback. Lowering the setpoint in this case is just a proportional demand to open the valve, and actual pressure must be watched very closely because there is no feedback to the controller.

Hand indicator controller, HIC-1100, is a proportional controller located on RTGB-103 [203] that receives as its input the selected analog output signal from PIC-1100X (Y):

- HIC-1100 is commonly referred to as the spray valve controller.
- HIC-1100 output is indicated by an horizontal output [bar graph] meter on the controller. PIC-1100X(Y) output to the controller is indicated by the left vertical [bar graph] meter on HIC-1100.
- As shown in Figure 31, the full 100% output range of HIC-1100X(Y) overlaps in a linear fashion; the upper 33.3% of PIC-1100X & Y output.
- Thus, as the output signal of PIC-1100X(Y) varies between 50% and 83% [33.33 and 66.6%] of maximum, the output of HIC-1100 and the percentage of spray valve opening vary from 0% to 100% of maximum in a direct, linear fashion.
    - Heater and spray proportional control are both related to PIC-1100X & Y output (given in % output), as shown in Figure 32.
- The electrical output of HIC-1100 is passed to the electro-pneumatic signal converters for either or both spray valves, depending upon the position of HS-1100-3 (1100E/BOTH/1100F), which was discussed under the section on "Heaters And Sprays." Signals to the spray valve(s) are displayed on the **horizontal** meter on the controller HIC-1100. The signal corresponds to the 0 to 100% spray valve position displayed on the left **vertical** graph on HIC-1100 when in Auto.

Pressurizer Pressure Safety Channels

Four safety channel pressure transmitters (PT-1102A, B, C, D) are used by the RPS, ESFAS, LTOP and ATWS systems with 1500 to 2500 psia indication on RTGB-103 [203]. Refer to Figure 33. Each consists of a bellows-type sensor with an electronic force balance transmitter.

TABLE 3 – Selected Pressure Channel Failures

SELECTED PRESSURE CHANNEL FAILS HIGH

AUTOMATIC RESPONSE TO FAILURE

- High/Low pressure alarm (2340 psia)
- Proportional heaters minimum (+25 psi) [all heaters Off at 2340 psia]
- Spray valve(s) full open (+100 [75] psi)
- Backup heaters in AUTO Off (2220 psia) [all heaters Off at 2340 psia]

PLANT RESPONSE TO FAILURE

- Actual pressure decreases
- High/Low pressure alarm on operable channel (2100 psia)
- TM/LP trip at 1887 [1900] psia (minimum setpoint; TM/LP setpoint will vary based power level, T_C and ASI)

OPERATOR ACTION

- Shift to operable pressure control channel
- Restore heaters as necessary

SELECTED PRESSURE CHANNEL FAILS LOW

AUTOMATIC RESPONSE TO FAILURE

- Proportional heaters on maximum (-25 psi)
- Backup heaters in AUTO On (2200 psia)
- High/Low pressure alarm (2100 psia)
- Spray valve(s) close (if open)

PLANT RESPONSE TO FAILURE

- Actual PZR pressure increases
- High/Low pressure alarm operable channel (2340 psia)
- High Pressurizer pressure reactor trip if actual PZR pressure reaches 2400 [2370] psia

OPERATOR ACTION

- Shift to operable pressure control channel
- Restore heaters as necessary

PRESSURIZER HEATER AND SPRAY PROPORTIONAL CONTROL

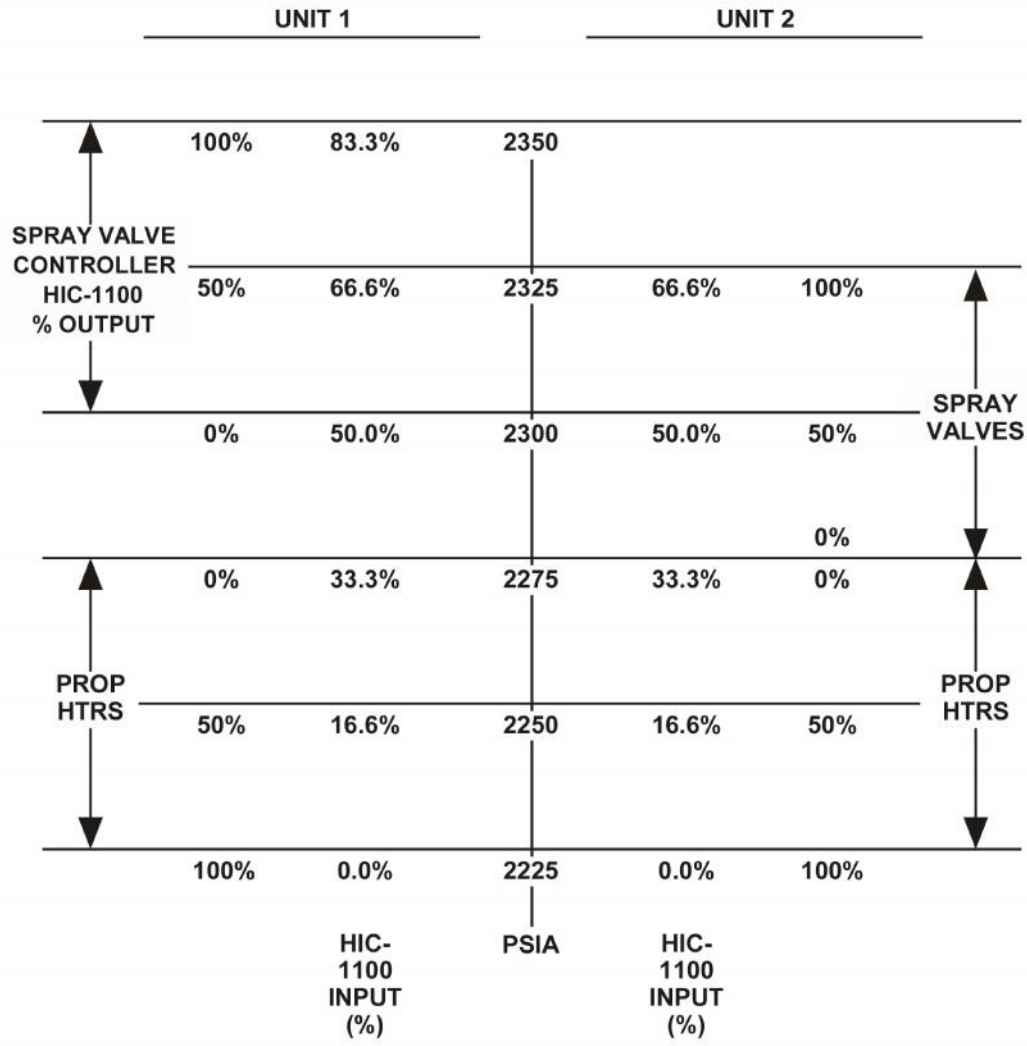


FIGURE 31

HEATER AND SPRAY PROPORTIONAL CONTROL

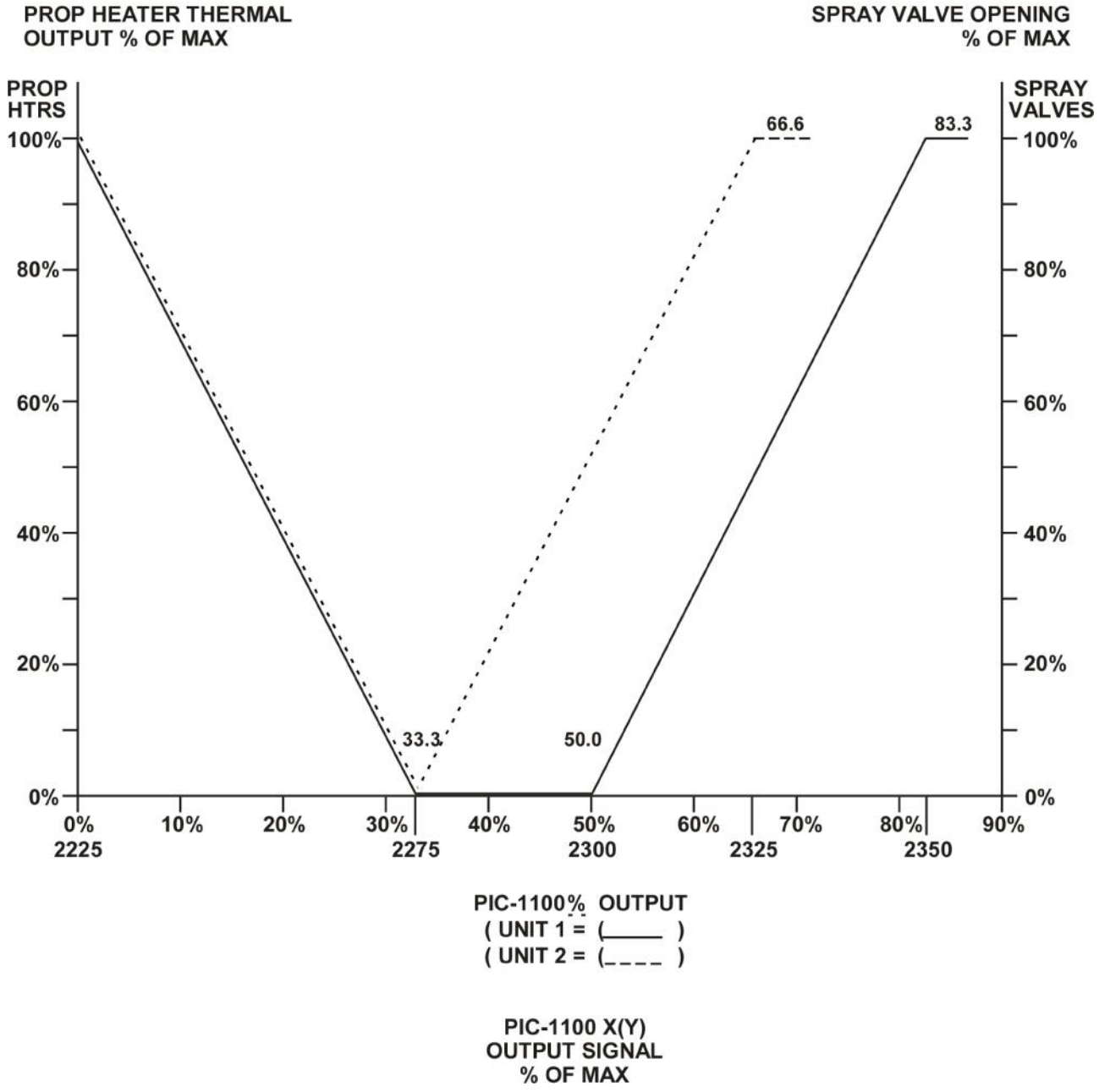


FIGURE 32

ORIGINAL QUESTION 2011 NRC

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	027AK2.03	
	Importance Rating	2.6	

Pressurizer Pressure Control System Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and Positioners

Proposed Question: RO 8

Given the following conditions on Unit1:

- The unit is operating at 100% power.
- PIC-1110X, “Pressurizer (Pzr) pressure controller” is selected.
- Pzr pressure is being maintained at 2250 psia with Pzr Backup Heaters B1, B2, and B5 ON with a 10% output to the Pzr Proportional Heaters.

The Output on PIC-1110X begins to slowly drift HIGH due to a malfunction of PT-1110X.

Which ONE of the following describes the response of the OUTPUT on HIC1100, “Main Spray controller “AND the effect on actual Pzr pressure?

(Assume no Operator actions)

HIC-1100 output __(1)____.

Actual Pzr pressure __(2)_____.

A. 1) rises
   2) rises

B. 1) rises
   2) lowers

C. 1) lowers
   2) lowers

D. 1) lowers
   2) rises

Proposed Answer: B

Explanation (Optional):

Applicant is required to know response of Pressurizer pressure controller output to sensor malfunctions including other controllers that receive output from them (namely Main Spray controller HIC-1100).

A. Incorrect. 1st part is right but second part is wrong. Heaters go to minimum and de-energize while sprays open causing actual pressure to lower.
B. Correct. As PIC-1110X drifts high, HIC-1100 output increases (proportional heater output goes to minimum and sprays eventually begin to open). Because sprays open, actual pressure lowers.
C. Incorrect. 1st part wrong. 2nd part right (see A).
D. Incorrect. Both parts wrong (output increases and pressure lowers).

Technical Reference(s): PSL OPS 0711206 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: _____

Learning Objective: PSL OPS 0702206 obj 12 (As available)
PSL OPS 0702206 obj 18

Question Source: Bank # QID 1834
Modified Bank # _____ (Note changes or attach parent)
New _____

Question History: Last NRC Exam _____

Question Cognitive Level: Memory or Fundamental Knowledge _____
Comprehension or Analysis x

10 CFR Part 55 Content: 55.45 7

Comments:

ORIGINAL QUESTION FROM 2017 NRC EXAM

7. 027AK2.03 Pressurizer Pressure Control System Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and positioners

Given the following conditions:

- Unit 1 is at 100% power
- PIC-1110X, Pressurizer Pressure Controller is selected
- Pressurizer pressure is being maintained at 2250 psia with Pressurizer Backup Heaters B1, B2 and B5 ON with a 10% output to the Pressurizer Proportional Heaters

Subsequently:

- PIC-1110X, Pressurizer Pressure controller OUTPUT slowly drifts HIGH due to a PT-1110X malfunction

Which ONE of the following describes the response of the OUTPUT on HIC-1100, Main Spray controller AND the effect on ACTUAL Pressurizer pressure?

HIC-1100, Main Spray Controller OUTPUT ____(1)____.

ACTUAL Pressurizer pressure ____(2)____.

A.	(1)	RISES
	(2)	RISES
B.	(1)	RISES
	(2)	LOWERS
C.	(1)	LOWERS
	(2)	LOWERS
D.	(1)	LOWERS
	(2)	RISES

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: See analysis B. Part 2 incorrect: Plausible because the applicant may have the misconception that has output of the controller drifts high; it may maintain heaters on therefore actual pressurizer pressure will be rising.
B.	Correct:	Part 1 correct: As PIC-1110X drifts high, HIC-1100 output increases (proportional heater output goes to minimum and sprays eventually begin to open). Part 2 correct: Because sprays open, actual pressure lowers.
C.	Incorrect:	Part 1 incorrect: Plausible because the applicant may have the misconception that has output of the controller drifts high; it may send an inverse signal to HIC-1100 which would result in the controller output lowering. This is plausible due to other plant controllers being inversely proportional to demanded valve position (e.g., Shutdown Cooling FCV-3306 and Letdown TIC-2223). Part 2 correct: See analysis B.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 incorrect: See analysis A. This is plausible due to other plant controllers being inversely proportional to demanded valve position (e.g., Shutdown Cooling FCV-3306 and Letdown TIC-2223).

Question Number: 7

Tier: 1 Group: 1

K/A: 027AK2.03 Pressurizer Pressure Control System Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and positioners

Importance Rating: 2.6 2.8

10 CFR Part 55: (CFR 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how the PPCS system responds to a controller malfunction.

Technical Reference: PSL OPS 0711206

Proposed references to be provided: None

Learning Objective: PSL OPS 0702206-18

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: Bank question from the 2011 NRC Exam for the 2017 NRC RO Exam

Comments:

9.

029 EK2.08 ATWS / Knowledge of the interrelations between the and the following an ATWS: Breakers, relays, and disconnects

Which ONE of the following completes the statement below?

The Diverse Scram System (DSS) trips the reactor with a(n) ____(1)____ to actuate signal which OPENS the CEA Drive MG Set ____(2)____.

A.	(1)	energize
	(2)	Output Contactor
B.	(1)	energize
	(2)	Supply Breaker
C.	(1)	de-energize
	(2)	Output Contactor
D.	(1)	de-energize
	(2)	Supply Breaker

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: The DSS is an energize-to-actuate signal Part 2 correct: that opens a line contactor in series with each of the CEA MG set breakers on a 2/4 Hi-Hi pzr pressure of 2450 psia (FSAR).
B.	Incorrect:	Part 1 correct: See analysis A. Part 2 incorrect: When an ATWS exists EOP-01, actions direct opening the CEA Drive Set Supply Breakers to trip the Reactor.
C.	Incorrect:	Part 1 incorrect: But plausible, since this is an ESFAS feature and the majority of ESFAS actuations are de-energize to actuate with the only exceptions being (DSS, CSAS and RAS) Part 2 correct: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 9

Tier: 1 Group: 1

K/A: 029 EK2.08 ATWS / Knowledge of the interrelations between the and the following an ATWS: Breakers, relays, and disconnects

Importance Rating: 2.9 3.1

10 CFR Part 55: (CFR 41.5 / 41.10 / 45.6 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the interrelations between ATWS and MG set breakers

Technical Reference: 2-EOP-01, PSL OPS 0711405

Proposed references to be provided: None

Learning Objective: PSL OPS 0711405

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

- [Unit 2 MSIS logic has been modified to prevent spurious trips caused by pulling fuses while performing DC ground isolation. The power loss (125V DC) caused by pulling fuses, caused de-energization of the MSIS isolation relays on the opposite side S/G. These isolation relays are located externally to the ESFAS cabinets. A separately fused 125 VDC power supply in cabinets "SA and SB" prevents a recurrence.]

To warn the operator of a loss of 125 VDC power to these relays which would prevent MSIS/ESFAS on the opposite side S/G, a new relay (74-1) is wired into annunciators Q-47 (Q-49) [P-47 (P-49)], MSIV HCV-08-1A (HCV-08-1B) AIR PRESS LOW/DC FAILURE.

ATWS DIVERSE SCRAM SYSTEM (DSS)

Background

In July 1984, the Code of Federal Regulations (CFR) was amended to include requirements for improvements in the design and operation of nuclear power plants to reduce the likelihood of a failure to automatically trip the reactor following anticipated transients (10CFR50.62).

The combination of a RPS failure and an anticipated transient outside the existing design basis had to be re-analyzed by C.E. It was determined that a total loss of feed with a failure of the reactor to trip would result in RCS pressure well beyond the design service pressure of the pressure vessel (3200 psia).

For St. Lucie, the prevention of an ATWS takes the form of the DSS, the purpose of which is to independently trip the reactor diverse from the RPS. Mitigation of an ATWS is via turbine trip by reactor trip (using UV relays), and AFAS actuation. The combination of prevention and mitigation will limit peak RCS pressure to within acceptable limits.

Operation

- The DSS is an **energize-to-actuate** signal that opens a line contactor in series with each of the CEA MG set breakers on a 2/4 Hi-Hi pzr pressure of **2450 psia** (FSAR).

- To function during and after an operational basis earthquake.
- They are designed to be capable of tripping or inserting the CEAs after a design basis earthquake.
- They are designed to maintain the position of the CEAs in the core for pipe break accident loads.
- They are designed to be capable of inserting the CEA to the full in position from the full out position and transmitting all position indication signals for 15 minutes after a postulated loss-of-coolant accident (LOCA).
- The CEDM pressure housing is designed to be part of the RCS pressure boundary.
- For Unit 1 only, the CEDMs are designed to prevent the ejection of the control element assembly in the event of a split of the upper portion of the pressure housing above the operating mechanism.

DETAILED DESCRIPTION

Because of the significant differences between Unit 1 and Unit 2 CEA control systems, each unit will be covered separately in this text.

UNIT 1 CONTROL ELEMENT DRIVE SYSTEM (CEDS)

Power Train Component Description

The power train, as shown on Figure 1, consists of the CEDM motor generator (MG) sets, the reactor trip circuit breakers (TCBs), the coil power programmers (CPPs), and the CEDMs. The CEDM MG sets, 1A and 1B, are located on the 19.5 foot elevation of the Reactor Auxiliary Building (RAB) as shown on Figure 2. The MG sets are driven by 480VAC, 273 amp motors with 240VAC, 515 amp, 150KW, 100% capacity flywheeled generators. They are designed to ensure that adequate power is available to hold all CEAs, and sustain the motion of any CEA already being stepped, during a 1 second loss of power to the MG set's motor. The MG sets are powered from 480VAC vital load centers 1A2 and 1B2 respectively, and are controlled from separate local control panels.

Normally, both MG sets are running in parallel with the total reactive load balanced. The balance is made by fine adjust voltage rheostats on each MG set's voltage regulator. Under abnormal conditions, one MG set could provide all the load requirements of the CED bus. Refer to Figure 3. The line contactors in series with each MG set's output breaker is controlled by the Diverse Scram System (DSS). The DSS is a function of the Engineering Safeguards Features Actuation System (ESFAS) to provide redundant reactor trip capability in the case of an Anticipated Transient Without Scram (ATWS) and the resulting high RCS pressure. When actuated, the DSS will open these contactors to de-energize the CEA bus and allow CEA insertion in the core. The contactors and output breakers are interlocked such that the contactor must be shut before the output breaker can be closed. At no time are the two MG sets run in a series alignment with TCB 9 open.

The MG sets are started and stopped locally. They are placed in service by closing the output breaker on a dead CEA bus, or synchronizing the MG set to a live CEA bus. If the MG set requires synchronization, the output breaker and machine are protected from being placed in service out of phase by a Synch Check Supervisory Relay. The Synch Check Supervisory Relay allows the output breaker to be closed only when the phase angle of the running machine and incoming frequency fall within an acceptable window. Figure 3 shows the interconnections of the MG sets and how they connect to the CEDS.

Two annunciators indicate that the MG sets are not functioning properly. The 1A (1B) CEA DRIVE MG SET OVRLD/TRIP annunciator indicates that the 480 VAC load center breaker has tripped on overcurrent. The 1A (1B) CEA DRIVE MG SET LOCAL ALARM indicates that there is a high vibration on the MG set motor, generator or flywheel. It could also indicate that the respective MG set has tripped due to one of the following conditions:

a. Output overvoltage
b. Input undervoltage
c. High/Low field current
d. Output underfrequency

The TCBs are also located in the electrical equipment room as shown on Figure 2. They are controlled by the RPS and their operation is described in the RPS text. A power flow path must be established through the TCBs to operate the CEDS.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS

NOTE

- Section 4.0, Step 1 and Section 4.0, Step 2 are immediate actions and satisfy Reactivity Control.
- An ATWS may require entry into E-Plan categories SS2 or SA2.
- Steps designated with an * may be performed non-sequentially or are to be performed continuously.

☐ **1.** **VERIFY** reactor trip:

- Reactor power LOWERING
- Startup Rate NEGATIVE
- All CEAs are fully INSERTED
- **NO** dilution is in progress

1.1 **PERFORM** the following:

A. IF reactor trip breakers are CLOSED, THEN **INSERT** CEAs by any of the following methods:

- Manually **TRIP** the reactor.
- **DEENERGIZE** the CEDM MG sets by opening both of the following breakers:
  - LC 2A2, Bkr 2-40212, CEA Drive MG set 2A
  - LC 2B2, Bkr 2-40511, CEA Drive MG set 2B
- **OPEN** TCB-1 through TCB-8, at Rx Trip Swgr.

STEP 1 CONTINUED ON NEXT PAGE

10. 038EA1.36: Steam Generator Tube Rupture (SGTR), ability to operate and monitor the following as they apply to a SGTR—Cooldown of RCS to specified temperature.

Given the following conditions:

- Unit 1 has experienced a SGTR
- 1-EOP-04, SGTR, is in progress at step 10, INITIATE lowering RCS Temperature

Which ONE of following completes the statement below?

The RCS is cooled down to less than a ____(1)____ of ____(2)____ in accordance with 1-EOP-04, Step 10.

A.	(1)	Thot
	(2)	510 °F
B.	(1)	Thot
	(2)	500 °F
C.	(1)	Rep CET
	(2)	510 °F
D.	(1)	Rep CET
	(2)	500 °F

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1, Thot is the correct parameter per 1-EOP-04, SGTR Steps 10 and 17. The Basis of the 510 °F is to ensure sufficient subcooling exists to ensure the MSSVs don't inadvertently lift after the steam generator is isolated. The applicant may confuse the required subcooling utilizes Rep CET as is the case in most other conditions. Part 2 is correct.
B.	Incorrect:	Part 1, Thot is the correct parameter per 1-EOP-04, SGTR Steps 10 and 17. The Basis of the 510 °F is to ensure sufficient subcooling exists to ensure the MSSVs don't inadvertently lift after the steam generator is isolated. The applicant may confuse the required subcooling utilizes Rep CET as is the case in most other conditions. Part 2 is incorrect, but plausible since this is the Temperature which directs securing at least ONE RCP and initiating Emerg Boration in 1-EOP-01, SPTAs.
C.	Incorrect:	Part 1 is incorrect. Rep CET is the normal temperature used throughout the EOPs to determine the amount of subcooling we maintain. PSL also uses Rep CET when RCPs are OFF. The Basis of the 510 °F is to ensure sufficient subcooling exists to ensure the MSSVs don't inadvertently lift after the steam generator is isolated. The applicant may confuse the required subcooling utilizes Rep CET as is the case in most other conditions. Part 2 is correct, See A
D.	Incorrect:	Part 1 is incorrect. Rep CET is the normal temperature used throughout the EOPs to determine the amount of subcooling we maintain. PSL also uses Rep CET when RCPs are OFF. The Basis of the 510 °F is to ensure sufficient subcooling exists to ensure the MSSVs don't inadvertently lift after the steam generator is isolated. The applicant may confuse the required subcooling utilizes Rep CET as is the case in most other conditions. Part 2 is incorrect, See B

Question Number: 10

Tier: 1 Group: 1

K/A: 038EA1.36: Steam Generator Tube Rupture (SGTR), ability to operate and monitor the following as they apply to a SGTR—Cooldown of RCS to specified temperature.

Importance Rating: 4.3 4.5

10 CFR Part 55: (CFR 41.7 / 45.5 / 45.6)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know EOP actions for Cooldown of RCS to specified temperature

Technical Reference: 1-EOP-04, SGTR

Proposed references to be provided: None

Learning Objective: PSL OPS 0702825-6

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

CAUTION

Operation of the 1C AFW Pump should be avoided to minimize direct releases to the environment. If motor driven AFW pumps are **NOT** available, steam from the least affected S/G should be used.

☐ **10.** **INITIATE** lowering RCS T_{hot} to less than 510°F using SBCS.

10.1 IF SBCS is UNAVAILABLE, THEN **COOLDOWN** using ADVs from both S/Gs.

10.2 IF Instrument Air is UNAVAILABLE, THEN **OPERATE** ADVs locally per Appendix U, Local Operation of Unit 1 Atmospheric Dump Valves.

10.3 IF SBCS and ADVs are UNAVAILABLE, THEN **COOLDOWN** using 1C AFW Pump and alternate steaming flow paths on the unisolated S/G.

A. **REFER TO** Table 12, Alternate S/G Heat Removal Paths.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

* **38. CHECK** if single-phase natural circulation cooling is established:

A. VERIFY all RCPs STOPPED.

A.1 GO TO Section 4.0, Step 39.

B. VERIFY at least one loop meets all of the following conditions:

- Loop ΔT (T_{hot} minus T_{cold}) less than 50°F
- Hot leg temperature stable or lowering
- Cold leg temperature stable or lowering
- RCS subcooling is greater than or equal to minimum subcooling based on Rep CET temperature
- RCS T_{hot} and Rep CET temperature difference within 20°F

B.1 CONTROL S/G feeding and steaming to establish natural circulation.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

7. D. (continued)

RCS HEAT REMOVAL

3. IF T_{COLD} is approaching or less than 500°F, THEN **PERFORM** both of the following:

a. **ENSURE** at least one RCP is STOPPED.

b. **INITIATE** emergency boration to achieve adequate SDM.

NOTE

SBCS is designed to plateau at 940 psia for 4 minutes, then ramp to 900 psia over the next 5 minutes.

E. **VERIFY** S/G pressure is between 850 and 930 psia (835 and 915 psig).

E.1 **PERFORM** the following:

1. IF S/G pressure is less than 600 psia (585 psig), THEN **ENSURE** MSIS has ACTUATED.

STEP 7 CONTINUED ON NEXT PAGE

11. 055 G2.2.44 / Station Blackout / 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.

Given the following conditions:

- Unit 2 is at 100% power
- 2A EDG is out of service for CMM

Subsequently:

- LOOP occurs
- 2B EDG is running output breaker is OPEN
- The following annunciators are LIT
  - A-14, 4.16KV SWGR 2B3 Δ CURRENT TRIP
  - A-28, 480V LC 2B2 UV/UV TEST/GROUND
  - A-35, 480V LC 2B5 UV/UV TEST/GROUND
  - A-46, 4.16KV EMERG SWGR 2B3 UV/UV TEST

Which ONE of the following completes the statement below?

In accordance with ADM-11.16, Transient Procedure Use and Adherence and 2-EOP-01, SPTAs, the RO ____(1)____ attempt to CLOSE the 2B EDG output breaker.

IF 2B3 remains de-energized, the RO will establish RCS Heat Removal by operating ADVs in ____(2)____.

A.	(1)	will
	(2)	AUTO/MANUAL
B.	(1)	will
	(2)	MANUAL/MANUAL
C.	(1)	will NOT
	(2)	AUTO/MANUAL
D.	(1)	will NOT
	(2)	MANUAL/MANUAL

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 Incorrect: Plausible since 2-EOP-01 MVA Contingency action directs the closure of the EDG output breaker to restore power to the energized bus, this is also supported by ADM-11.16 to perform after the immediate actions are taken. Ops-106 standard phrase description also has the operator to evaluate the status of the bus lockout prior to energizing the bus from the EDG. The applicant must correctly interpret the meaning of Annunciator A-14. If they do not, per EOP guidance they will attempt a breaker closure. Part 2 Incorrect: See Analysis "C"
B.	Incorrect:	Part 1 Incorrect: See Analysis "A" Part 2 Correct: See Analysis "D"
C.	Incorrect:	Part 1 Correct: See Analysis "D" Part 2 Incorrect: Incorrect but plausible. Auto/Auto is the normal configuration for operation of the ADVs. Ops-106 provides standard phrases for operating ADVs which ONLY discuss Auto/Auto and Auto/Manual operation. Manual/Manual is not discussed. On a loss of power, the applicant may have the misconception they will operate the ADVs with the controller in manual. The ADV motor field winding are energized by DC which is still available.. DC power to the motor armature is supplied from either: the same DC panels as the field winding when operating in the **MAN-MAN** mode, or the modutronic unit in **AUTO-MAN** or AUTO-AUTO modes. The modutronic units which convert AC to DC for operation in automatic or with the controller receive power from 120 VAC panels PP-201A (Train A) and PP-202 (Train B) for the Train A and Train B ADVs respectively. The applicant may have the misconception that operating the "ADV controller" in manual will align the available DC power to the DC field.
D.	Correct:	Part 1 Correct: 2-EOP-01 MVA Contingency action directs the closure of the EDG output breaker to restore power to the energized bus, this is also supported by ADM-11.16 to perform after the immediate actions are taken. Per 2-AOP-47.01B. Annunciator A-14, 4.16KV SWGR 2B3 Δ CURRENT TRIP is indicative of a bus fault and an bus lockout being tripped. The applicant must recognize this condition in the stem and make the determination that they will NOT attempt to energize a faulted bus with the running EDG. The ARP for A-14 directs the operator to 2-AOP-47.01B. This is supported by 2-AOP-47.01B which directs the operator to contact Electrical to investigate prior to making any attempt to energize the bus. Part 2 Correct: The ADV motor field windings are always energized by DC. When the switch selector is in manual/manual, DC is aligned with will allow control of the ADVs bypassing the controller. The switch much be in this position for ADV operation with AC busses de-energized. The modutronic units which convert AC to DC for operation in automatic or with the controller receive power from 120 VAC panels PP-201A (Train A) and PP-202 (Train B) for the Train A and Train B ADVs respectively. The modutronic unit converts the AC power to DC power for the MOV armature with an output based on the signal from the PIC. The PIC receives power from the same AC source as the modutronic unit.

Question Number: 11

Tier: 1 Group: 1

K/A: 055 G2.2.44 / Station Blackout / 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.

Importance Rating: 4.2 4.4

10 CFR Part 55: (CFR 41.5 / 43.5 / 45.12)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required interpret CR indications to verify status during a SBO.

Technical Reference: ADM-11.16, OPS-106, 2-ARP-01-A00, 2-EOP-01

Proposed references to be provided: None

Learning Objective: PSL OPS 0711304-14

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

Modes of Operation

The ADVs can be operated in either automatic or manual. As shown in Figure 9, the mode of operation is determined by the position of the ADV AUTO/MAN selector switches, PICs and CLOSE/OPEN control switches located on RTGB-202, PACB and the HSCP. The modes of control are MAN-MAN, AUTO-MAN, and AUTO-AUTO.

When operating an ADV electrically:

- The field winding of the DC motor is always supplied by Safety-Related 125 VDC. The valve cannot be operated electrically if DC power to the field is lost.
  - PP-254 (Train A) supplies the Train A ADVs (MV-08-18A/B).
  - PP-255 (Train B) supplies the Train B ADVs (MV-08-19A/B).
- DC power to the motor armature is supplied from either:
  - the same DC panels as the field winding when operating in the MAN-MAN mode, or
  - the modutronic unit in AUTO-MAN or AUTO-AUTO modes.
  - The modutronic units receive power from 120 VAC panels PP-201A (Train A) and PP-202 (Train B) for the Train A and Train B ADVs respectively. The modutronic unit converts the AC power to DC power for the MOV armature with an output based on the signal from the PIC. The PIC receives power from the same AC source as the modutronic unit.

The power supplies to the Unit 2 atmospheric dump and isolation valve motors are arranged such that loss of any single bus will not prevent any of the ADVs from either being closed or isolated. That is, if a Train A powered ADV cannot be closed, the Train B powered isolation valve can still be closed; and, if a Train B powered isolation valve cannot be closed, the Train A powered ADV can be closed. Likewise, this power scheme ensures at least one flow path should be available for steaming the S/G.

The following table provides an overview of the control modes.

MODE	SELECTOR SWITCH	PIC CONTROLLER	ARMATURE POWER SOURCE
MAN-MAN	MAN	N/A	D.C.
AUTO-MAN	AUTO	Manual	A.C.→D.C.
AUTO-AUTO	AUTO	Auto	A.C.→D.C.

MAN-MAN Mode – With the AUTO/MAN selector switch in MAN (manual), the respective ADV's position is determined by its CLOSE/OPEN switch.

- For example, at RTGB-202 with the SG 2A ADV AUTO/MAN selector switch in MAN and the SG 2A ADV CLOSE/OPEN switch positioned to OPEN, MV-08-18A strokes open while the control switch is held in the OPEN position. Refer to Figure 9.

- During operation above 15% power, the ADVs are maintained in the MAN-MAN (manual) mode to meet Technical Specification requirements.

AUTO-MAN and AUTO-AUTO Modes – With the AUTO/MAN selector switch in AUTO, ADV position is controlled from the respective PIC that sends an electrical signal to the modutronic unit (see Figure 9). A rheostat monitoring ADV position provides a feedback signal that stops valve movement when actual position matches desired position based on the input signal to the modutronic unit. Normally the PICs are maintained in manual control with the automatic actuation pressure setpoint at 900 psia.

AUTO-MAN Mode – With the PIC set to manual operation, the ADV can be positioned by pushing the up-arrow or down-arrow pushbuttons on the PIC.

AUTO-AUTO Mode - With the PIC in the automatic mode, valve control is based on the setpoint on the PIC. For example, as S/G pressure increases above setpoint, the controller output increases to the modutronic unit, which in turn repositions the ADV to open it more, limiting S/G pressure.

On the PACB in the Unit 2 Control Room, controls are provided for MV-08-19A for S/G 2A and MV-08-18B for S/G 2B, as illustrated on Figure 8. Control is functionally the same as at RTGB-202, except the power supply trains are reversed.

If DC power is lost to the ADV, the valve cannot be repositioned electrically in any mode of control due to loss of power to the DC motor field.

Response of an ADV following restoration of electrical power (e.g., EDG loading following a LOOP) is determined by the mode of control.

If DC power is lost and then regained while in the MAN-MAN mode, the valve will not move because there is no signal being generated to move it.

If AC power is lost to the modutronic unit and ADV controller and then regained while in the AUTO-MAN mode, the ADV will remain at the current valve position. The controller output is restored to its previous value, which is the input to the modutronic unit. Since the ADV fails as-is, the feedback signal from the rheostat should still match the demand position.

Note that if the ADV controller fails to zero with AC power still available to the modutronic unit, the ADV will close (if open) to match the input signal.

If AC power is lost to the modutronic unit and/or ADV controller and then regained while in the AUTO-AUTO mode, the ADV will go to the position dictated by the pressure setpoint on the PIC.

The pressure indicating bar on the controller (red bar) is one way to determine if AC power is lost to the ADV controller (i.e., the red bar fails low).

As actual pressure deviates from setpoint, the valve will open or close to control S/G pressure at the setpoint.

[On Unit 2, Technical Specifications require all ADVs to be in Manual when above 15% power. (This is the MAN-MAN Mode.) Manual operation ensures the ADVs will be closed in the event of a steam line break, thus limiting the blowdown rate of the S/G. Below 15% and above 5% power, only one ADV may be in AUTO.]

3. Standard Phrases (continued)

H. ADVs

Individual's Name place ADVs in auto/auto with a setpoint of 900#.

Individual's Name make T-hot less than 510° F using ADVs not to exceed 100° F in one hour.

Expected Action:

Fully open one ADV in each S/G in auto/manual until both T-hots are <510° F, then report to US and request a new temperature band.

Individual's Name restore subcooling using ADVs not to exceed 100° F in one hour.

Expected Action:

For Unit 1, open the ADV on each Steam Generator to 50% open.

For Unit 2, Fully open one ADV in each S/G in auto/manual to initiate cooldown.

Individual's Name: Commence a cooldown not to exceed X° F in one hour using ADVs in auto/manual.

Expected Action:

Open ADVs in auto/manual until desired cooldown rate is established. Calculate cooldown rate every 6 minutes and report out every 12 minutes to Unit Supervisor. Do not exceed 100° F in one hour.

Individual's Name after Steam Generator dry-out, stabilize to the lowest T-cold using the Alpha ADVs.

Expected Action:

When S/G dryout is indicated by RCS temperature or pressure beginning to rise with S/G empty, place one of the non-affected S/Gs ADVs in auto/manual, fully open then place in auto/auto at the pressure corresponding to the lowest Tcold observed. Repeat this process for the second ADV in the un-affected S/G. 2nd operator or STA will verify ADVs set at correct setpoint using steam tables.

3. Standard Phrases (continued)

I. De-energized Bus

Individual's Name attempt one closure the 2 Alpha EDG breaker.

Expected Action:

Review annunciators to ensure no lockout exists on the 2A3 4160 volt bus. Verbalize this to the Unit Supervisor, then using the Synch switch, close the 2A EDG output breaker and return the synch switch back to off. Do not attempt to re-close an EDG output breaker that has TRIPPED open unless the health and safety of the public is at immediate risk without performing an inspection locally.

J. Restore CCW to the RCPs

Individual's Name perform Appendix Juliet.

K. Isolate a Steam Generator

Individual's Name perform Appendix Romeo to isolate the Alpha S/G.

L. Throttle HPSI

Individual's Name perform Appendix Sierra.

M. Multiple Alarms

"Multiple alarms" is a condition which occurs when more than one alarm is received at the same time. This signifies that an "event" has occurred vice an isolated annunciator condition. Some judgment is required as to when this response is utilized. Two or more alarms that occur on RTGB panels simultaneously may indicate that an "Event" has occurred vice an isolated action. The intent of the "multiple alarm" response is to quickly ascertain the status of the secondary and the primary to determine if they are stable or degrading.

Expected Action:

The Unit Supervisor will call out "multiple alarms".

The DRCO will perform a walkdown of the secondary parameters listed below to ascertain if the secondary is stable. The report will either be, "The secondary is stable" or if one of the secondary monitored parameters is not stable, the report will be that the "The secondary is not stable" followed by the Parameter, Value, Rate, and Trend (PVRT) for the parameter which is degrading e.g. "The secondary is not stable, 2B S/G level is 55% and lowering rapidly".

12. 056 G2.4.21 / LOOP / 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.

Given the following conditions:

- Unit 2 has experienced a LOOP
- 2-EOP-01, SPTAs is complete
- 2-EOP-09, LOFC/LOOP is in progress
- Pressurizer Pressure is 1825 psia
- Pressurizer Level is 40%
- Thot is 561 °F
- Tcold is 507 °F
- REP CET is 563 °F
- S/G A is 18% and RISING
- S/G B is 19% and slowly LOWERING

Which ONE of the following Safety Functions in 2-EOP-09, is NOT being met?

REFERENCE PROVIDED

A.	RCS Inventory Control
B.	RCS Pressure Control
C.	Core Heat Removal
D.	RCS Heat Removal

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	RCS Inventory control is being met: A. Pressurizer Level Between 10 and 68% AND B. RCS Subcooling Greater than or equal to minimum subcooling (Using Rep CET)
B.	Incorrect:	RCS Pressure control is being met within the limits of Fig 1A
C.	Correct:	Core Heat Removal is NOT being met: Condition 1 A. RCPs All are STOPPED AND B. RCS Loop Delta T Less than 50°F AND C. RCS Subcooling Greater than or equal to minimum subcooling (Using Rep CET)
D.	Incorrect:	RCS Heat Removal is being met: A. Steam Generator Level Level in at least one S/G is between 60 and 70% NR OR Feedwater is restoring level in at least one S/G to between 60 and 70% NR AND B. RCS Tcold Stable or lowering

Question Number: 12

Tier: 1 Group: 1

K/A: 056 G2.4.21 / LOOP / 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.

Importance Rating: 4.0 4.6

10 CFR Part 55: (CFR 41.7 / 43.5 / 45.12)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the status of the Safety Function for a LOOP

Technical Reference: 2-EOP-09, LOOP/LOFC

Proposed references to be provided: REDACTED FIG 1A/1B

Learning Objective: PSL OPS 0702835-15

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

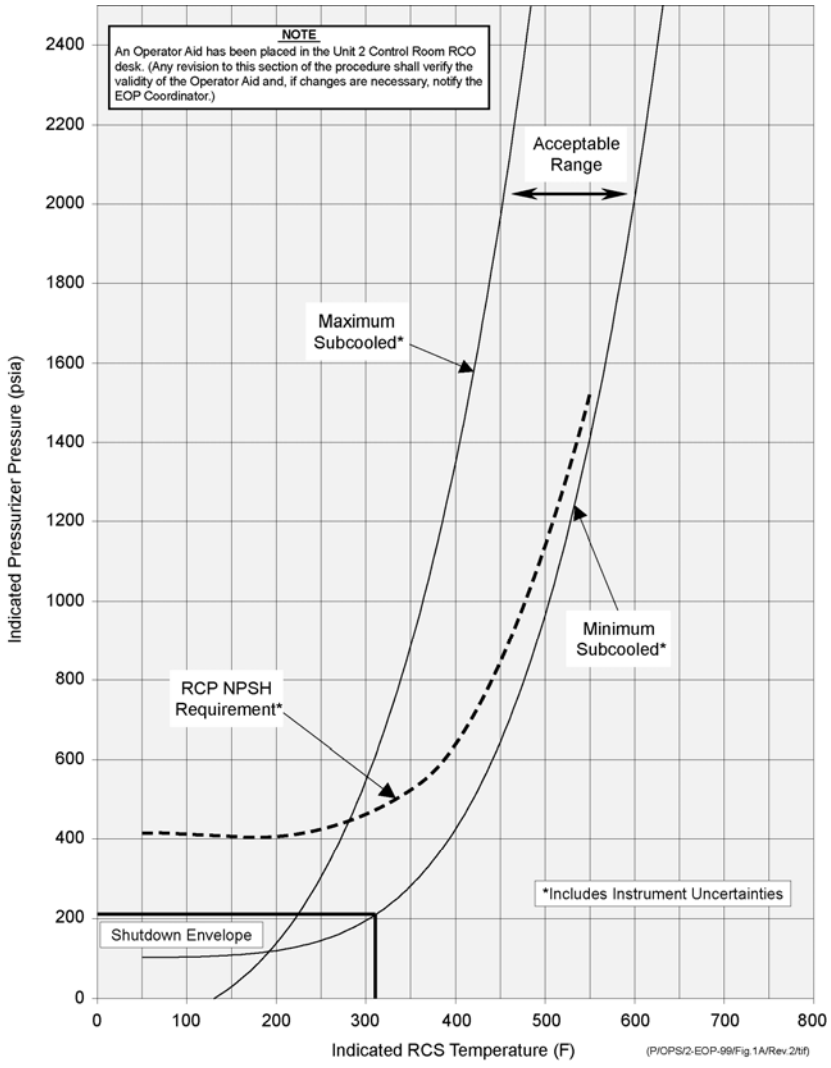
Question History: NEW question for the 2019 NRC Exam

Comments:

FIGURE 1A
RCS PRESSURE TEMPERATURE
(Page 1 of 1)

[redacted]

CAUTION
The RCP NPSH curve assumes one pump is operating in each loop. RCP instrumentation should be monitored for seal and pump performance in accordance with 2-EOP-99, Table 13.

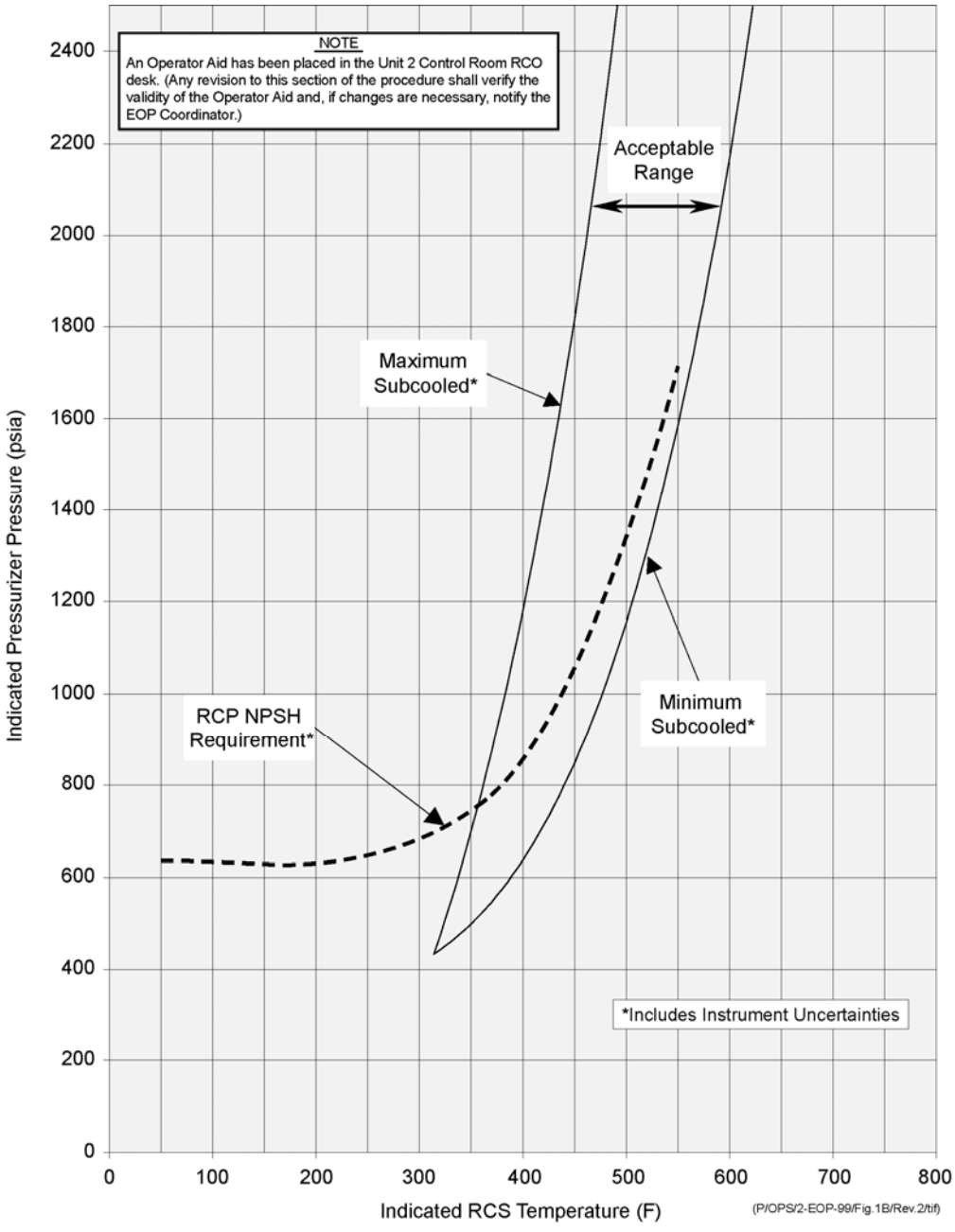


RCS Pressure Range	Required QSPDS Subcooled Margin Reading (Rep CET)
2250 psia to 1000 psia	40 to 180°F
1000 psia to 500 psia	50 to 170°F
Less than 500 psia	80 to 160°F

FIGURE 1B
RCS PRESSURE TEMPERATURE
(Page 1 of 1)

[redacted]

CAUTION
The RCP NPSH curve assumes one pump is operating in each loop. RCP instrumentation should be monitored for seal and pump performance in accordance with 2-EOP-99, Table 13.



ATTACHMENT 1
Safety Function Status Check Sheet
(Page 3 of 7)

3. RCS INVENTORY CONTROL

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A. Pressurizer Level	Between 10 and 68%	
		AND
B. RCS Subcooling	Greater than or equal to minimum subcooling (Using Rep CET)	
		AND
C. Reactor Vessel Level	Greater than hot leg nozzles (sensors 4 through 8 covered, if available)	
		OR
	Less than 20°F difference between T_{hot} and Rep CET temperature	

END OF SAFETY FUNCTION 3

ATTACHMENT 1
Safety Function Status Check Sheet
(Page 4 of 7)

4. RCS PRESSURE CONTROL

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A. Pressurizer Pressure	Within the limits of Figure 1A, RCS Pressure Temperature	

END OF SAFETY FUNCTION 4

ATTACHMENT 1
Safety Function Status Check Sheet
(Page 5 of 7)

5. CORE HEAT REMOVAL

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
Either Condition 1 or Condition 2 will satisfy this safety function.		
Condition 1		
A. RCPs	All are STOPPED	
		AND
B. RCS Loop ΔT	Less than 50°F	
		AND
C. RCS Subcooling	Greater than or equal to minimum subcooling (Using Rep CET)	
	OR	
Condition 2		
A. RCPs	Any OPERATING	
		AND
B. RCS Loop ΔT	Less than 10°F	
		AND
C. RCS Subcooling	Greater than or equal to minimum subcooling (Using RCS T_{hot})	

END OF SAFETY FUNCTION 5

ATTACHMENT 1
Safety Function Status Check Sheet
(Page 6 of 7)

6. RCS HEAT REMOVAL

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A. Steam Generator Level	Level in at least one S/G is between 60 and 70% NR	
	OR	
	Feedwater is restoring level in at least one S/G to between 60 and 70% NR	
	AND	
B. RCS T_{cold}	Stable or lowering	

END OF SAFETY FUNCTION 6

13.

057 AA2.17 / Loss of Vital AC Bus / Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: System and component status, using local or remote controls

Given the following conditions:

- Unit 2 is at 100% power

Subsequently:

- Annunciator, B-43, 120V AC INVTR 2A INSTR BUS 2MA/ 2MA-1 TROUBLE ALARMS
- The BRCO reports ALL lights on RPS channel “A” are OFF
- 2-AOP-49.02, 120V Instrument AC System has been entered

Which ONE of the following completes the statements below?

____(1)____ Trip Circuit Breakers will OPEN.

In accordance with 2-AOP-49.02, the 2A Instrument bus will be re-energized from the Isolimiter operating components ____(2)____ .

A.	(1)	TWO
	(2)	on the Instrument (Static) Inverter
B.	(1)	TWO
	(2)	at the Maintenance Bypass Bus Cabinet
C.	(1)	FOUR
	(2)	on the Instrument (Static) Inverter
D.	(1)	FOUR
	(2)	at the Maintenance Bypass Bus Cabinet

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: It plausible to think a single channel failure will result in only the B channel TCBs to open. Part 2 correct: See analysis C.
B.	Incorrect:	Part 1 incorrect: It plausible to think a single channel failure will result in only the B channel TCBs to open. Part 2 incorrect: This would be correct when restoring on Unit 1, IAW 1-AOP-49.02, Att 3. 1. VERIFY proper voltage (118-124 VAC) and frequency (60HZ ±1%) is being supplied to the bypass bus at the 1A Maintenance Bypass Bus cabinet; 3. PLACE CKT 13, FEED TO INSTRUMENT BUS 1MA, in ON at the 1A Maintenance Bypass Bus.
C.	Correct:	Part 1 correct: 4 TCBs open due to loss of power to 1 K relay. Part 2 correct: IAW 2-AOP-49.02, Att 3. 1.0 PLACING THE 2MA INSTRUMENT BUS ON THE ISOLIMITER 1. VERIFY 2-41207, ISOLIMITER 2A, is CLOSED at MCC 2A5. 2. IF the 2MA bus is deenergized, THEN PLACE the MANUAL BYPASS SWITCH in BYPASS TO LOAD position on STATIC INVERTER - 2A Panel.
D.	Incorrect:	Part 1 correct: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 13

Tier: 1 Group: 1

K/A: 057 AA2.17 / Loss of Vital AC Bus / Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: System and component status, using local or remote controls

Importance Rating: 3.1 3.4

10 CFR Part 55: (CFR 43.5 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to determine the system status and use local controls to restore

Technical Reference: 2-AOP-49.02

Proposed references to be provided: None

Learning Objective: PSL OPS 0702404-3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

TRIP PATHS

The four trip channels, A, B, C, and D and their associated trip unit relays are arranged to provide a 2-out-of-4 coincidence logic. The relay contacts are distributed among six logic matrix ladders designated as AB, AC, AD, BC, BD, and CD representing all possible 2-out-of-4 trip combinations. Each logic ladder supplies power to four matrix relays. Refer to Figures 17 and 18.

Recall that each trip unit has five relays: two alarm relays (trip and pretrip); and three trip relays that operate the contacts in the logic matrices. Each trip relay operates two contacts in its associated logic ladder: one to maintain the matrix relays energized (normal contact) and one to provide trip indication (trip contact). When the trip relay is energized, the "normal contact" is closed and the "trip contact" is open. When the trip relay de-energizes, the "normal contact" opens and the "trip contact" closes. The "trip contact" aligns power to the small red lights on the front of the trip units. The contacts depicted in Figures 17 and 18 are operated by the trip relays. For normal (energized) operation (Figure 17), current (depicted by arrows) flows from the power supplies, down the outside of the "ladder", up through matrix relays AB1, AB2, AB3, and AB4, through closed contacts A10-1 to A1-1 and B10-1 to B1-1, and finally to the positive terminals of the power supplies.

A TM/LP trip occurring in channels A and B will prevent current from flowing through the matrix relays. As shown on Figure 18, an open circuit will exist at contacts A7-1 and B7-1. The only current flow is through the "trip contacts" and trip indicator lights. The matrix relays de-energize and four trip path ‘K’ relays will de-energize causing the ‘K’ contacts in the TCB circuits to open. Subsequently, all TCBs open and all CEAs insert. The red "trip relay contact" lights indicate which channels and trip unit(s) have operated contacts in the logic matrix.

If only one channel trips, a current flowpath still exists and a reactor trip does not occur. Also, if a TM/LP trip occurs in channel A (A7-1), and an LPD trip occurs in channel B (B10-1), again a reactor trip does not occur. Two-out-of-four of the **same** NSSS trip unit must trip for a logic ladder circuit to be fully interrupted. Each logic matrix contains four matrix relays, all of which de-energize when the associated logic ladder is fully interrupted. If the associated matrix ladder is not fully interrupted, none of the logic matrix relays de-energize.

Each matrix has two 28 VDC power supplies, each powered from a different instrument bus. Failure of one matrix power supply only de-energizes two of the four matrix relays (e.g.,

failure of PS5 de-energizes logic relays AB1 and AB2, but not AB3 or AB4). It will be seen later that this causes four trip circuit breakers to open, however no CEDMs are de-energized.

- Failure of one of the two DC power supplies for a given logic matrix does not result in a reactor trip.

- The failure of one 120 VAC instrument bus also will not cause a trip. Each instrument bus only supplies the left or right side of the matrix in the ladders. It takes the loss of both sides to trip.

Each one of the four logic matrix relays supplied through a given logic ladder operates a single contact in one of the four trip paths. Each trip path consists of six contacts, representing each logic ladder, all in series with a TCB control ('K') relay and its 120 VAC instrument bus power supply. The 'K' relays are designated K1, K2, K3, and K4 according to trip path.

Each 'K' relay operates two pairs of contacts: one pair associated with two parallel undervoltage (UV) trip coils; the other pair, with two parallel shunt trip (ST) coils. The set of contacts are designated: K1, K2, K3, K4 according to which 'K' relay operates them. Each trip path and 'K' relay is associated with two parallel TCBs.

- Each TCB can be tripped by de-energizing its associated UV coil, or by energizing its associated ST coil.

The four coils (2 UV and 2 ST) associated with a given trip path are all connected in parallel supplied by a common safety-related 125 VDC source. The four panels (MA, MB, MC, MD) are powered from the two 125 VDC buses as follows:

- A Train: MA and MC
- B Train: MB and MD

- De-energizing any one 'K' relay causes its associated UV coils to de-energize and ST coils to energize. The associated TCBs trip open.

- De-energizing any one set of four logic matrix relays opens contacts in all four trip paths resulting in a full reactor trip.

Each TCB has an undervoltage coil and a shunt trip coil. When a Reactor Trip condition is reached the undervoltage coil de-energizes and trips the breaker open. At the same time,

the shunt trip coil energizes and trips the breaker open. This provides redundant trip actuation.

To summarize, assume a TM/LP trip has been received in channels A and B. Contacts operated by logic matrix relays AB1, AB2, AB3, and AB4 open in trip paths 1 through 4. This in turn de-energizes K1, K2, K3, and K4. This action de-energizes the UV relays and energizes the ST relays, thereby opening the TCBs by two redundant methods. Power is then lost to all CEDM power supplies, and their associated CEDMs drop to the bottom of the core.

The RPS is designed with redundancy so that a single failure does not cause a spurious trip nor does it prevent a valid trip. For example, if one matrix relay fails, a trip does not occur; likewise one relay can be tested without causing a trip. Failure of a K relay does not cause a trip. If a K relay remains energized after a trip condition arises, this failure alone does not prevent a trip.

RPS CALCULATORS

Core Protection Calculators 1 and 2 (CPC-1 and CPC-2)

- CPC-1 is often referred to as the TM/LP trip calculator.
- CPC-2 is often referred to as the LPD and VHP trip and calculator.

The following process variables are input into the two calculators:

- Nuclear Linear Safety power from both upper and lower excore detectors
- Average T_{HOT} (one T_{HOT} per loop)
- 2 T_{COLDs} from diametrically opposed loops (max is selected in CPCs')
- 2 Steam generator pressures (one from each S/G)
- Pzr pressure

Using these variables, the CPCs develop the:

- Variable High power pretrip & trip setpoints (CP-2)
- LPD pretrip & trip contacts (CP-2)
- TM/LP pretrip & trip setpoints (CP-1)
- ΔT pwr calculation (CP-1)
- Q pwr input to Hi power trip, and PRC (CP-1)
- ASGT input for TM/LP (CP-2)
- RTGB 104[204] indications for Qpwr, Qtrip, ASI (Y),+Y, & -Y (CP-2)
- Tcold max (CP-1)

ATTACHMENT 3
Placing an Instrument Bus on its Isolimiter
(Page 2 of 4)

2.0 PLACING THE 2MB INSTRUMENT BUS ON THE ISOLIMITER

1. **VERIFY** 2-42050, ISOLIMITER 2B, is ON at MCC 2B5.

2. IF the 2MB bus is deenergized, THEN **PLACE** the MANUAL/BYPASS SWITCH in BYPASS TO LOAD.

3. **VERIFY** A-43, 120V AC INVTR 2B/INSTR BUS 2MB/2MB-1 TROUBLE, undervoltage and ground alarms are clear.

4. IF conditions exist that require shutdown of the inverter, THEN **PERFORM** the following:

A. **VERIFY** the other three instrument buses are energized.

B. **PRESS** BYPASS SOURCE TO LOAD pushbutton

C. **PLACE** B-2, INVERTER OUTPUT , in OFF on Static Inverter 2B.

D. **PLACE** B-1, 125V DC INPUT, in OFF on Static Inverter 2B.

E. **ENSURE** B-4, BYPASS SOURCE AC INPUT , is ON at Static Inverter 2B.

F. **PLACE** MANUAL/BYPASS SWITCH to BYPASS TO LOAD position on Static Inverter 2B.

5. **NOTIFY** the Control Room that 2MB Instrument Bus is now being supplied by its Maintenance Bypass Bus.

6. IF in MODES 1-4, THEN **RE-ENERGIZE** the Instrument Bus from its associated Inverter within 24 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. (Section 6.2, Commitment 1)

ATTACHMENT 3
Placing an Instrument Bus on the Maintenance Bypass Bus
(Page 1 of 8)

NOTE

Maintenance bypass buses should remain energized at all times except during maintenance of bus isolimiters.

CAUTION

This attachment is to be used for a loss of instrument bus only. These instructions are **NOT** to be used for normal removal or restoration of inverters. Incorrect execution of this attachment can result in the inadvertent actuation of safeguards equipment as well as a plant trip.

1.0 PLACING THE 1MA INSTRUMENT BUS ON THE MAINTENANCE BYPASS BUS

1. **VERIFY** proper voltage (118-124 VAC) and frequency (60HZ ±1%) is being supplied to the bypass bus at the 1A Maintenance Bypass Bus cabinet;

   A. IF proper voltage and frequency are **NOT** being supplied, THEN **ENSURE** 1-41207, ISOLIMITER 1A, is in the ON position at MCC 1A5.

2. **VERIFY** SS/1009-2, TRANSFER SWITCH 1MC, is positioned to INVERTER 1C at the Instrument Bus Transfer Panel 1A.

NOTE

1MA and 1MC instrument buses share a common maintenance bypass bus (1A). Feeder breakers for each set of instrument buses are mechanically interlocked so that only one instrument bus can be supplied by the maintenance bypass bus at any one time.

3. **PLACE** CKT 13, FEED TO INSTRUMENT BUS 1MA, in ON at the 1A Maintenance Bypass Bus.

4. **VERIFY** that L/1009-2, MAINT BYPASS BUS 1A FEED, is ON inside the Instrument Bus Transfer Panel 1A.

CAUSES: Any of below setpoints reached or exceeded.

120V AC INVTR 2A INSTR BUS 2MA/2MA-1 TROUBLE

R **B-43**

DEVICE:	SETPOINT:	LOCATION:
RA-RAB-16/B-43/1009	Any of the following:	RAB/47/N-RA2/W-RAJ
M1-1, Low DC Volts	108 Volts	2A Inverter
M1-2, High DC Volts	138.5 Volts	2A Inverter
M1-3, Low AC Volts	117.6 Volts	2A Inverter
M1-4, High AC Volts	124.4 Volts	2A Inverter
M1-5, Out of Frequency	<59.4 or > 60.6 Hz	2A Inverter
M1-6, 27MA/1009	Undervoltage - Instrument Bus < 90 volts	2MA Instrument Bus
M1-6, 27MA/1809	Undervoltage - Instrument Bus < 90 volts	2MA-1 Instrument Bus
M1-7, 64LA2/1009	Ground	2MA Instrument Bus
M1-7, 64LA1/1809	Ground	2MA-1 Instrument Bus
M1-8, 64LA1/1009	Ground	2MA Instrument Bus
M1-8, 64LA2/1809	Ground	2MA-1 Instrument Bus

ALARM CONFIRMATION

1. Local indication on reflash panels and inverters

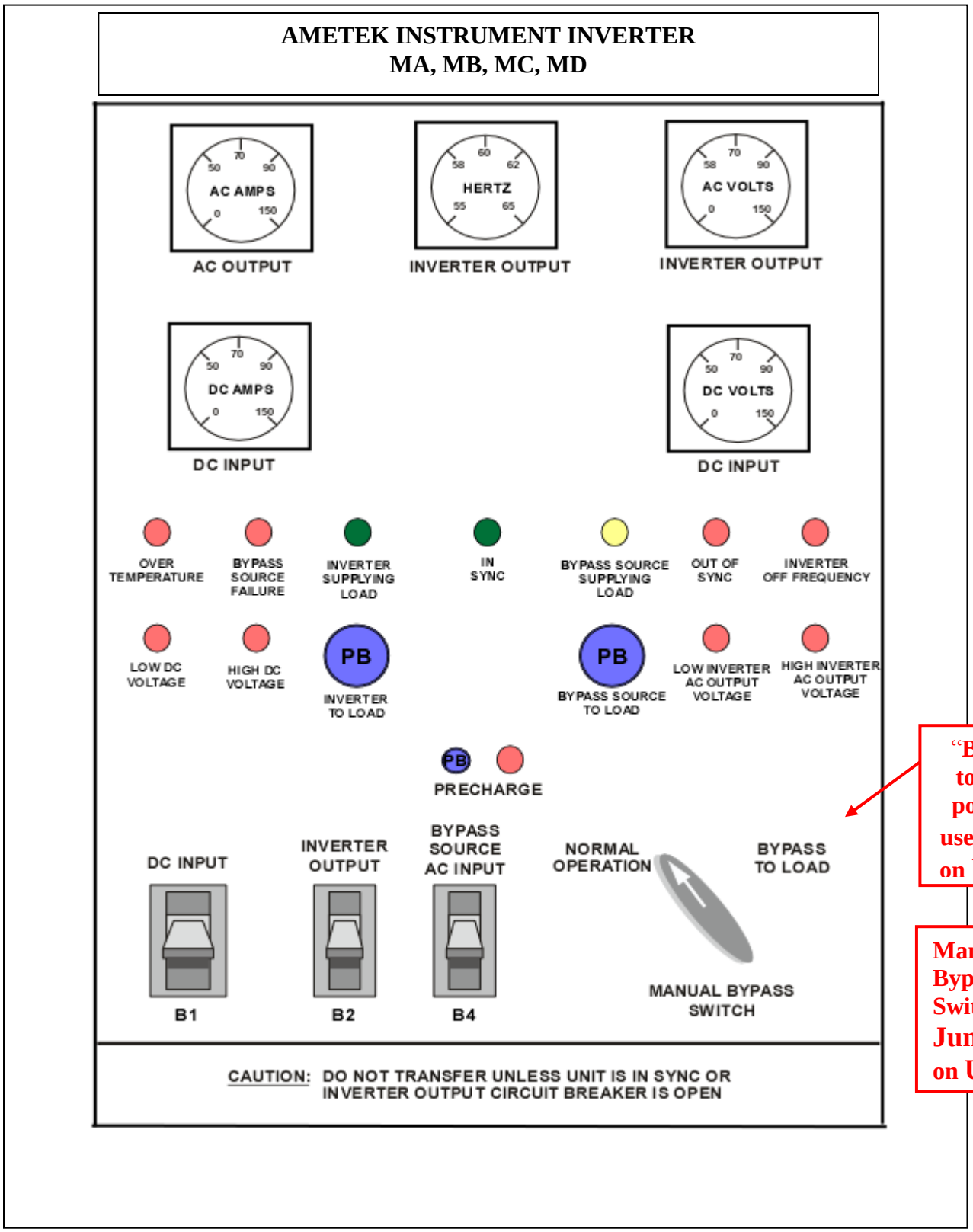
OPERATOR ACTIONS

NOTE

If this annunciator reflashes (alarms) with the inverter off-line, alarm is likely due to Instrument Bus Undervoltage.

1. **CHECK** Reflash Panel for alarming condition.
2. **IMPLEMENT** 2-AOP-49.02, 120V Instrument AC System (Class1E).
3. **REVIEW** Technical Specifications for any required actions.

REFERENCES: 1. CWD 2998-B-327 sheet 1009 ,1809



"Bypass to Load" position used only on Unit 2

Manual Bypass Switch Jumpered on Unit 1

FIGURE 13

TYPICAL UNIT 1 120 VAC INSTRUMENT POWER

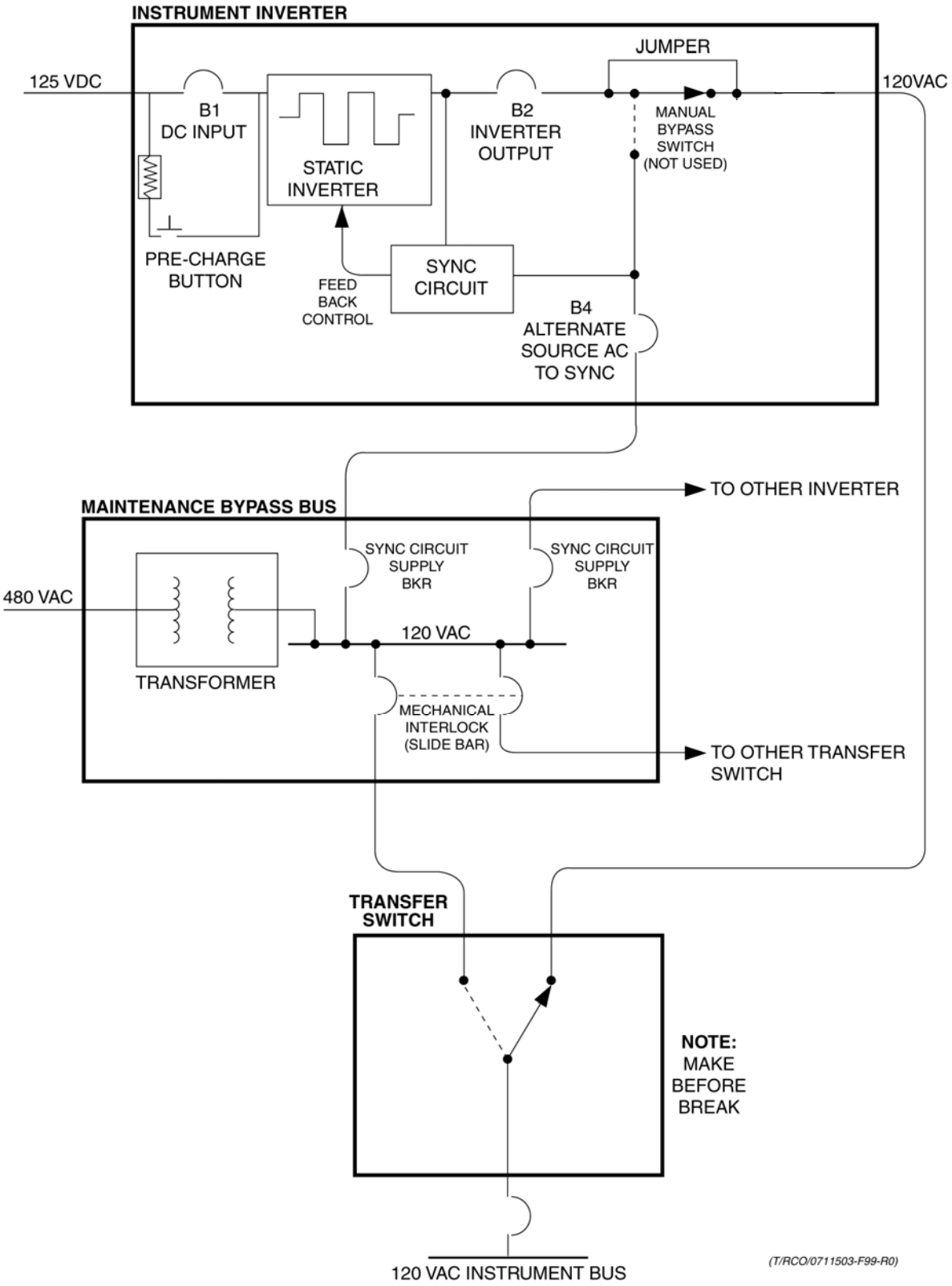


FIGURE 14

14. 058 AK1.01 / Loss of DC Power / Knowledge of the operational implications of the following concepts as they apply to Loss of DC Power: Battery charger equipment and instrumentation

Given the following conditions:

- Unit 1 is at 100% power
- AB Busses are aligned to the “B” train
- 1AA Battery Charger is OOS

Subsequently:

- 1A Battery Charger trips
- 1-AOP-50.08, Loss of 125 VDC Station Battery Charger has been entered

Which ONE of the following completes the statements below?

The 1A DC Battery is rated to operate for a MAXIMUM of ____(1)____ hours without the assistance of a battery charger during emergency operations.

In accordance with 1-AOP-50.08, the operator is required to FIRST **CLOSE** ____(2)____ breakers to align the 1AB Charger to 1A DC bus.

A.	(1)	2
	(2)	60135, TIE 1AB-1A (“inside”) THEN 60130, TIE 1A-1AB (“outside”)
B.	(1)	2
	(2)	60130, TIE 1A-1AB (“outside”) THEN 60135, TIE 1AB-1A (“inside”)
C.	(1)	4
	(2)	60135, TIE 1AB-1A (“inside”) THEN 60130, TIE 1A-1AB (“outside”)
D.	(1)	4
	(2)	60130, TIE 1A-1AB (“outside”) THEN 60135, TIE 1AB-1A (“inside”)

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is incorrect, 2 hours is plausible based on TS 3.8.2.3 which requires the bus to be energized within 2 hours or be in Mode 3 within 6 hours and HOT shutdown within 6 hours. Part 2 is incorrect. This is the wrong order, it is plausible that the applicant believes that the inside breaker goes first, this will not work since the control power comes from the bus so the bus must be energized to operate the inside breaker. The steps are bulleted so the procedure doesn't specify order.
B.	Incorrect:	Part 1 is incorrect, 2 hours is plausible based on TS 3.8.3.1 which requires the bus to be energized within 2 hours or be in Mode 3 within 6 hours and cold shutdown within 30 hours. Part 2 is correct: IAW 1-AOP-50.08, Att 5. Step 7 B.
C.	Incorrect:	Part 1 is correct: 4 hours is correct. Part 2 is incorrect: See analysis A.
D.	Correct:	Part 1 is correct 4 hours is correct. Part 2 is correct: IAW 1-AOP-50.08, Att 5. Step 7 B. The operational implication is in the required sequencing of breaker operation. The outside breaker MUST be closed first to energize the control power of the inner cross-tie breaker. If not performed in this sequence, cross-tie is not possible due to inner breaker not closing.

Question Number: 14

Tier: 1 Group: 1

K/A: 058 AK1.01 / Loss of DC Power / Knowledge of the operational implications of the following concepts as they apply to Loss of DC Power: Battery charger equipment and instrumentation

Importance Rating: 2.8 3.1

10 CFR Part 55: (CFR 41.8 / 41.10 / 45.3)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the operational implications of the loss of DC power utilizing battery charger equipment and instrumentation

Technical Reference: 1-AOP-50.08, PSL OPS 0711503

Proposed references to be provided: None

Learning Objective: PSL OPS 0711503

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

- Fan Failure Alarm—senses a failure of the internal fan on the SCR heatsink and/or fans located on top of the unit.
- End of Discharge Alarm—senses when DC voltage is <105 VDC.

Any of these local alarms will generate a common control room annunciator for that charger. For details, refer to annunciator response procedures for the A and B annunciator panels.

BATTERIES

Each unit has four batteries A, B, C and D. Batteries A and B are safety related while the C and D batteries are non-safety related. Each battery is comprised of 60 lead-calcium acid cells.

PURPOSE

The station batteries provide a backup source of power to the DC bus if the associated battery charger(s) becomes unavailable.

DESIGN

The safety related batteries are rated at 2400 amperes-hr at an 8 hour discharge rate. This rating is sufficient for a 4 hour emergency period without assistance from a battery charger.

The non-safety related batteries are rated at 2400 ampere-hr at an 8 hour discharge rate or 1900 ampere-hr at a 3 hour discharge rate.

Each cell of the batteries has Individual Cell Equalizers (ICE) installed. The ICE is an electrical component connected to the positive and negative terminals of each battery cell. The ICE circuits are set such that when its cell reaches 2.23 volts, the circuit bypasses the cell. The remaining cells in the battery continue to charge until they reach 2.23 volts. This ensures all cells reach the same voltage during equalize charging. Without the ICE circuit, the battery could have some cells charge to a higher voltage than others. Uneven cell voltages cause a lower overall battery capacity.

A load bank, which is a series of resistors, is used to test the capacity of the battery. A mechanical interlock prevents the battery to DC bus breaker and the load bank breaker from being closed at the same time.

DC Buses

There are five DC buses. A, AB, and B are safety related. C and D are non-safety related.

PURPOSE

The DC Bus provides a common point for connecting various DC power sources to various DC loads.

DESIGN

Each bus contains breakers used for switching and fault protection. Refer to Figures 2 and 3.

The AB bus can be supplied from any other DC bus through two tie breakers in series. The breakers between the safety related buses are key switch operated from the control room. The key is captured when the switch is closed. The captured key switch, in combination with the administrative control of the number of keys available prevents simultaneously connecting both A and B DC buses to the AB bus.

The breakers between the safety related buses have a built in undervoltage trip function. From the perspective of the AB Bus, an undervoltage upstream of the cross tie breaker causes that breaker to trip and prevents it from closing. If an undervoltage condition occurs on the bus supplying the AB bus, both tie breakers would trip open. The undervoltage condition prevents closing the tie breakers until voltage is restored.

The AB bus can receive power from the C bus through two breakers in series. One breaker is located on the AB bus and the other on the C bus. Each of these breakers has captured key mechanical locks that must be operated before the breakers can be closed. The keys for these locks are administratively controlled. A similar arrangement is provided between the D and AB buses.

ATTACHMENT 5
Aligning Battery Charger 1AB to 125V DC Bus 1A
(Page 3 of 3)

NOTE

The AB Battery charger can be used to take credit for the A or B side battery charger provided the AC power source (A or B train) is the same train the D.C. output is aligned to.

6. IF 125V DC Bus 1AB is DEENERGIZED, THEN **PLACE** Bkr 1-60317, BATTERY CHARGER 1AB, in ON. (125V DC Bus 1AB, Circuit 17)

NOTE

Swinging the 125V DC 1AB Bus may alarm or clear the following annunciators. In this case, Tech Specs 3.8.2.3 (3.8.2.4), DC Distribution - Operating (Shutdown), and OPS-503, Technical Specification Guidance, may be applicable.

- B-60, EMERG 125V DC/4.16KV/480V AB BUSSES MISALIGNED
- S-15, EMERG 125V DC/4.16KV/480V AB BUSSES MISALIGNED

7. **ALIGN** 125V DC Bus 1AB to 125V DC Bus 1A as follows: (RTGB-101)

A. **ENSURE** the following tie breakers are OPEN:

- 60316, TIE 1AB-1B (Key 3)
- 60230, TIE 1B-1AB (Key 4)

B. **ENSURE** the following tie breakers are CLOSED:

- 60130, TIE 1A-1AB (Key 4)
- 60315, TIE 1AB-1A (Key 3)

8. IF Battery Charger 1AB equalizer timer is in HOLD, THEN **TURN** timer to zero to return to FLOAT mode.

9. **VERIFY** battery charger is supplying power to DC Bus 1A as follows:

- Battery Charger 1AB DC amps indicating greater than zero
- DC Bus 1A volts 133 to 135 VDC (RTGB-101)

5.2 Transfer DC Bus 1AB from DC Bus 1B to DC Bus 1A (continued)

NOTE

Depending on 1AB bus alignment, performance of Section 5.2, Step 6, may cause following annunciators to ALARM or CLEAR:

- S-15, EMERG 125V DC/4.16KV/480V AB BUSES MISALIGNED (RTGB 106)
- B-60, EMERG 125V DC/4KV/480V AB BUSES MISALIGNED (RTGB 101)

6. At RTGB-101, **PERFORM** the following:

A. **OPEN** Bkr 60316, TIE 1AB-1B.

B. **OPEN** Bkr 60230, TIE 1B-1AB.

C. **CLOSE** Bkr 60130, TIE 1A-1AB.

D. **CLOSE** Bkr 60315, TIE 1AB-1A.

7. At Battery Charger 1AB, **TURN** the equalizer timer to zero (0).

8. **VERIFY** battery charger trouble alarms on RTGB panels A, B, and Z are CLEAR.

9. **VERIFY** one or both of the following is carrying some load:

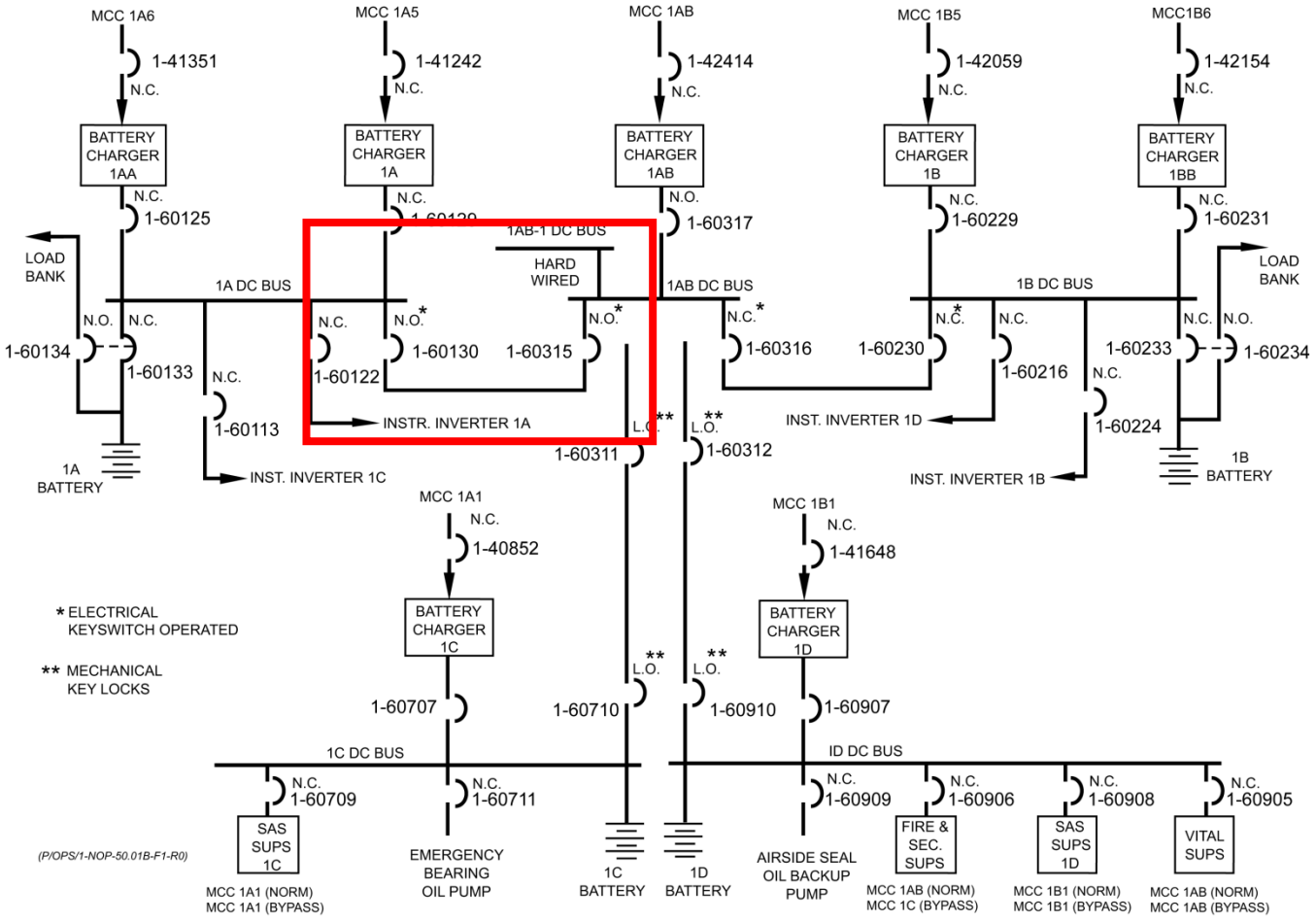
- Battery Charger 1A
- Battery Charger 1-AA

10. IF returning Battery Charger 1AB to standby, THEN at 125V DC Bus 1AB, **PLACE** Bkr 1-60317, BATTERY CHARGER 1AB, in OFF.

11. **NOTIFY** Unit 1 Control Room that Battery Charger 1AB is in standby.

ATTACHMENT 5
DC Bus 1 Line
(Page 1 of 1)

125 VDC SYSTEM



15. 077 AA1.01 / Generator Voltage and Electric Grid Disturbances / Ability to operate and/or monitor the following as they apply to Generator Voltage and Electric Grid Disturbances: Grid frequency and voltage

Given the following conditions:

- Unit 1 is at 100% power
- Unit 2 is in a Forced Outage
- Switchyard voltage is 240 KV
- VARM-8881, Megavars indicates 0 MVARs

Subsequently,

- A grid disturbance occurs, resulting in the System Dispatch Operator requesting that Unit 1 LOWER Switchyard voltage 2 Kv

Which ONE of the following completes the statements below?

AFTER Unit 1 LOWERS Switchyard Voltage 2 Kv, VARM-8881 will indicate in the ____(1)____ direction.

In accordance with 1-NOP-99.07, Operations Hard Cards, a log entry ____(2)____ required.

A.	(1)	Lagging (VARS OUT)
	(2)	is
B.	(1)	Lagging (VARS OUT)
	(2)	is NOT
C.	(1)	Leading(VARS IN)
	(2)	is
D.	(1)	Leading (VARS IN)
	(2)	is NOT

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Inorrect:	Part 1 incorrect: Theory of VARs that any increase in voltage will result in an increase of VARs in the lagging direction. . Part 2 correct, IAW 1-NOP-99.07, Att 2, Step 1.1.5. IF adjusting VARS due to a call from System Dispatch, THEN RECORD the activity in the Narrative Logs.
B.	Incorrect:	Part 1 correct: see analysis A Part 2 incorrect: IAW 1-NOP-99.07, Att 2, Step 1.1.5. IF adjusting VARS due to a call from System Dispatch, THEN RECORD the activity in the Narrative Logs., it is plausible that since this is a System directed manipulation that the narrative log is not required to be updated.
C.	Correct:	Part 1 correct: With the given MVAR loading of 0, any change in the grid voltage will impact VARs increasing either in the lead or lag direction. In this case of Unit 1 lowering switchyard voltage due to grid disturbance to 239KV, the main generator output voltage being maintained by the automatic voltage regulator will be greater than the grid voltage. This will result in the VARs lowering in the leading direction. Part 2 correct, IAW 1-NOP-99.07, Att 2, Step 1.1.5. IF adjusting VARS due to a call from System Dispatch, THEN RECORD the activity in the Narrative Logs.
D.	Incorrect:	Part 1 correct: see analysis C Part 2 incorrect: see analysis B

Question Number: 15

Tier: 1 Group: 1

K/A: 077 AA1.01 / Generator Voltage and Electric Grid Disturbances / Ability to operate and/or monitor the following as they apply to Generator Voltage and Electric Grid Disturbances: Grid frequency and voltage

Importance Rating: 3.6 3.7

10 CFR Part 55: (CFR: 41.5 and 41.10 / 45.5, 45.7, and 45.8)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to or monitor the Grid frequency and voltage as they apply to Generator Voltage and Electric Grid Disturbances

Technical Reference: 1-NOP-99.07, PSL OPS 0711307

Proposed references to be provided: None

Learning Objective: PSL OPS 0702311-3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

ATTACHMENT 2
VAR ADJUSTMENTS
(Page 1 of 2)

1.0 VAR ADJUSTMENTS

Critical Parameters

Notification to the SM/US is required for any abnormal indications.

- VARS
- Voltage

1.1 Adjusting VARS

NOTE

- Notification and co-ordination with the other unit offline, there is no need to contact the other unit unless they are performing an EDG surveillance.
- Operate the AC Regulator Adjuster using the Bump and Wait method, (i.e. 1 second bump then a 10 second wait before next bump to see results of previous change).
- Voltage adjustments are coordinated between Units to prevent excessive circulating currents
- To raise vars, 90AC-CS/875, AC Regulator Adjuster, is placed in the RAISE position.
- To lower vars, 90AC-CS/875, AC Regulator Adjuster, is placed in the LOWER position.

1. OBTAIN US/SM permission to ADJUST VARS.

2. IF Unit 2 is online OR performing an EDG surveillance, THEN **NOTIFY** UNIT 2 RCO of reason and intent for raising/lowering vars.

3. While maintaining contact with Unit 2, **ADJUST** VARS in small increments by placing 90AC-CS/875, AC Regulator Adjuster to RAISE/LOWER position as required.

4. WHEN both units are at the desired VARS, THEN **STOP** raising/lowering vars.

5. IF adjusting VARS due to a call from System Dispatch, THEN **RECORD** activity in the Narrative logs.

As you change the excitation (voltage) of the generator, you would move “up” or “down” the KVA axis increasing the phase angle as you move away from the Megawatts line. While doing so, unless megawatts are reduced, generator current would increase.

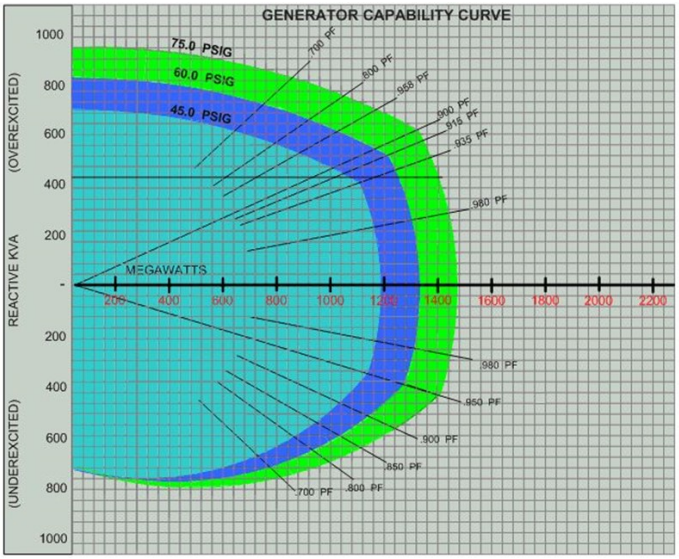


Figure: Sample Generator Capability Curve

VARs Terminology

Consider the figure below overlayed against the generator capability curve:

- As generator excitation increases, lagging VARs result
- As generator excitation decreases, leading VARs result

In both cases, for a constant true power (megawatts out), generator amps increase. In the case of the leading VARs point, a significant amount of current is being consumed by the reactive power which would require a significant decrease in real power output.

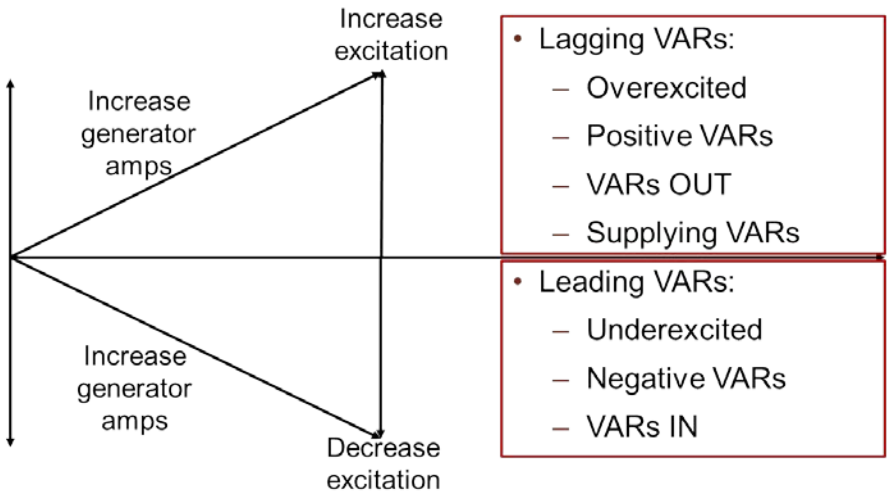


Figure: Power Factor and VARs

Operation in parallel with a large grid

When paralleling a single generator with a large power system (grid), the output of the single oncoming generator is minimal compared with the power output of the entire grid. Hence, the House Curve below shows the system as a constant frequency, constant voltage power source.

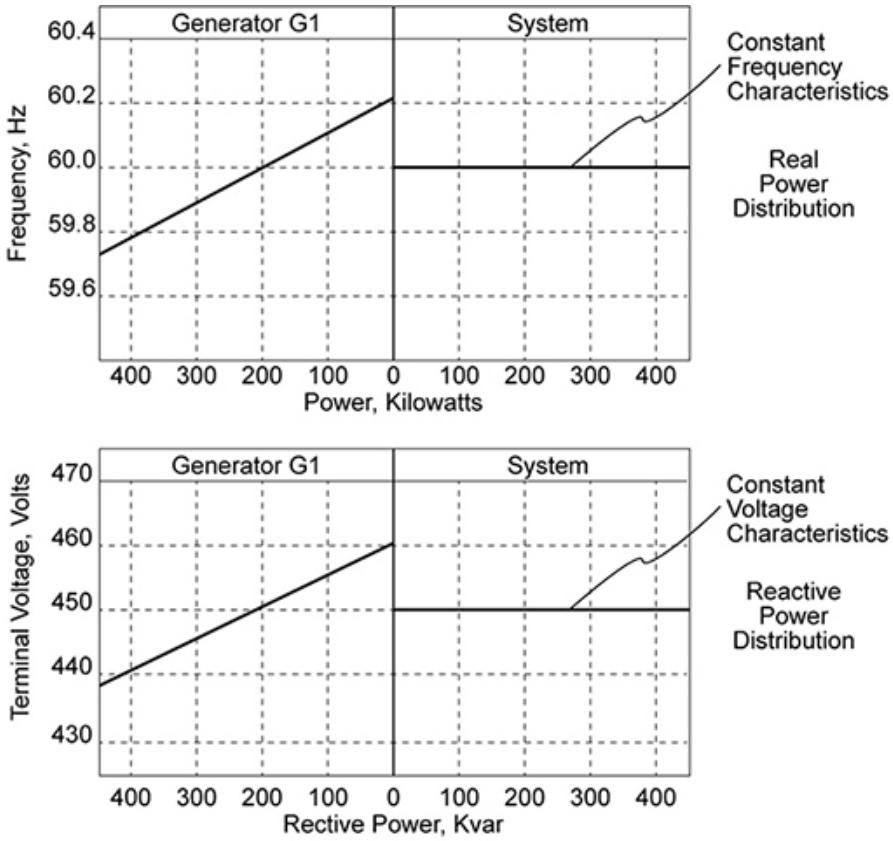


Figure: Parallel Operation of a Single Generator with the Grid

The figure above illustrates the distribution of real and reactive load of a single generator in parallel with a large power grid. An operator independently adjusts the appropriate regulators to set the load distributions on the single generator G1. The power grid will automatically supply the remainder of the required load. It is possible to have a single generator supply negative reactive power, thereby decreasing the total reactive load, improving the power factor, and requiring less current for the same total real power.

AC Voltage Regulator

In **automatic**, the AC voltage regulator controls the magnetic field in the main generator rotor to maintain the main generator output voltage at the demand setting of the AC voltage adjuster. The AC Voltage Regulator Adjust Switch, located on RTGB 101 [201], has positions of RAISE-OFF-LOWER with a spring return to OFF. An indicator, located just above the switch, shows the relative position of the adjuster from 0 to 100%. The AC voltage adjuster switch allows the operator to make adjustments and control generator terminal voltage and reactive load. Reactive load limits vary with load, H_2 pressure, availability of the other unit and Power System Stabilizer status. Use generator capability curves found in Plant Curve Books.

Basic operation of the control circuit would be described as follows:

The operator makes an adjustment of the AC Voltage Regulator Adjuster on RTGB 101 [201]. This signal is sent to the AC Voltage Error detector where it is compared with feedback signals from main generator potential transformers (PTs) and a current transformer (CT). The output of the Error detector goes to the Signal Mixer, where it is combined with signals from the limiting and damping circuitry. The resulting signal determines the output of the firing circuits/power amplifiers. The output of the power amplifiers is the Exciter Field current.

Limiting and damping signals are applied at various stages in the automatic regulator. The limiting circuits ensure that the exciter and generator field currents do not exceed specific minimum and maximum values. These values are set to ensure that the generator is operated within its design capability to keep it in synchronism with the grid and prevent overheating. Protection circuits have been provided to indicate abnormal conditions, and to either trip from the AC to the DC voltage regulator or trip the main generator, if the limiting circuits are unable to keep the generator within its design capability.

When the AC regulator is placed into service, the DC voltage regulator is COMPLETELY REPLACED by the AC regulator. The AC voltage regulator is sometimes referred to as the "automatic control" mode of operation. The AC regulator consists of a voltage error detector (and other components, which will be discussed later). The AC voltage error detector senses the machine terminal voltage via a 3-phase potential transformer bank. The 3-phase voltage is rectified and compared against an adjustable reference signal in the

MAIN GENERATOR BRUSHLESS EXCITATION BASIC BLOCK DIAGRAM

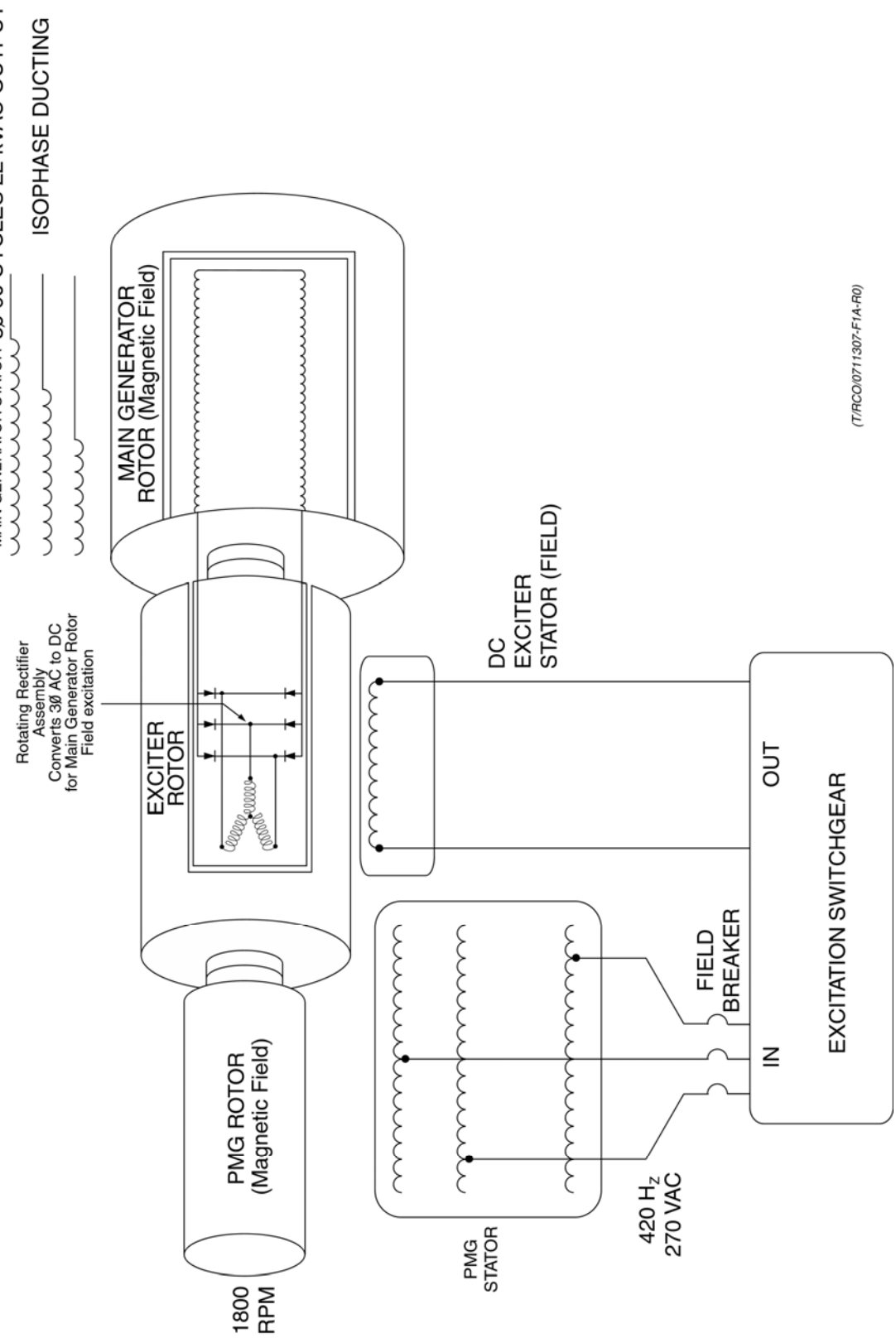


FIGURE 1

VOLTAGE REGULATORS

There are two modes of voltage regulation controlling the output of the excitation switchgear:

- In **Automatic**, *the AC voltage regulator controls the magnetic field in the main generator rotor to maintain the main generator output voltage at the demand setting of the AC voltage adjuster.*

- In **Manual**, the DC regulator maintains a constant current to the main generator rotor at the demand setting of the DC regulator adjuster. This control serves as the manual means of adjusting voltage and reactive power.

On RTGB 101 [201] there is a three-position transfer switch. Three lights are located above the switch: green (off), amber (test), and red (on). The switch positions function as follows:

- **OFF** is the position where the DC voltage regulator is in service.

- **Test** is the position where the AC voltage regulator is energized with the DC voltage regulator still in service. This position allows adjustments to be made to the AC voltage regulator that ensure the transition from the DC voltage regulator to the AC voltage regulator will be bumpless when the **ON** position is selected.

- **ON** is the position where the AC voltage regulator is placed in service and the DC voltage regulator is removed from service.

16. CE02 EK1.1 / Reactor Trip – Stabilization – Recovery / Knowledge of the operational implications of the following concepts as they apply to the (Reactor Trip Recovery): Components, capacity, and function of emergency systems.

Given the following conditions:

- Unit 2 is at 50% power
- 2A MFWP is out of service

Subsequently:

- 2B MFWP Trips
- 2-EOP-01, SPTAs are complete
- 2-EOP-02, Reactor Trip Recovery has been entered
- 2A S/G is 48% NR 2B S/G is 44% NR
- 2A AFW pump was started per 2-NOP-99.07, Hard Cards
- 2B AFW pump tripped when attempting to manually start

In accordance with 2-NOP-99.07, which ONE of the following completes the statements below?

Restore AFW to the 2B S/G from the 2C AFW Pump by ____(1)____.

When restoring AFW flow, the initial 5 minute feedwater flow limit ____(2)____ applicable.

A.	(1)	opening MV-08-12, SG 2B STM TO AFW PP 2C ONLY
	(2)	is
B.	(1)	opening MV-08-12, SG 2B STM TO AFW PP 2C ONLY
	(2)	is NOT
C.	(1)	simultaneously opening MV-08-12 and MV-08-13, SG 2A STM TO AFW PP 2C
	(2)	is
D.	(1)	simultaneously opening MV-08-12 and MV-08-13, SG 2A STM TO AFW PP 2C
	(2)	is NOT

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: It is plausible the applicant believes that since only the 2B S/G is not being fed then the steam supply should only have to come from the affected SG. Part 2 incorrect: It is plausible that the applicant believes that the 150 gpm initial feed limit is applied at all times, since this is a recent revision to the Hard Card.
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 correct: See analysis D.
C.	Incorrect:	Part 1 correct: See analysis D. Part 2 incorrect: See analysis A.
D.	Correct:	Part 1 correct: IAW 2-NOP-99.07, Step 1.2.2 NOTE The valves should be opened simultaneously to prevent overspeed tripping of the 2C AFW Pump. Part 2 correct: IAW 2-NOP-99.07, Step 1.2. CAUTION, IF SG Levels never dropped below 35% NR the 150 gpm limit is NOT applicable.

Question Number: 16

Tier: 1 Group: 1

K/A: CE02 EK1.1 / Reactor Trip – Stabilization – Recovery / Knowledge of the operational implications of the following concepts as they apply to the (Reactor Trip Recovery): Components, capacity, and function of emergency systems.

Importance Rating: 2.9 3.2

10 CFR Part 55: (CFR: 41.8 / 41.10, 45.3)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the operational implications of the plant status on AFW operations during RTR

Technical Reference: 2-NOP-99.07

Proposed references to be provided: None

Learning Objective: PSL OPS 0711412

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

ATTACHMENT 5
AUXILIARY FEEDWATER OPERATIONS
(Page 7 of 8)

1.2 Restoring Steam Generator Levels using Auxiliary Feedwater when an AFAS has NOT occured (continued)

2. (continued)

NOTE

The following valves should be opened simultaneously to prevent overspeed tripping of the 2C AFW Pump:

- MV-08-12, SG 2B STM TO AFW PP 2C
- MV-08-13, SG 2A STM TO AFW PP 2C

B. **START** 2C AFW PUMP by performing both of the following simultaneously:

- **OPEN** MV-08-12, SG 2B STM TO AFW PP 2C
- **OPEN** MV-08-13, SG 2A STM TO AFW PP 2C

C. **OPEN** the solenoid valve(s) in the header(s) to feed the appropriate S/G(s):

- SE-09-4, 2C PUMP DISCH TO 2A S/G VLV (KEY 85)
- SE-09-5, 2C PUMP DISCH TO 2B S/G VLV (KEY 86)

D. **ESTABLISH** AND **MAINTAIN** desired flow in the header(s) to feed the appropriate S/G(s):

- **THROTTLE** MV-09-11, PUMP 2C TO SG 2A
- **THROTTLE** MV-09-12, PUMP 2C TO SG 2B

ATTACHMENT 5
AUXILIARY FEEDWATER OPERATIONS
(Page 6 of 8)

1.2 Restoring Steam Generator Levels using Auxiliary Feedwater when an AFAS has NOT occured (continued)

CAUTION

- Initial feedwater flow should be controlled to less than 150 gpm for the first 5 minutes when using Aux Feed for water hammer and thermal shock concerns. Failure to control flow to less than 150 gpm for at least five minutes or until a level rise is observed may require a visual inspection of the feed ring prior to startup. If Steam Generator level never lowered to below 35% NR, the 150 gpm limit is not applicable. (Section 7.1.3, Management Directive 2)
- During emergencies, this flow limit can be exceeded to restore an EOP Safety Function prior to requiring transition to the Functional Recovery procedure or to prevent escalation of an Emergency Declaration.
- If a steam generator has a tube leak/rupture, then operation of the 2C AFW Pump should be avoided to minimize direct releases to the environment. If motor driven AFW pumps are **NOT** available, steam from the least affected S/G should be used. The steam supply from the MOST affected steam generator should **NOT** be opened.

2. **FEED** the 2A AND 2B Steam Generators using the 2C AFW PUMP:

A. IF a steam generator has a tube leak/rupture, THEN **CONSIDER** the following:

(1) **PLACE** the control switch to CLOSE for the steam supply from the MOST affected S/G:

- MV-08-13, S/G 2A STM TO AFW PP 2C
- MV-08-12, S/G 2B STM TO AFW PP 2C

17. CE05/EK2.1Knowledge of the interrelations between the (Excess Steam Demand) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Given the following conditions:

- Unit 2 has experienced an ESDE inside containment
- 2A S/G pressure is 740 psia
- 2B S/G pressure is 850 psia
- Containment pressure is 3.1 psig

Which ONE of the following completes the statements below?

The Reactor AUTOMATICALLY tripped ON ____(1)____.

In accordance with 2-EOP-01, SPTAs, RCS Heat Removal, S/G Pressure ____(2)____ reached the value requiring manual closure of the MSIVs.

A.	(1)	TM/LP
	(2)	HAS
B.	(1)	TM/LP
	(2)	HAS NOT
C.	(1)	Containment pressure
	(2)	HAS
D.	(1)	Containment pressure
	(2)	HAS NOT

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 – incorrect. The setpoint of 120 psid has not been reached but will be when the required action of 2-EOP-01 is completed. Plausible if the candidate does not recall the specific trip setpoint with the indication provided that there is an asymmetric S/G event occurring. At PSL, the asymmetric S/G trip is via the TM/LP bistable. Tech Spec Table 2.2-1 Reactor Protective Inst Trip Stpt Limits Steam Generator Pressure(1) Difference – High (Logic in TM/LP Trip Unit) On Unit 1, the Containment Pressure Reactor Trip Setpoint has NOT been reached. The setpoint on Unit 1` is 3.3 psig. Part 2 – correct. 2-EOP-01, Step 7 RCS Heat Removal requires MSIVs be closed when S/G pressure is less than 750 psia.
B.	Incorrect:	Part 1 – incorrect. See explanation in Analysis A Part 2 – incorrect. 2-EOP-01, Step 7 RCS Heat Removal requires MSIVs be closed when S/G pressure is less than 750 psia.
C.	Correct:	Part 1 – correct. The reactor trip setpoint for high containment pressure is 3.0 psig. This value is exceeded in the stem of the question. Current S/G differential pressure is less than 120 psid, therefore a reactor trip from TM/LP via ASGT will not occur. See highlighted Tech Spec Table 2.2-1 in supporting references for setpoints Tech Spec Table 2.2-1 Reactor Protective Inst Trip Stpt Limits. Containment Pressure – High < 3.0 psig Steam Generator Pressure(1) Difference – High (Logic in TM/LP Trip Unit) < 120.0 psid Part 2 – correct. 2-EOP-01, Step 7 RCS Heat Removal requires MSIVs be closed when S/G pressure is less than 750 psia. 2. IF S/G pressure is less than 750 psia (735 psig), THEN PERFORM the following: a. CLOSE the MSIVs
D.	Incorrect:	Part 1 – correct. See explanation in Analysis A Part 2 – incorrect. 2-EOP-01, Step 7 RCS Heat Removal requires MSIVs be closed when S/G pressure is less than 750 psia.

Question Number: 17

Tier: 1 Group: 1

K/A: CE05/EK2.1Knowledge of the interrelations between the (Excess Steam Demand) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Importance Rating: 3.3 3.6

10 CFR Part 55: (CFR 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required how the ESDE and the automatic features of the MSIVs and the RPS trips.

Technical Reference: PSL OPS 0702204 RPS
2-EOP-01, SPTAs

Proposed references to be provided: None

Learning Objective: PSL OPS 0702204-4

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: Q#18 on PSL 2017 NRC Exam

TABLE 2.2-1

REACTOR PROTECTIVE INSTRUMENTATION TRIP SETPOINT LIMITS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES
1. Manual Reactor Trip	Not Applicable	Not Applicable
2. Variable Power Level – High(1)		
Four Reactor Coolant Pumps Operating	≤ 9.61% above THERMAL POWER, with a minimum setpoint of 15% of RATED THERMAL POWER, and a maximum of ≤ 107.0% of RATED THERMAL POWER.	≤ 9.61% above THERMAL POWER, and a minimum setpoint of 15% of RATED THERMAL POWER and a maximum of ≤ 107.0% of RATED THERMAL POWER.
3. Pressurizer Pressure – High	≤ 2370 psia	≤ 2374 psia
4. Thermal Margin/Low Pressure(1)		
Four Reactor Coolant Pumps Operating	Trip setpoint adjusted to not exceed the limit lines of Figures 2.2-3 and 2.2-4. Minimum value of 1900 psia.	Trip setpoint adjusted to not exceed the limit lines of Figures 2.2-3 and 2.2-4. Minimum value of 1900 psia.
5. Containment Pressure – High	≤ 3.0 psig	≤ 3.1 psig
6. Steam Generator Pressure – Low	≥ 626.0 psia(2)	≥ 621.0 psia(2)
7. Steam Generator Pressure Difference – High (Logic in TM/LP Trip Unit)(1)	≤ 120.0 psid	≤ 132.0 psid
8. Steam Generator Level – Low	≥ 35.0%(3)	≥ 35.0%(3)

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

7. E. (continued)

RCS HEAT REMOVAL

2. IF S/G pressure is less than 750 psia (735 psig), THEN **PERFORM** the following:

a. **CLOSE** the MSIVs.

b. IF MSIV closure has terminated the cooldown, THEN **ENSURE** ADVs are restoring RCS TAVG to between 525 and 535°F.

3. IF S/G pressure is less than 850 psia (835 psig), THEN **STOP** steaming S/Gs as follows:

a. **ENSURE** SBCS valves are CLOSED.

b. **ENSURE** ADVs are CLOSED.

STEP 7 CONTINUED ON NEXT PAGE

TABLE 2.2-1

REACTOR PROTECTIVE INSTRUMENTATION TRIP SETPOINT LIMITS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES
1. Manual Reactor Trip	Not Applicable	Not Applicable
2. Power Level – High (1) Four Reactor Coolant Pumps Operating	≤ 9.61% above THERMAL POWER, with a minimum setpoint of 15% of RATED THERMAL POWER, and a maximum of < 107.0% of RATED THERMAL POWER.	≤ 9.61% above THERMAL POWER, and a minimum setpoint of 15% of RATED THERMAL POWER and a maximum of ≤ 107.0% of RATED THERMAL POWER.
3. Reactor Coolant Flow – Low (1) Four Reactor Coolant Pumps Operating	≥ 95% of minimum reactor coolant flow with 4 pumps operating *	≥ 95% of minimum reactor coolant flow with 4 pumps operating *
4. Pressurizer Pressure – High	≤ 2400 psia	≤ 2400 psia
5. Containment Pressure – High	≤ 3.3 psig	≤ 3.3 psig
6. Steam Generator Pressure – Low (2)	≥ 600 psia	≥ 600 psia
7. Steam Generator Water Level – Low	≥ 35.0% Water Level – each steam generator	≥ 35.0% Water Level – each steam generator
8. Local Power Density – High (3)	Trip setpoint adjusted to not exceed the limit lines of Figures 2.2-1 and 2.2-2.	Trip set point adjusted to not exceed the limit lines of Figures 2.2-1 and 2.2-2.

* For minimum reactor coolant flow with 4 pumps operating, refer to Technical Specification LCO 3.2.5.

ORIGINAL QUESTION FROM 2017 NRC EXAM

18. CE05/EK2.1Knowledge of the interrelations between the (Excess Steam Demand) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Given the following conditions:

- Unit 2 has experienced an ESDE inside containment
- 2A S/G pressure is 740 psia
- 2B S/G pressure is 850 psia
- Containment pressure is 3.1 psig

Which ONE of the following completes the statements below?

The Reactor AUTOMATICALLY tripped ON ____(1)____.

In accordance with 2-EOP-01, SPTAs, RCS Heat Removal, S/G Pressure ____(2)____ reached the value requiring manual closure of the MSIVs.

A.	(1)	TM/LP
	(2)	HAS
B.	(1)	TM/LP
	(2)	HAS NOT
C.	(1)	Containment pressure
	(2)	HAS
D.	(1)	Containment pressure
	(2)	HAS NOT

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 – incorrect. The setpoint of 120 psid has not been reached but will be when the required action of 2-EOP-01 is completed. Plausible if the candidate does not recall the specific trip setpoint with the indication provided that there is an asymmetric S/G event occurring. At PSL, the asymmetric S/G trip is via the TM/LP bistable. Tech Spec Table 2.2-1 Reactor Protective Inst Trip Stpt Limits Steam Generator Pressure(1) Difference – High (Logic in TM/LP Trip Unit) On Unit 1, the Containment Pressure Reactor Trip Setpoint has NOT been reached. The setpoint on Unit 1` is 3.3 psig. Part 2 – correct. 2-EOP-01, Step 7 RCS Heat Removal requires MSIVs be closed when S/G pressure is less than 750 psia.
B.	Incorrect:	Part 1 – incorrect. See explanation in Analysis A Part 2 – incorrect. 2-EOP-01, Step 7 RCS Heat Removal requires MSIVs be closed when S/G pressure is less than 750 psia.
C.	Correct:	Part 1 – correct. The reactor trip setpoint for high containment pressure is 3.0 psig. This value is exceeded in the stem of the question. Current S/G differential pressure is less than 120 psid, therefore a reactor trip from TM/LP via ASGT will not occur. See highlighted Tech Spec Table 2.2-1 in supporting references for setpoints Tech Spec Table 2.2-1 Reactor Protective Inst Trip Stpt Limits. Containment Pressure – High < 3.0 psig Steam Generator Pressure(1) Difference – High (Logic in TM/LP Trip Unit) < 120.0 psid Part 2 – correct. 2-EOP-01, Step 7 RCS Heat Removal requires MSIVs be closed when S/G pressure is less than 750 psia. 2. IF S/G pressure is less than 750 psia (735 psig), THEN PERFORM the following: a. CLOSE the MSIVs
D.	Incorrect:	Part 1 – correct. See explanation in Analysis A Part 2 – incorrect. 2-EOP-01, Step 7 RCS Heat Removal requires MSIVs be closed when S/G pressure is less than 750 psia.

Question Number: 18

Tier: 1 Group: 1

K/A: CE05/EK2.1Knowledge of the interrelations between the (Excess Steam Demand) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Importance Rating: 3.3 3.6

10 CFR Part 55: (CFR 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required how the ESDE and the automatic features of the MSIVs and the RPS trips.

Technical Reference: PSL OPS 0702204 RPS
2-EOP-01, SPTAs

Proposed references to be provided: None

Learning Objective: PSL OPS 0702204-4

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: New question for the 2017 NRC RO Exam

Comments:

18.

CE06 EK1.3 / Loss of Feedwater / Knowledge of the operational implications of the following concepts as they apply to the (Loss of Feedwater): Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Feedwater).

Given the following conditions:

- Unit 1 is at 45% power
- 1B AFW Pump is out of service
- 1A Main Feedwater pump is out of service
- Bkr 60316, 1AB 125VDC CROSSTIE 1AB-1B is out of service

Subsequently:

- Annunciator A-60, 125 VDC BUS 1AB UV ALARMS
- Bkrs 60135, TIE 1AB-1A and 60130, TIE 1A-1AB Trip OPEN
- The 1B Main Feedwater pump trips
- 1A/1B S/G Levels are 40% NR and SLOWLY LOWERING

Which ONE of the following actions is required in accordance with 1-EOP-01, SPTAs?

A.	Secure ALL RCPs
B.	Secure ONE RCP in EACH loop
C.	Align the 1AB DC bus to the 1C or 1D DC bus
D.	Align the 1AB Battery Charger to the 1AB DC bus

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Plausible because if no AFW pumps were running step 7 C.1 would direct securing ALL RCPs
B.	Correct:	Step 7 B directs if only one AFW pump is running secure 1 RCP in each loop.
C.	Incorrect:	Plausible as the 1AB DC bus CAN be lined to the C or D DC bus, but these are NON-VITAL DC busses and not directed on EOP-01. This can only be done in Modes 5 and 6.
D.	Incorrect:	Plausible as the 1AB Battery Charger is normally on standby with the output breaker open, however this action is not performed in EOP-01

Question Number: 18

Tier: 1 Group: 1

K/A: CE06 EK1.3 / Loss of Feedwater / Knowledge of the operational implications of the following concepts as they apply to the (Loss of Feedwater): Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Feedwater).

Importance Rating: 3.2 3.7

10 CFR Part 55: (CFR 41.8 / 41.10 / 45.3)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the operational implication of annunciators and conditions associated with LOFW

Technical Reference: 1-EOP-01, PSTG SPTA

Proposed references to be provided: None

Learning Objective: PSL OPS 0702822-5

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: Question #12 on 2011 PSL NRC Exam. Changed a distractor and modified stem to support plausibility.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

RCS HEAT REMOVAL

* **7. VERIFY** RCS Heat Removal:

A. **VERIFY** the following conditions exist on at least one S/G:

- S/G NR level is between 20 and 90%
- Feedwater is being supplied

A.1 **PERFORM** the following:

1. **ESTABLISH** main or auxiliary feedwater flow to at least one S/G.

2. **CONTROL** feedwater flow to restore S/G level to between 60 and 70% NR.

B. IF 1A or 1B AFW Pump is the ONLY source of Feedwater, THEN **STOP** one RCP in each loop.

C. **VERIFY** at least ONE of the following is supplying feedwater to the S/G(s):

- Main Feedwater
- Auxiliary Feedwater

C.1 **STOP** all RCPs.

STEP 7 CONTINUED ON NEXT PAGE

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

MAINTENANCE OF VITAL AUXILIARIES (AC & DC POWER)

3. **VERIFY** Maintenance of Vital Auxiliaries:

A. **VERIFY** station loads transferred to offsite electrical power:

(1) **VERIFY** all Vital and Non-Vital AC buses transfer from Auxiliary to Start-up Transformers AND are ENERGIZED.

(1).1 IF either Vital 4.16 KV bus is **NOT** powered from offsite, THEN **ENSURE** all of the following:

A. The associated EDG is RUNNING.

B. The associated EDG output breaker is CLOSED.

C. **ENSURE** 1AB 480V Load Center is aligned to an energized bus.

D. IF instrument air is lost, THEN **DISPATCH** an operator to restore instrument air per Appendix H, Operation of the 1A and 1B Instrument Air Compressors.

STEP 3 CONTINUED ON NEXT PAGE

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

3. A. (1) (continued)

MAINTENANCE OF VITAL AUXILIARIES (AC & DC POWER)

(1).2 IF all 6.9 KV or non-vital 4.16 KV AC buses are DEENERGIZED, THEN **INITIATE** action to restore electrical power to affected buses as time and resources allow.

(1).3 IF NO Vital 4.16 KV buses are energized, THEN **PERFORM** all of the following:

A. **CONTACT** Unit 2 to determine power availability.

B. **NOTIFY** Unit 2 to perform Appendix W, Supplying Unit 1 with AC Power Using SBO Crosstie.

C. **ENSURE** all RCPs are STOPPED.

D. **ENSURE** RCP controlled bleedoff will remain isolated by placing the TWO RCP Bleedoff valves to CLOSE.

STEP 3 CONTINUED ON NEXT PAGE

INSTRUCTIONS	CONTINGENCY ACTIONS

4.0 OPERATOR ACTIONS (continued)

3. A. (1) (continued)

MAINTENANCE OF VITAL AUXILIARIES (AC & DC POWER)

E. **PERFORM** Appendix V, Receiving AC Power from Unit 2 Using SBO Crosstie.

(2) **VERIFY** <u>all</u> Vital and Non Vital DC Buses are ENERGIZED.

(2).1 IF the 1AB DC bus is de-energized, THEN **ALIGN** the 1AB DC Bus to an energized Vital DC Bus.

B. **VERIFY** seal cooling to RCPs:

- **VERIFY** CCW to the RCPs.

B.1 **PERFORM** the following:

1. **RESTORE** RCP seal cooling to affected RCPs.

a. IF an SIAS has isolated CCW to the RCPs, THEN **RESTORE** CCW per Appendix J, Restoration of CCW and CBO to the RCPs.

2. IF seal cooling can **NOT** be restored to an RCP within 10 minutes, THEN **TRIP** affected RCP.

MAINTENANCE OF VITAL AUXILIARIES COMPLETE

ORIGINAL QUESTION FROM 2011 NRC EXAM

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	CE/EO6EK1.3	
	Importance Rating	3.2	

Knowledge of the operational implications of the following concepts as they apply to the (Loss of Feedwater) Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Feedwater).

Proposed Question: RO 12

Unit 1 is at 45% power with the following conditions:

- 1B AFW Pump is out of service.
- 1A Main Feedwater pump is out of service.

The following alarm is received:

125V DC BUS 1AB UV A-60

Shortly after the alarm, the 1B Main Feedwater pump trips and cannot be restarted.

Which ONE of the following actions are taken in 1-EOP-01, 'Standard Post Trip Actions' as a direct result of the above conditions?

A. Align the 1AB DC bus to the 1C or 1D DC bus.

B. Align the 1AB Battery Charger to the 1AB DC bus.

C. Maintain current DC alignment with ALL RCP's running.

D. Secure ONE RCP in EACH loop.

Proposed Answer: D

Explanation (Optional):

A. Plausible as the 1AB DC bus CAN be lined to the C or D DC bus, but these are NON-VITAL DC busses and not directed on EOP-01
B. Plausible as the 1AB Battery Charger is normally on standby with the output breaker open, however this action is not performed in EOP-01.
C. This is an indication of loss of 1C AFW pump leaving only one electrical AFW pump available which requires one RCP in each loop to be stopped.
D. Correct

Technical Reference(s): 1-EOP-01 (Attach if not previously provided)
PSTG SPTA 1-22

Proposed references to be provided to applicants during examination: _____

Learning Objective: _____ (As available)

Question Source: Bank # _____
Modified Bank # _____ (Note changes or attach parent)
New X

Question History: Last NRC Exam _____

Question Cognitive Level: Memory or Fundamental Knowledge _____
Comprehension or Analysis x

10 CFR Part 55 Content: 55.45 3
_____

Comments:

19.003 AA2.03 Dropped Control Rod / Ability to determine and interpret the following as they apply to the Dropped Control Rod: Dropped rod, using in-core/ex-core instrumentation, in-core or loop temperature measurements

Given the following conditions:

- Unit 1 is performing 1-AOP-22.01, Rapid Downpower
- Unit 1 is at 90% power
- Group 7 CEAs are at 126 inches

Subsequently:

- Annunciator L-20, Reactor Power Range Subchannel Deviation is LIT
- Annunciator K-9, CEA Motion Inhibit is LIT
- “A” RPS Channel Hi-Hi Deviation is LIT

Which ONE of the following completes the statements below?

This is an indication of a ____(1)____ CEA.

In accordance with 1-AOP-66.01, Dropped or Misaligned CEA Abnormal Operations, IF the issue is not corrected, a downpower is required to be commenced within a MAXIMUM of ____(2)____ minutes.

A.	(1)	stuck
	(2)	10
B.	(1)	stuck
	(2)	60
C.	(1)	dropped
	(2)	10
D.	(1)	dropped
	(2)	60

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: Stuck rod is plausible due to the CEA Motion Inhibit Alarm. Per 1-OSP-66.01, CEA Exercise, Att 3, the alarms listed are indications of a stuck CEA. L-20 is not one of them. Part 2 incorrect: This is plausible since this is the time limit for actions related to a continuous high gripper voltage condition.
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 correct: 1-AOP-66, 01, states that determine the allowable time which is 60 minutes per TS 3.1.3.1.
C.	Incorrect:	Part 1 correct: Annunciator L-20 and the RPS Hi-Hi deviation actuates at 0.06 are indicative of a dropped CEA due to the change in flux resulting in a power deviation of up to 15% per the UFSAR. Part 2 incorrect: See analysis A.
D.	Correct:	Part 1 correct: Annunciator L-20 and the RPS Hi-Hi deviation actuates at 0.06 are indicative of a dropped CEA due to the change in flux resulting in a power deviation of up to 15% per the UFSAR.Part 2 correct: 1-AOP-66, 01, states that determine the allowable time which is 60 minutes per TS 3.1.3.1.

Question Number: 19

Tier: 1 Group: 2

K/A: 003 AA2.03 Dropped Control Rod / Ability to determine and interpret the following as they apply to the Inoperable / Stuck Control Rod: Dropped rod, using in-core/ex-core instrumentation, in-core or loop temperature measurements

Importance Rating: 3.6 3.8

10 CFR Part 55: (CFR 43.5 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to identify a dropped rod using instrumentation

Technical Reference: 1-ARP-L20, 1-ARP-K9, TS 3.2.4, 1-OSP-66.01

Proposed references to be provided: None

Learning Objective: PSL OPS 0702859-3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

REACTOR POWER RANGE SUBCHANNEL DEVIATION

L-20

CAUSES: Greater than or equal to 6 % deviation between Linear Range Nuclear Instrumentation channels.

Other Considerations:

- The setpoints for the high channel deviation alarm are derived from a grand average, which is the average of the sum of upper and lower subchannels in all linear range NI's in the RPS.
- The Comparator averager gets a signal from each of the Linear Range drawers summer circuit and averages it with the signals from the other 3 linear range drawers. The average signal is returned to each Linear Range comparator deviation circuit where it is compared to the real time field signal.
- There is a HI and HI HIGH alarm for each channel deviation circuit.

DEVICE:
Module W3J3 K8 and K9 relays

SETPOINT:
≥ 6%

LOCATION:
RPS Cabinets

ALARM CONFIRMATION

1. High Deviation light ON.
2. Hi High deviation light ON.
3. Linear Range Nuclear Instruments do **NOT** agree on power level.

OPERATOR ACTIONS

1. IF a large disagreement exists between Linear Range Nuclear Instrument channels, THEN **IMPLEMENT** 1-AOP-99.01, Loss of Tech Spec Instrumentation.
2. **DIRECT** I&C Department to troubleshoot and repair.
3. **DIRECT** Reactor Engineering to determine Tq per 0-OSP-64.01, Reactor Engineering Periodic Tests, Checks and Calibrations.

REFERENCES:

1. CWD 8770-B-327 SH 406
2. VTM 8770-7120, 13729

CAUSES: Any of the following:

- Inhibit from Regulating Group (IRG):
  - Any Shutdown Group CEA **NOT** withdrawn to at least 129 inches.
  - This is a Regulating Group Withdraw permissive.
- Inhibit from Shutdown Group (ISH):
  - All Regulating Group **NOT** inserted to at least 10 inches.
- Group Out of Sequence:
  - Regulating Groups do **NOT** conform to the programmed sequence.
- Group Deviation:
  - Highest and lowest CEA in any group exceeding 6 inches differential.
- Power Dependent Insertion Limit (PDIL) Violation.

CEA MOTION INHIBIT

K-9

DEVICE:	**SETPOINT:**	**LOCATION:**
CEDS	Multiple inputs	CEDS Logic Cabinet
IRG	Reg Group greater than or equal to 10 in. (low limit)	CEDS Logic Cabinet
ISH	Shutdown CEA less than or equal to 129 In.	CEDS Logic Cabinet
Group Out of Sequence (Withdraw)	Reg Group less than 87.2 in. with next higher Reg Group greater then 10 in.	CEAPDS Computer Cabinet
Group Out of Sequence (Insert)	Reg Group less than 123.5 in. with next higher Reg Group greater than 38.3 in.	CEAPDS Computer Cabinet
Group Deviation	Greater than 6 in. differential (high to low)	CEDS Logic Cabinet
PDIL Violation (CEAPDS)	Variable as a function of Q-Power	CEDS Logic Cabinet

ALARM CONFIRMATION

1. Annunciator K-21, GROUP OUT OF SEQUENCE (CEAPDS), in ALARM
2. Annunciator K-23, CEA PDIL (CEAPDS), in ALARM
3. Annunciator K-24, CEA POSITION DEVIATION MOTION BLOCK (CEAPDS), in ALARM
4. CEA position on CEA Display
5. CEA position on DCS

OPERATOR ACTIONS

NOTE

- CEA 63 RSPT is out of service and forced to 136 inches.
- CEA 63 is out of service and shall **NOT** be moved from UEL, except to trip reactor.

1. IF any CEA is misaligned or dropped, THEN **GO TO** 1-AOP-66.01, Dropped or Misaligned CEA Abnormal Operations.
2. IF CEA position indication malfunction is suspected, THEN **GO TO** 1-AOP-66.02, CEA Position Indicating System Abnormal Operations.

REFERENCES:
1. CWD 8770-B-327 SH 406, 430
2. TCC 288646

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.4 Removing CEA from Hold Bus

Start of critical step(s).

☐ **1.** Inside front of affected CEA control panel, **PLACE** CEA CIRCUIT BREAKER in ON and **VERIFY** lights indicate CIRCUIT BREAKER CLOSED.

NOTE

The Trouble Alarm LED may be flashing in Section 4.2.4, Step 2. It is acceptable to clear the Trouble Alarm LED using Section 4.2.4, Step 9, and then return to Section 4.2.4, Step 2.

☐ **2.** On affected CEA's ACTM, **VERIFY** LED status as follows:

- POWER LED is ON
- UG ENGAGED LED is ON
- All other LEDs are OFF

End of Critical Step(s)

☐ **3.** **VERIFY** K-26, CEDS TROUBLE/CONTINUOUS GRIPPER VOLTAGE HIGH, is CLEAR.

ATTACHMENT 3
ANNUNCIATORS EXPECTED DURING TESTING
(Page 1 of 2)

No.	Window Description	Initiating Condition(s) for the Annunciator
H-36	LOOSE PARTS MONITOR ALARM	• At least one of the RCS locations has exceeded threshold value and energized the associated channel alarm relay • At least one of the three Critical failure has energized the Critical Failure Relay
K-9	CEA MOTION INHIBIT	• IRG ≥ 10 inches • ISH ≤ 129 inches • Group out of sequence (withdraw) RG < 87.2 inches with next higher RG > 10 inches • Group out of sequence (insert) RG < 123.5 inches with next higher RG > 38.3 inches • Group deviation > 6-inch difference (high to low) • PDIL - variable setpoint as a function of Q-Power
K-15	GROUP OUT OF SEQUENCE (DCS)	• Any RG < 94.5 inches with next higher RG > 4.5 inches (withdraw) • Any RG < 132.5 inches with next higher RG > 41.3 inches (insert) • > 87-inch difference (lowest in RG - highest in next higher RG) when both groups > 4.5 inches and < 132.5 inches (overlap)
K-16	CEA PPDIL (DCS)	5 inches above PDIL
K-17	CEA PDIL (DCS)	Variable as a function of ΔT Power
K-18	CEA POSITION DEVIATION (DCS)	> 3.0 inches (highest to lowest in a group)
K-20	CEA WITHDRAWAL PROHIBIT	• LOC PWR DEN pretrip (2-out-of-4 logic) • HIGH POWER pretrip (2-out-of-4 logic) • HIGH RATE pretrip (2-out-of-4 logic) • TM/LP PRESS pretrip (2-out-of-4 logic)
K-21	GROUP OUT OF SEQUENCE (CEAPDS)	• Any RG < 87.2 inches with next higher RG > 10.5 inches (withdraw) • Any RG < 128 inches with next higher RG > 50.3 inches (insert) • > 87-inch difference (lowest in RG - highest in next higher RG) when both groups > 10.5 inches and < 128 inches (overlap)
K-22	CEA PPDIL (CEAPDS)	5 inches above PDIL
K-23	CEA PDIL (CEAPDS)	Variable as a function of Q-Power
K-24	CEA POSITION DEVIATION MOTION BLOCK (CEAPDS)	≥ 5.5 inches (highest to lowest in a group)
K-30	CEA POSITION DEVIATION LIMIT (DCS)	>6.7 inches (highest to lowest in a group)

ATTACHMENT 3
ANNUNCIATORS EXPECTED DURING TESTING
(Page 2 of 2)

No.	Window Description	Initiating Condition(s) for the Annunciator
K-33	CEA BLOCK CIRCUIT TEST/DEFEAT	CEA selector keyswitch in TEST or DEFEAT
L-36	CEA MOTION INHIBIT BYPASSED	• CEA GROUP INHIBIT BYPASS pushbutton depressed • CEA MOTION INHIBIT BYPASS pushbutton depressed

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

FULL LENGTH CEA POSITION

LIMITING CONDITION FOR OPERATION

3.1.3.1 The CEA Block Circuit and all full length (shutdown and regulating) CEAs shall be OPERABLE with each CEA of a given group positioned within 7.5 inches (indicated position) of all other CEAs in its group.

APPLICABILITY: MODES 1* and 2*.

ACTION:

a. With one or more full length CEAs inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.

b. With the CEA Block Circuit inoperable, within 6 hours either:

   1. With one CEA position indicator per group inoperable, take action per Specification 3.1.3.3, or

   2. With the group overlap and/or sequencing interlocks inoperable, maintain CEAs in groups 3, 4, 5 and 6 fully withdrawn and withdraw the CEAs in group 7 to less than 5% insertion and place and maintain the CEA drive system mode switch in either the "Manual" or "Off" position, or

   3. Be in at least HOT STANDBY.

c. With one full length CEA inoperable due to causes other than addressed by Action a above, but within its above specified alignment requirements and either fully withdrawn or within the long term steady state insertion limits if in CEA group 7, operation in MODES 1 and 2 may continue.

d. With one or more full length CEAs misaligned from any other CEAs in its group by more than 7.5 inches but less than 15 inches, operation in MODES 1 and 2 may continue, provided that within one hour the misaligned CEA(s) is either:

   1. Restored to OPERABLE status within its above specified alignment requirements, or

* See Special Test Exceptions 3.10.2 and 3.10.5.

ATTACHMENT 1
Dropped CEA Recovery With Reactor Critical
(Page 1 of 4)

NOTE

- TS 3.1.3.1, Full Length CEA Position, Action e, applies.
- If CEA remains inserted for an extended period of time, the following may apply additional power limitations:
  - TS 3.2.4, Azimuthal Power Tilt - T_q
  - TS 3.2.5, DNB Parameters

1. **VERIFY** the following:

- CEDS panel is in OFF.
- T-avg –T-ref deviation is stable AND less than or equal to ±2°F.
- CEA motion inhibit exists.

2. **RECORD** and **MAINTAIN** ΔT power less than or equal to power level recorded in Section 4.2, Step 4. (Section 6.1.3, Management Directive 2)

Power level to maintain: _____ %

3. **DETERMINE** allowable amount of time to restore CEA to within 7.5 inches of all other CEAs in its group, as follows:

A. **RECORD** most recent F_r^T value from Plant Physics Curve Book Figure C.3.

F_r^T _____

B. Using most recent F_r^T value and COLR Figure 3.1-1a, **DETERMINE** allowable time to align CEA to its group.

Allowable time: _____ minutes

4. **PERFORM** Attachment 5, CEA Functional Test and Operability Determination.

3. **DETERMINE** allowable amount of time to restore CEA to within 7.5 inches of all other CEAs in its group, as follows:

   A. **RECORD** most recent F_r^T value from Plant Physics Curve Book Figure C.3.

      F_r^T _____

   B. Using most recent F_r^T value and COLR Figure 3.1-1a, **DETERMINE** allowable time to align CEA to its group.

      Allowable time: _____ minutes

EO-1,2,3,4,5

F_r^T, Just What Is This?

What happens to power distribution when a rod is dropped?

F_r^T,

This is the highest amount of power that a given fuel pin theoretically could be producing. In this example, this fuel pin would be producing 165% more power than the average fuel pin in the core. Therefore we need to get the dropped CEA out of the core to evenly distribute power again.

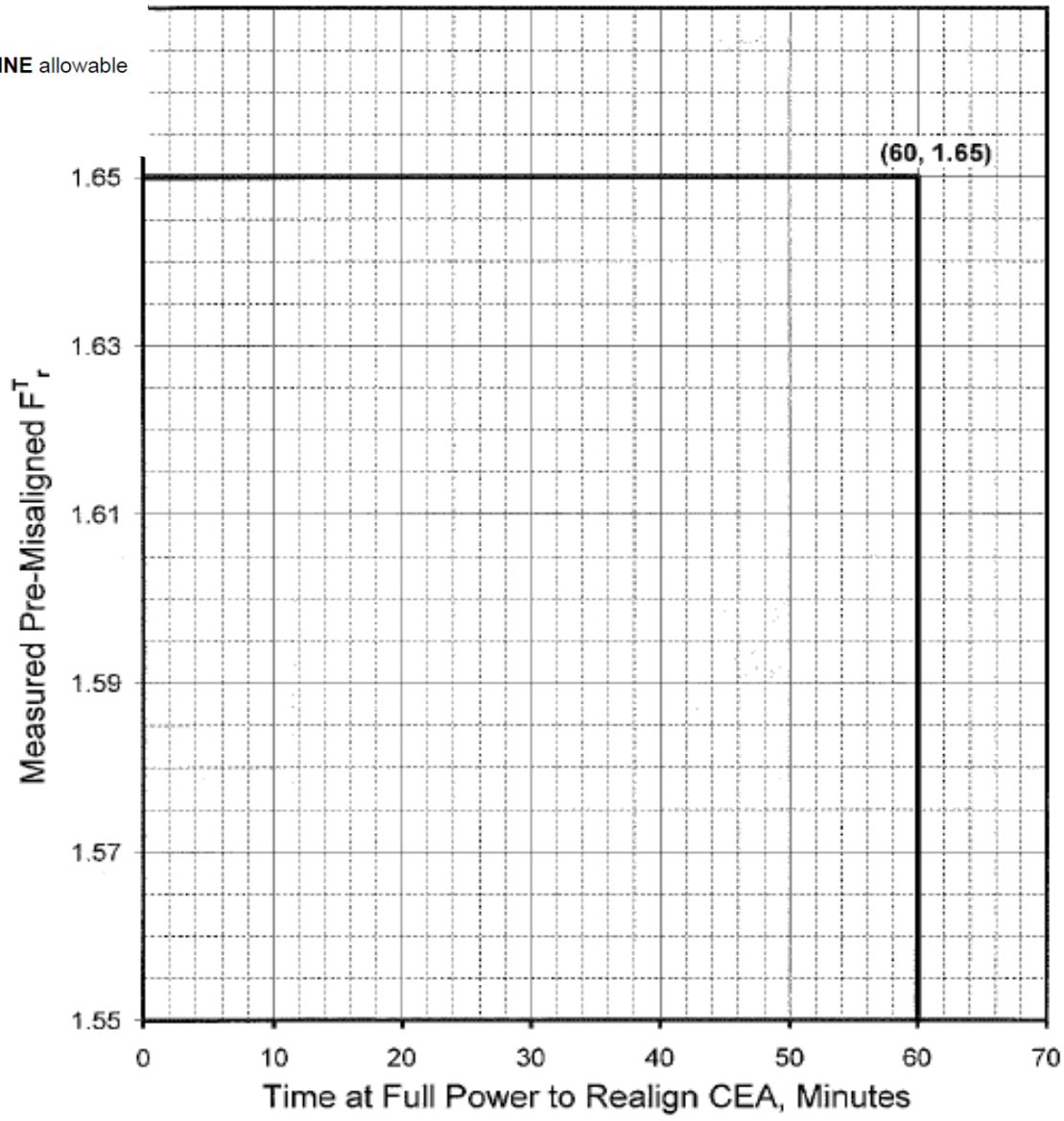


FIGURE 3.1-1a
Allowable Time to Realign CEA vs. Initial F_r^T

20. 024 AK1.02 / Knowledge of the operational implications of the following concepts as they apply to Emergency Boration: Relationship between boron addition and reactor power

Given the following conditions:

- Unit 1 is at 100% power
- 1-OSP-66.01, CEA Exercise is in progress
- While testing CEA #16, the crew determines the CEA is stuck/untrippable

Which ONE of the following completes the statements below?

IF the crew determines the SDM is inadequate, the crew is required to FIRST ____(1)____ in accordance with 1-AOP-02.02, Emergency Boration.

In accordance with TS 3.1.1.1, SHUTDOWN MARGIN - Tavg > 200 °F the crew is required to borate the RCS at a MINIMUM flowrate ≥ ____(2)____ .

A.	(1)	initiate emergency boration then trip the reactor
	(2)	40 gpm
B.	(1)	initiate emergency boration then trip the reactor
	(2)	44 gpm
C.	(1)	trip the reactor then initiate emergency boration
	(2)	40 gpm
D.	(1)	trip the reactor then initiate emergency boration
	(2)	44 gpm

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: 1-AOP-02.02, requires the emergency boration to be initiated at step 4.2.4 then step 4.2.7 states IF Emergency Boration was initiated in MODE 1 or 2 due to one or more full length CEA's inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, THEN PERFORM the following: A. TRIP the reactor and Turbine B. GO TO 1-EOP-01, Part 2 correct: This is the correct flowrate IAW 3.1.1.1 The SHUTDOWN MARGIN shall be within the limits specified in the COLR. APPLICABILITY: MODES 1, 2*, 3 and 4. ACTION: With the SHUTDOWN MARGIN not within limits immediately initiate and continue boration at > 40 gpm of greater than or equal to 1900 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.
B.	Incorrect:	Part 1 correct: See analysis A Part 2 incorrect: This is the flowrate of 1 CCP, it is plausible that the applicant believe that 1 CCP is the Minimum flowrate required.
C.	Incorrect:	Part 1 incorrect: This is plausible because this is the order in SPTAs for a CEA not fully inserted. Additionally, AOPs do provide direction to "trip the reactor" then perform an action described in the AOP. For example, conditions are met to secure an RCP, the RCP AOP would direct the reactor tripped, THEN the securing the affected RCP.Part 1 correct: IAW TS 3.1.3.1, this is required within 1 hour. Part 2 correct: See analysis A.
D.	Incorrect:	Part 1 correct: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 20

Tier: 1 Group: 2

K/A: 024 AK1.02 / Knowledge of the operational implications of the following concepts as they apply to Emergency Boration: Relationship between boron addition and reactor power

Importance Rating: 3.6 3.9

10 CFR Part 55: (CFR 41.8 / 41.10 / 45.3)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the relationship between boron addition and reactor power

Technical Reference: TS 3.1.3.1, 1-AOP-02.02

Proposed references to be provided: None

Learning Objective: PSL OPS 0702859-3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - T_{avg} > 200 °F

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be within the limits specified in the COLR.

APPLICABILITY: MODES 1, 2*, 3 and 4.

ACTION:

With the SHUTDOWN MARGIN not within limits immediately initiate and continue boration at ≥ 40 gpm of greater than or equal to 1900 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be within the COLR limits:

a. Within one hour after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is not fully inserted, and is immovable as a result of excessive friction or mechanical interference or is known to be untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable CEA(s).

b. When in MODES 1 or 2#, in accordance with the Surveillance Frequency Control Program by verifying that CEA group withdrawal is within the Power Dependent Insertion Limits of Specification 3.1.3.6.

c. When in MODE 2## at least once during CEA withdrawal and in accordance with the Surveillance Frequency Control Program until the reactor is critical.

d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of e below, with the CEA groups at the Power Dependent Insertion Limits of Specification 3.1.3.6.

---

* See Special Test Exception 3.10.1.

\# With K_{eff} ≥ 1.0.

\## With K_{eff} < 1.0.

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

FULL LENGTH CEA POSITION

LIMITING CONDITION FOR OPERATION

3.1.3.1 The CEA Block Circuit and all full length (shutdown and regulating) CEAs shall be OPERABLE with each CEA of a given group positioned within 7.5 inches (indicated position) of all other CEAs in its group.

APPLICABILITY: MODES 1* and 2*.

ACTION:

a. With one or more full length CEAs inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.

b. With the CEA Block Circuit inoperable, within 6 hours either:

1. With one CEA position indicator per group inoperable, take action per Specification 3.1.3.3, or

2. With the group overlap and/or sequencing interlocks inoperable, maintain CEAs in groups 3, 4, 5 and 6 fully withdrawn and withdraw the CEAs in group 7 to less than 5% insertion and place and maintain the CEA drive system mode switch in either the "Manual" or "Off" position, or

3. Be in at least HOT STANDBY.

c. With one full length CEA inoperable due to causes other than addressed by Action a above, but within its above specified alignment requirements and either fully withdrawn or within the long term steady state insertion limits if in CEA group 7, operation in MODES 1 and 2 may continue.

d. With one or more full length CEAs misaligned from any other CEAs in its group by more than 7.5 inches but less than 15 inches, operation in MODES 1 and 2 may continue, provided that within one hour the misaligned CEA(s) is either:

1. Restored to OPERABLE status within its above specified alignment requirements, or

* See Special Test Exceptions 3.10.2 and 3.10.5.

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN - T_{avg} > 200 °F

LIMITING CONDITION FOR OPERATION

3.1.1.1 The SHUTDOWN MARGIN shall be within the limits specified in the COLR.

APPLICABILITY: MODES 1, 2*, 3 and 4.

ACTION:

With the SHUTDOWN MARGIN not within limits immediately initiate and continue boration at ≥ 40 gpm of greater than or equal to 1900 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be within the COLR limits:

a. Within one hour after detection of an inoperable CEA(s) and at least once per 12 hours thereafter while the CEA(s) is inoperable. If the inoperable CEA is not fully inserted, and is immovable as a result of excessive friction or mechanical interference or is known to be untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable CEA(s).

b. When in MODES 1 or 2#, in accordance with the Surveillance Frequency Control Program by verifying that CEA group withdrawal is within the Power Dependent Insertion Limits of Specification 3.1.3.6.

c. When in MODE 2## at least once during CEA withdrawal and in accordance with the Surveillance Frequency Control Program until the reactor is critical.

d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading, by consideration of the factors of e below, with the CEA groups at the Power Dependent Insertion Limits of Specification 3.1.3.6.

---

* See Special Test Exception 3.10.1.

\# With K_{eff} ≥ 1.0.

\## With K_{eff} < 1.0.

cooldown by injecting the charging flow directly into the pressurizer through the selected auxiliary spray valve.

The charging pumps can be lined up to discharge to the HPSI header. This lineup provides:

- an alternate means of borating if the normal lineup is out of service,
- a means to functionally test the safety injection to RCS check valves,
- a boration flowpath in modes 5 and 6,
- an alternate Unit 1 hot leg injection flowpath.

The Reactor Coolant Pumps at St. Lucie are equipped with mechanical seals on the pump shaft. When operating at normal reactor coolant temperatures these seals require cooling in order to prevent damage to the seals and to prolong seal life. The Component Cooling Water system is the primary means of cooling the Reactor Coolant Pump (RCP) seals. A complete discussion of the RCP seals can be found in 0711202 "Reactor Coolant Pumps."

The major components associated with the normal charging flowpath to be described include:

1. Charging Pumps and Auxiliary Equipment
2. Regenerative Heat Exchanger
3. Control Valves

Charging Pumps and Auxiliary Equipment

The charging pumps are credited as supporting the Emergency Core Cooling System (ECCS) in delivering high pressure flow during a Small Break Loss of Coolant Accident (SBLOCA).

Each unit has three triplex positive displacement plunger pumps with a combined capacity of 132 gpm (44 gpm per pump) and a discharge pressure of 2475 [2750] psig. (Refer to Figures 4 and 5).

1.0 PURPOSE

The purpose of this procedure is to provide instructions to inject concentrated boric acid solution into the Reactor Coolant System (RCS) via the charging pumps to ensure SHUTDOWN MARGIN requirements are met.

2.0 ENTRY CONDITIONS

2.1 Indications

Any of the following conditions exist:

- Unanticipated or uncontrolled RCS cooldown in MODES 1 & 2, following a reactor trip, or in MODES 3 & 4 as indicated by:
  - Uncontrolled lowering in RCS temperature.
  - Uncontrolled lowering in pressurizer pressure or level.
  - Uncontrolled lowering in secondary steam pressure.
- Unexplained or uncontrolled reactivity rise as indicated by:
  - Abnormal rise in RCS temperature or Reactor power.
  - Abnormal rise in Reactor power or count rate when shut down.
- Loss of shutdown margin due to excessive CEA insertion as indicated by:
  - Power dependent insertion alarm (DCS).
  - Power dependent insertion alarm (CEAPDS).
- One or more CEA(s) **NOT** fully inserted following a Reactor Trip as indicated by:
  - The CEA Core Mimic Lower Electrical Limit lights (green) indicate One or more CEA(s) **NOT** fully inserted.
  - The CEA Core Mimic Dropped Rod lights (amber) indicate One or more CEA(s) **NOT** fully inserted.
  - CEAPDS indicates One or more CEA(s) **NOT** fully inserted.
- One or more full length CEA(s) inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable in MODE 1 or 2.

2.1 Indications (continued)

- Boration to ensure required shutdown margin is maintained as directed by the Unit Supervisor

2.2 <u>Annunciators</u>

- K-17, CEA PDIL (DCS)
- K-23, CEA PDIL (CEAPDS)

3.0 EXIT CONDITIONS

- RCS cooldown and/or reactivity excursion has been terminated.

AND

- SHUTDOWN MARGIN has been restored to within limits specified in COLR.

INSTRUCTIONS	CONTINGENCY ACTIONS

4.0 OPERATOR ACTIONS

4.1 Immediate Operator Actions

None

4.2 Subsequent Operator Actions

NOTE

- This procedure may contain steps that could adversely affect reactivity. Proper consideration and appropriate briefings shall occur prior to performance of steps that could challenge reactivity.
- The following information is posted as an Operator Aid at RTGB-105 Panel "M". Any revision to this section of the procedure shall verify the validity of the Operator Aid and, if changes are necessary an assignment to Ops Support Labeling Specialist to update and install revised Operator Aids must be initiated.

☐ **1.** **VERIFY** at least one charging pump is running.

1.1 **START** at least one charging pump.

NOTE

The MAKEUP MODE SELECTOR switch is required to be in MANUAL prior to switching the Boric Acid Pump control switches to preclude pump breaker trips.

☐ **2.** **VERIFY** the MAKEUP MODE SELECTOR switch is in MANUAL.

2.1 **PLACE** the MAKEUP MODE SELECTOR switch in MANUAL.

☐ **3.** **ENSURE** V2525, BORON LOAD CONTROL VALVE is CLOSED.

3.1 **GO TO** Section 4.2, Step 4.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2 Subsequent Operator Actions (continued)

NOTE

Both Boric Acid Pumps are required to be placed in service when the combined Boric Acid Makeup Tank volumes are being credited as a borated water source. Otherwise, the pump associated with the Boric Acid Makeup Tank being credited as the borated water source should be started.

☐ **4.** **PERFORM** the following to Emergency Borate using V2514, EMERGENCY BORATE:

4.1 **GO TO** Section 4.2, Step 5.

A. **START** at least one of the following:

- 1A BORIC ACID PUMP
- BORIC ACID PUMP 1B

B. IF 1A BORIC ACID PUMP was started,
THEN **CLOSE** V2510, BA TANK 1A RECIRC VALVE.

C. IF BORIC ACID PUMP 1B was started,
THEN **CLOSE** V2511, BA TANK 1B RECIRC VALVE.

D. **OPEN** V2514, EMERGENCY BORATE.

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2 Subsequent Operator Actions (continued)

NOTE

Both Boric Acid Gravity Feed valves are required to be placed in service when the combined Boric Acid Makeup Tank volumes are being credited as a borated water source. Otherwise, the Gravity Feed valve associated with the Boric Acid Makeup Tank being credited as the borated water source should be opened.

☐ **5.** IF unable to Emergency Borate using V2514,
THEN **PERFORM** the following:

5.1 **GO TO** Section 4.2, Step 6.

A. **STOP** the running BORIC ACID PUMPS.

B. **OPEN** at least one of the following:

- V2508, BA GRAVITY 1B
- V2509, BA GRAVITY 1A

C. **CLOSE** V2501, VCT OUTLET VALVE.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2 Subsequent Operator Actions (continued)

☐ **6.** IF the Boric Acid Makeup Tanks are unavailable
OR both Gravity Feed valves failed to OPEN,
THEN **PERFORM** the following:

A. **OPEN** V2504, REFUEL WATER TO CHARGING PUMP.

B. **ENSURE** V2501, VCT OUTLET VALVE, CLOSED.

C. **CLOSE** V2508, BA GRAVITY 1B.

D. **CLOSE** V2509, BA GRAVITY 1A.

E. **CLOSE** V2514, EMERGENCY BORATE.

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2 Subsequent Operator Actions (continued)

7. IF Emergency Boration was initiated in MODE 1 or 2 due to one or more full length CEA's inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, THEN **PERFORM** the following:

A. **TRIP** the reactor and Turbine

B. **GO TO** 1-EOP-01, Standard Post Trip Actions.--

☐ **8.** IF all of the following conditions exist:

- Unit 1 is in MODE 3 thru 6
- SIAS BLOCKED
- Emergency Boration is **NOT** available,

THEN **VERIFY** at 15 minute intervals that SFSC criteria are met per Low Mode AOP for the current plant conditions.:

8.1 **IMPLEMENT** Low Mode AOP for current plant conditions.

☐ **9.** **DIRECT** Chemistry to sample the RCS for Boron concentration.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS

NOTE

- Section 4.0, Step 1 and Section 4.0, Step 2 are immediate actions and satisfy Reactivity Control.
- An ATWS may require entry into E-Plan categories SS2 or SA2.
- Steps designated with an * may be performed non-sequentially or are to be performed continuously.

☐ **1.** **VERIFY** reactor trip:

- Reactor power LOWERING
- Startup Rate NEGATIVE
- All CEAs are fully INSERTED
- **NO** dilution is in progress

1.1 **PERFORM** the following:

A. IF reactor trip breakers are CLOSED, THEN **INSERT** CEAs by any of the following methods:

- Manually **TRIP** the reactor.
- **DEENERGIZE** the CEDM MG sets by opening both of the following breakers:
  - LC 1A2, Bkr 1-40207, CEA Drive MG set #1A
  - LC 1B2, Bkr 1-40507, CEA Drive MG set #1B
- **OPEN** TCB-1 through TCB-8, at Rx Trip Swgr.

STEP 1 CONTINUED ON NEXT PAGE

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

1. (continued)

B. IF any CEA is **NOT** fully INSERTED, THEN **INITIATE** emergency boration to achieve adequate SDM.

C. IF a dilution is in progress, THEN **STOP** the dilution.

21. 037 AK3.07 / SGTL / Knowledge of the reasons for the following responses as they apply to the Steam Generator Tube Leak: actions contained in EOP for S/G tube leak. Note to PSL—please consider “EOP” as “any procedure (abnormal or emergency) that mitigates a steam generator tube leak condition.”

Given the following conditions:

- 1B Steam Generator Tube Rupture has occurred
- 1 RCP in each loop is running
- 1B S/G pressure is 900 psia
- RCS Thot is 450 °F
- The crew is performing 1-EOP-04 Step 11. A, Depressurize the RCS in preparation for isolating the affected S/G

In accordance with 1-EOP-04, Steam Generator Tube Rupture, the RCS pressure band should be 850 psia to ___(1)___.

The reason for the UPPER pressure limit is to ___(2)___.

A.	(1)	930 psia
	(2)	prevent lifting a secondary safety valve
B.	(1)	930 psia
	(2)	allow control of ruptured S/G level to prevent overfill
C.	(1)	950 psia
	(2)	prevent lifting a secondary safety valve
D.	(1)	950 psia
	(2)	allow control of ruptured S/G level to prevent overfill

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 is correct. The EOP step has RCS pressure limitation of 930 psia, based upon current steam generator pressure of 900 psia, the applicant must know this is more limiting RCS pressure than the 50 psia difference that is approximately equal to the isolated steam generator pressure, it will minimize the loss of primary fluid to the secondary and the possibility of overfilling the steam generator. Part 2 is correct. One of the RCS pressure limitations of the step is 930 psia. The reason for this limitation is to prevent lifting the secondary safety valve.
B.	Incorrect:	Part 1 is correct – see analysis "A" Part 2 is incorrect but plausible. The basis for maintaining RCS pressure than the 50 psia difference that is approximately equal to the isolated steam generator pressure, it will minimize the loss of primary fluid to the secondary and the possibility of overfilling the steam generator.
C.	Incorrect:	Part 1 is incorrect but plausible. Based upon the initial conditions, the operator is directed to maintain RCS pressure within 50# of S/G pressure not to exceed 930 psia. The maximum upper limit would be 950 psia if the applicant added the 50 psia. Part 2 is correct, see analysis "A".
D.	Incorrect:	Part 1 is incorrect but plausible, See analysis "C" Part 2 is incorrect but plausible, See analysis "B"

Question Number: 21

Tier: 1 Group: 2

K/A:
037 AK3.07 / SGTL / Knowledge of the reasons for the following responses as they apply to the Steam Generator Tube Leak: actions contained in EOP for S/G tube leak. Note to PSL—please consider "EOP" as "any procedure (abnormal or emergency) that mitigates a steam generator tube leak condition."

Importance Rating: 4.2 4.4

10 CFR Part 55: (CFR 41.5 / 41.10 / 45.6 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the reasons for actions contained in the EOP for SG Tube Leak Event

Technical Reference: 1-EOP-04

Proposed references to be provided: None

Learning Objective: PSL OPS 0702825-12

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

NOTE

RCP operation is desirable while depressurizing the RCS during a SGTR event.

- RCP operation takes precedence over equalizing primary and secondary pressures.
- Monitor RCPs for cavitation as the NPSH curve is approached and exceeded.
- Maintain minimum subcooling within the limits of Figure 1A.

☐ **11.** **DEPRESSURIZE** the RCS in preparation for isolating the affected S/G:

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

11. (continued)

NOTE

If the PORVs are unavailable, then only one RCGVS vent path is required. If venting is required, then the preferred venting flow path order is as follows:

- PORVs when available
- Pzr vent to quench tank
- Pzr vent to containment atmosphere
- Pzr vent to RX Head Vent accumulator - last resort

A. **ESTABLISH** and **MAINTAIN** pressurizer pressure to meet all of the following criteria:

- Within limits of Figure 1A, RCS Pressure Temperature
- Less than 930 psia
- Greater than minimum RCP NPSH Requirement per Figure 1A, RCS Pressure Temperature
- Within 50 psia of the most affected S/G pressure

A.1 IF pressurizer pressure can **NOT** be lowered and maintained within the specified criteria, THEN **OPERATE** the PORVs or RCGVS to reduce pressure as follows:

1. **ENSURE** pressurizer level is less than 68%.

2. **PERFORM** the following to cycle the PORVs:

a. **OPEN** PORV Block valves.

b. **ENSURE** PORV control switches are in OVERRIDE:

- V1402
- V1404

c. **PULL** at least **TWO** RPS Hi Pzr Press bistables.

EPG Step: 10

Depressurize the RCS in preparation for isolating the affected SG

Intent

The intent of this step is to establish control of RCS pressure.

The general goals associated with RCS pressure control are: providing subcooling to support the core heat removal process, avoiding overpressure situations for PTS and RT NDT considerations, minimizing the pressure differential between the steam generator and the RCS in SGTRs to minimize the leakage, deliberately creating a primary to secondary differential pressure to establish backflow to control SG level rise or reduce SG pressure/temperature, and controlling RCS pressure below the main steam safety valve (MSSV) lift pressure to prevent uncontrolled release of radioactivity to the environment.

Method

Pressurizer pressure may be reduced by any of the following:

1. Operation of Pressurizer sprays and heaters.
2. Control of charging pumps, letdown and HPSI pumps (if HPSI Stop/Throttle criteria are met).
3. As a last resort, by operating the [PORV(s) or pressurizer vent(s)]. This method would likely be chosen in the event that main and auxiliary pressurizer spray are not available and it is necessary to lower pressurizer pressure. Pressure control by this method requires close operator attention, because the resultant pressure decrease when the PORV(s) is opened can be dramatic. In addition, the operator must closely monitor RCS inventory control and pressure/ temperature conditions in the RDT/containment while utilizing this method.

Maintaining the RCS pressure within the PT limits and approximately equal to the isolated steam generator pressure [±50 psi] and below (O02) will minimize the loss of primary fluid to the secondary side and the possibility of overfilling the isolated SG. This action will minimize the potential for release of radiation to the environment by minimizing RCS to steam generator leakage.

Maintaining RCS pressure approximately equal to or less than the affected SG pressure allows for the backflow of secondary water into the RCS which provides several operational benefits. These benefits include:

1. SG level can be maintained within the indicating range,
2. by controlling SG level, the probability of filling the main steam piping with water is greatly reduced,
3. use of the blowdown system for SG level control can be minimized, thus minimizing contamination of the secondary
4. depressurization of the isolated SG can be performed without steaming to the condenser or to the atmosphere,
5. less secondary makeup water is required for the RCS cooldown.

Boron dilution of the RCS will occur due to unborated secondary water flowing through the tube rupture into the RCS. However, under most circumstances, this dilution will not threaten the maintenance of (P03).

An important point that the SGTR event strategy is to maintain or restore forced circulation as soon as possible to minimize the adverse affects of RCS dilution. On the other hand, maintaining adequate NPSH for RCP operation may cause the operator to hold RCS pressure above secondary pressure until the RCS is cooled down beyond the SG isolation temperature. If continued RCP operation is possible, the requirement to maintain NPSH takes precedence over the strategy of equalizing primary pressure and secondary pressure.

During the forced circulation cooldown process the isolated steam generator may cool faster in the lower regions (see Figure E4-8). The cooling of the isolated SG steam space will significantly lag in the cooldown and cause the fluid in the lower regions to be subcooled. If the tube rupture is located in this subcooled region, as it is most likely to be, then the primary fluid can be at the same pressure as the secondary fluid and still be subcooled. However the continued depressurization of the primary during the cooldown will now be limited by the ability to depressurize the isolated SG.

During natural circulation cooldown conditions the isolated steam generator will not cool unless there is a transfer of mass in the isolated SG. This complicates RCS pressure control during the cooldown. It is desirable to cool the RCS such that the tube bundle region of the affected SG remains subcooled. Voiding in the tube bundle region can be expected and may result in the region becoming a pressurizing source for the RCS. Maintaining the presence of subcooled liquid in affected loop will be a complicated process under natural circulation conditions. Forced circulation conditions are much more desirable and if possible should be maintained or restored. During natural circulation conditions the cooldown and depressurization of the RCS will be limited to the operator's ability to control the conditions of the isolated steam generator.

Sequence

This step is sequenced prior to the isolation of the most affected steam generator, after cooling down T-hot to less than (O02).

Plant Parameters

Steam Generator pressure less than the lowest MSSV lift setpoint

The bases for the engineering limit is the lift setpoint of the lowest MSSV, minus lift tolerance. The intent of the application is prevent lifting an MSSV which then sticks open, resulting in an uncontrolled release to the environment, because the operator can do nothing to stop it. The operational limit, [950 psia] was derived by taking the lowest MSSV setting [1000 psia.], subtracting the lift tolerance, typically ±1%, [± 10 psi], and additional operational margin [40 psi].

22.

051 AK3.01 / Loss of Condenser Vacuum / Knowledge of the reasons for the following responses as they apply to the Loss of Condenser Vacuum: Loss of steam dump capability upon loss of condenser vacuum

Given the following conditions:

- Unit 1 is at 11% power
- The turbine is being rolled for a start up
- The condenser has developed a small vacuum leak
- Condenser back pressure is 2.7 inches of Hg. and slowly rising
- The crew has entered 1-AOP-12.01, Loss of Condenser Vacuum

Which ONE of the following describes the MINIMUM backpressure setpoint at which the Steam Bypass Control System (SBCS) becomes unavailable and the basis for this setpoint?

A.	8” of Hg. absolute, protect main condenser from overpressure
B.	8” of Hg. absolute, protect low pressure turbine blades from resonance cracking
C.	12” of Hg. absolute, protect main condenser from overpressure
D.	12” of Hg. absolute, protect low pressure turbine blades from resonance cracking

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	8” of Hg. Absolute backpressure is the automatic low vacuum turbine trip setpoint
B.	Incorrect:	8” of Hg. Absolute backpressure is the MINIMUM automatic low vacuum turbine trip setpoint. (8-12” of Hg absolute) For 25% power operation (<30%) a manual turbine trip is directed at 3.5” Hg. Absolute for the reason stated in this distractor. (turbine blading resonance cracking
C.	Correct:	12” of Hg. Absolute is correct setpoint for SBCS unavailable.
D.	Incorrect:	12” of Hg. Absolute is correct setpoint for SBCS unavailable. Part 2 reason is not correct as stated in B.

Question Number: 22

Tier: 1 Group: 2

K/A: 051 AK3.01 / Loss of Condenser Vacuum / Knowledge of the reasons for the following responses as they apply to the Loss of Condenser Vacuum: Loss of steam dump capability upon loss of condenser vacuum

Importance Rating: 2.8 3.1

10 CFR Part 55: (CFR 41.8 / 41.10 / 45.6 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the loss of SBCS setpoint and its basis

Technical Reference: PSL OPS 0711406.

Proposed references to be provided: None

Learning Objective: PSL OPS 0711406 - 5

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: #21 on 2011 PSL NRC Exam

load rejection using turbine generator inputs. If the OPC signal fails, the Turbine Control System will use actual megawatts to monitor for a rate of change. The actual load signal is a diverse but redundant signal to the steam flow rate of change signal. It goes to the Quick Open 2 logic and helps to ensure that a valid load rejection has occurred prior to activating the QO signal (and fully opening all SBCS valves at power). Having this additional method for detecting a load rejection in the logic prevents a single failure (in the load rejection circuitry) from causing an inadvertent actuation. This setpoint is the same as the steam flow rate of change logic being set to detect a 16%[19%]/Min or greater load rejection.

Reactor Trip - four undervoltage relay contacts from the reactor trip buses signal a reactor trip has occurred. Two separate trip signals (i.e., Reactor Trip 1 and Reactor Trip 2) are generated within the SBCS by monitoring the four contacts in groups of two. In order to prevent an inadvertent SBCS Quick-Open actuation following a spurious (i.e., 'partial') trip signal, only closure of all four relay contacts is accepted as a valid indication of a reactor trip for the Quick-Open logic and for changing the pressure modulate setpoint to 940 psia. Only 2/2 contact closures are required for the Transfer-To-Tavg logic (Reactor Trip 1) and/or the post-trip permissive setpoint change (Reactor Trip 2). Reactor Trip breaker status can be observed on the Reactor Trip Bus mimic over the RPS panels in the control room.

Condenser Vacuum Status/Interlock - condenser vacuum inputs to the SBCS via two contact inputs from the DEH system. Each contact is actuated by a 2/3 logic (from 3 pressure transmitters) from each A or B condenser sections.

If either condenser A or B high pressure is sensed (2 of 3 greater than 12" Hg backpressure), the vacuum interlock immediately closes any open (and prevents re-opening) SBCS valves by both removal of the valve permissive signal and interruption (i.e., blocking) of the output from the M/A Station controllers. When actuated, this interlock annunciates L-24[L-4], STEAM BYPASS SYSTEM TROUBLE annunciator. Condenser vacuum status (LOW or NORMAL) is displayed on the SBCS Overview and the SBCS Inputs Display on the FW Flat Panel Display.

There is also a single condenser vacuum indication on the SBCS Overview page from PI-10-7 [7A] which also has an indicator on RTGB 101[201]. This input has no control function and is for indication only. This is a useful indicator as the Vacuum permissive is a go/no-go indication/interlock that does not provide any warning of an approaching vacuum problem.

Control Signal Outputs

The SBCS calculator generates the following:

- Pressure Setpoints Psp1 and Psp2
- Permissive Signal path

RPM or, 2) one input is Bad and the other two disagree by more than 27 rpm or, 3) all 3 inputs are Bad Quality.

- If all speed inputs indicate good quality but no two signals agree within 27 rpm, the 2/3 HI Monitor block provides protection as the median select trip logic is inhibited. The trip will occur when the second speed signal exceeds 1998 rpm.

- In the event that all 3 speed inputs fail, the ETS trip does not occur unless the OA/OPC speeds also fail.

Low Condenser Vacuum Protection

The Turbine Condenser Vacuum A and B Protection functions each process three pressure transmitter inputs and determine whether a Condenser Vacuum trip or pre-trip condition exists. The Condenser Vacuum units will be displayed as InHGA and will be labeled 'Backpressure'. A normal operating vacuum is <4 InHGA.

Condenser Vacuum Trip and Pre-Trip Logic

The three transmitters on each condenser are monitored by two sets of logic blocks. Each of these blocks can generate a trip. These logic blocks are 1) a median selector and 2) a 2/3 HI Monitor block – both of these are Ovation algorithms. The 2/3 HI Monitor block generates a trip when 2 of the 3 inputs from one condenser indicate Good Quality with pressure above the trip setpoint. The median selector will initiate a trip under either of the following conditions:

1. 2, meaning exactly 2, of the inputs indicate Bad Quality and the third indicates high condenser pressure
2. All 3 transmitters on both condensers (i.e., all six transmitters) indicate Bad Quality

When the vacuum trips are enabled, the trip setpoint varies from approximately 8.859 InHGA to 3.839 InHGA and then back to 8.859 InHGA. The Trip Limit varies with OPC Pressure according to the Siemens Trip function CT-27467 for Maximum Permissible Condensing Pressure. If the OPC Pressure is between 7.9 and 116 psig and the condenser A or B vacuum is higher than the trip limit, a 300 second (5 minute) timer begins to count down to 0. If the Trip condition remains after 300 seconds, the turbine will be tripped automatically. The Condenser pressures and trip limits are displayed on the Ovation Screen. The delayed trip is not applied to the 6 of 6 Bad Quality trip. Following a turbine trip, it is sometimes necessary to bypass the Condenser Vacuum A and B trips in order to perform a turbine trip reset. This bypass is manually selected via the Ovation Screen. This action sets the setpoint significantly higher (default 30 InHGA) than the trip setpoint which allows the trip reset to commence despite the temporary low

ORIGINAL QUESTION FROM 2011 NRC EXAM

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	051AK3.01	
	Importance Rating	2.8	

Knowledge of the reasons for the following responses as they apply to the Loss of Condenser Vacuum: Loss of steam dump capability upon loss of condenser vacuum

Proposed Question: RO 21

Given the following conditions on Unit 1:

- Reactor power is 11% power
- The turbine is being rolled for a start up
- The condenser has developed a small vacuum leak
- Condenser back pressure is 2.7 inches of Hg. and slowly rising
- The crew has entered 1-AOP-12.01, 'Loss of Condenser Vacuum'

Which ONE of the following states:

The MINIMUM backpressure setpoint at which the SBCS becomes unavailable and the basis for this setpoint?

A. 8" of Hg. absolute, protect low pressure turbine blades from resonance cracking

B. 12" of Hg. absolute, protect low pressure turbine blades from resonance cracking

C. 8" of Hg. absolute, protect main condenser from overpressure

D. 12" of Hg. absolute, protect main condenser from overpressure

Proposed Answer: D

Explanation (Optional):

A. 8” of Hg. Absolute backpressure is the MINIMUM automatic low vacuum turbine trip setpoint. (8-12” of Hg absolute) For 25% power operation (<30%) a manual turbine trip is directed at 3.5” Hg. Absolute for the reason stated in this distractor. (turbine blading resonance cracking
B. 12” of Hg. Absolute is correct setpoint for SBCS unavailable. Part 2 reason is not correct as stated above.
C. 8” of Hg. Absolute backpressure is the automatic low vacuum turbine trip setpoint.
D. Correct

Technical Reference(s): Lesson text 0711303 Main Turbine, Lube Oil, Auto Stop Oil and Gland Seal Systems. (Attach if not previously provided)

PSL OPS SYS 406 TXT SBCS

Proposed references to be provided to applicants during examination: _____

Learning Objective: PSL OPS 0702406 Obj. 3.e (As available)

Question Source: Bank # _____

Modified Bank # _____ (Note changes or attach parent)

New x

Question History: Last NRC Exam _____

Question Cognitive Level: Memory or Fundamental Knowledge _____

Comprehension or Analysis x

10 CFR Part 55 Content: 55.45 6,13

Comments:

23.

061 AK2.01 / ARM System Alarms / Knowledge of the interrelations between the Area Radiation Monitoring (ARM) System Alarms and the following: Detectors at each ARM system location

Which ONE of the following Rad Monitor Signals FAILING HIGH will automatically actuate the Unit 1 Containment Evacuation alarm?

A.	Containment High Range Radiation Monitor
B.	Containment Post-LOCA Radiation Monitor
C.	Containment Atmosphere Radiation Monitor
D.	Containment Isolation Signal (CIS) Radiation Monitor

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Containment High Rad Alarm is the other TS required RM that is located inside the containment, applicant may believe that this causes the Containment Evacuation Alarm due to the fact on Unit 2 the pre-trip is the cause of the alarm.
B.	Incorrect:	Containment Post LOCA can be used in lieu of CHRMMs but are physically located outside the containment in the RAB and will not result in a containment evacuation alarm.
C.	Incorrect:	But plausible since this monitor does monitor the containment atmosphere but it does not result in a containment evacuation alarm.
D.	Correct:	On Unit 1, Four Containment Isolation Signal (CIS) Radiation Monitors, spaced 90 degrees apart, provide continuous radiation monitoring in containment. If a 1-out-of-4 high high alarm condition is met, the containment evacuation alarm will sound.

Question Number: 23

Tier: 1 Group: 2

K/A: 061 AK2.01 / ARM System Alarms / Knowledge of the interrelations between the Area Radiation Monitoring (ARM) System Alarms and the following: Detectors at each ARM system location

Importance Rating: 2.5 2.8

10 CFR Part 55: (CFR 41.5 / 41.10 / 45.6 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the interrelations between ARM and the location of the ARM

Technical Reference: PSL OPS 0711411

Proposed references to be provided: None

Learning Objective: PSL OPS 0711411-06

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2010 NRC Exam

Comments: RO #26 on 2010 NRC Exam. Slightly modified choices to have more clear noun names and added more distractor analysis.

Front panel controls include three alarm lights with reset pushbuttons and a three-position spring-loaded function switch. The function switch allows for normal operation, trip level adjustments, and internal check signal actuation. In the CHECK position, an electric current is generated in the module to produce a mid-scale indication. Test points and adjustment potentiometers are accessible from the front panel. The test points and adjustments are recessed to prevent accidental adjustment.

They can be used as a backup source of information for determining for classifications of emergencies per EPIP-01, protective action requirements per EPIP-08, calculating off-site dose during an accident and for core damage assessment in EPIP-11.

Containment Isolation Signal Radiation Monitors (Channels 3-6)

Four Containment Isolation Signal (CIS) Radiation Monitors, spaced 90 degrees apart, provide continuous radiation monitoring in containment. If a 1-out-of-4 high high alarm condition is met, the containment evacuation alarm will sound. This alarm will sound in the Control Room for 30 seconds and then automatically silence. The alarm inside the Containment will sound until the condition clears or it is silenced in the Control Room at the radiation monitoring panels using a keyswitch. The alarm is driven by the HI-HI alarm on the Victoreen modules, and can be bypasses at the radiation monitoring panel with a key switch.

The output signals from these monitors also feed the engineered safety features logic to make up the CIS. If 2 of the 4 CIS monitors reach their preset high high alarm setpoints they will activate Containment Isolation. The monitors are located within the containment 90 foot at 90 degree intervals along the containment vessel wall. The detectors are powered by 120VAC instrument buses MA, MB, MC, & MD.

The Victoreen radiation monitors Hi-Hi level alarm is set at less than 10 R/hr (Modes 1-4), and less than 90 mR/hr (mode 6). When in Modes 1-4, Victoreen modules Hi-HI and CIS bistables are set at the same value. When in Mode 6, Victoreen modules are reset to lower values than the CIS bistables (ESFAS bistables). CIS Bistables are NOT reset to these values except during movement of recently irradiated fuel within containment (as is allowed per T.S. 3.3.3.1). A setpoint of 10 R/hr was selected based on response

Loss of offsite Power (LOOP). All other area monitors have 120VAV power supplies PP-120/121 that require manual closure of the non essential load breaker on MCC -1A/1B6 to restore power following a LOOP or SIAS (if SIAS is reset).

LOCAL AUXILIARY UNIT (REMOTE ALARM/METER)

All of the area monitors are equipped with Local Auxiliary Units except for Channels 1, 3, 4, 5, and 6. The Local Auxiliary Unit provides indication of the radiation level in the vicinity of the detector. The local auxiliary units are sometimes referred to as remote alarm/meter units.

The local auxiliary unit is driven by the Readout module for each channel and gives a visual indication of the radiation level at the associated detector on the panel meter. If any alarm (FAIL, HIGH, or HIGH-HIGH) should occur at the readout module, the local auxiliary unit will also alarm. In the alarm condition, a red light is illuminated on the local auxiliary unit front panel and an audio alarm is activated. Local auxiliary unit alarms can only be cleared at the Readout module.

Containment Post-LOCA Radiation Monitors (Channels 52 and 53)

Two (2) Containment Post-LOCA Ion Chamber Radiation Monitors provide post-accident monitoring of containment levels. They are located in the RAB on the outside of the Shield Building wall. They read up to 10^5 mR/hr and are the last resort for obtaining information for calculating off-site dose during an accident.

TECHNICAL SPECIFICATION 3.3.3.1 AREA MONITORS

There are four Area Radiation Monitoring Subsystems specifically identified in the Technical Specifications. They are collectively referred to as the Technical Specification Area Monitors. Control Room Outside Air Isolation Radiation Monitors are really area monitors, but they are recorded on the Process Radiaiton Moniotor recorder. They will be included in this discussion as area monitors even though elsewhere they may be shown as process monitors.

The four TS area monitors subsystems include:

- Containment High Range Radiation Monitors
- Containment Isolation Signal (CIS) Radiation Monitors
- Fuel Pool Area and Canal Radiation Monitors
- Control Room Outside Air Isolation Radiation Monitors

Containment High Range Radiation Monitors (Channels 58 and 59)

The two Containment High Range Radiation Monitors provide post-accident monitoring of containment radiation levels. They are located on the 90 ft. elevation of the containment 180 degrees apart. The detectors are gas filled ion chambers that are capable of detecting high intensity radiation up to 10^8 R/hr. The detector generates an analog output signal, which is sent to a Readout module in the Radiation Monitoring Panel in the Control Room. The detectors are Class IE and environmentally qualified (EQ) for post-LOCA conditions. The detectors are required by Technical specification 3.3.3.1 and are powered by PP-101/102A which will be powered automatically by the EDG 1A/1B following a loss of offsite power (LOOP). These detectors are also used in EPIP-01 for classifications of emergencies, EPIP-08 for protective action recommendations, and for offsite dose recommendations, and EPIP-11 for core damage assessment.

The readout module, (see Figure 6), accepts the signal from the detector, conditions the signal, and outputs a signal analogous to the logarithm of the detector current. This output signal is measured by an ammeter with a display in units of R/hr. Analog outputs are provided for a front panel meter, two remote meters, a remote recorder, and a date-logging system.

The readout module has two solid-state trip circuits that can be adjusted over the complete meter range. It has a self-checking failure trip that is actuated upon loss of power, high voltage, or loss of signal from the detector. Each readout module includes low-voltage regulators and a regulated high-voltage power supply.

- Control Room Outside Air Intake Radiation Monitors – Four monitoring stations

Containment Isolation Actuation Signal (CIAS) Radiation Monitors (RIM-26-3, 4, 5,& 6)

Four (4) Containment Isolation Actuation Signal (CIAS) Radiation Monitor detectors are spaced 90 degrees apart in containment and provide continuous radiation monitoring. Their associated RM-80s are located in the RAB.

Unlike most radiation monitors, the CIAS monitors have not only RMCS high and alert alarms, but they also have separate alarms (and actions) based on 1) their ESFAS bistable and 2) their RTGB-206 OTEK bistable. If two of the four CIAS monitors reach their preset high alarm setpoint (the ESFAS bistable setpoint), they will initiate a Containment Isolation Actuation Signal (CIAS). Each monitoring station uses a gamma sensitive IC detector. One out of four detectors in pretrip (Alert) (on the OTEKs on RTGB-206) will actuate the containment evacuation alarm and the CNTMT RAD HIGH CIS CHANNEL PRE TRIP annunciator (P-15). Each CIAS RM is powered from an instrument power supply.

The setpoints are ≤ 10R/hr in Modes 1-3 and ≤ 90 mR/hr in Mode 6 (if the ESFAS bistables are set as if moving recently irradiated fuel). RMCS designates these monitors as GAG-001, 002, 003, & 004. The CIAS monitors are required by plant Technical Specifications 3.3.2, 3.3.3.1, & 3.9.9 and are used in EPIP-01 for classifications of emergencies. These monitors are powered by 120VAC instrument buses MA, MB, MC, & MD and as such will be available post loss of offsite power (LOOP).

Spent Fuel Pool Monitors (RIM-26-7, 8, 9, 10, 11, &12)

The Spent Fuel Pool Monitors use GM detectors to indicate problems around the Spent Fuel Pool. They are grouped into 2 groups, group SA 7, 9, & 11and group SB 8,10, & 12, each having 3 channels. Refer to the Functional Diagram (Figure 4) for the arrangement. Redundant logic assemblies provide alarm output signals when either of the two circuits (groups) have high radiation alarm signals. Two out of three channels (in the same group) alarming will initiate a FHB and Fuel ventilation transfer to the Shield Building Ventilation System (SBVS). By starting the SBV fans and stopping the FHB exhaust fan This action “scrubs” the spent fuel pool exhaust through the SBVS HEPA and Charcoal Filters prior to discharge to the atmosphere. The ventilation component actuation sequence is discussed in the RAB Ventilation Lesson Text 0711601. The setpoint for alarm and actuation is ≤ 15mR/hr. RMCS designates these

monitors as GAG-007, 008, 009, 010, 011, & 012. The SFP monitors are required by plant Technical Specification 3.3.3.1 and are used in EPIP-01 for classifications of emergencies. These monitors are powered by 120VAC PPs-246/247 (MCC-2A6/MCC-2B6) and as such will be available post loss of offsite power (LOOP).

Containment High Range Radiation Monitors (RIM-26-40 & 41)

The two (2) Containment High Range Post-Accident Radiation Monitors provide post-accident monitoring of containment levels. They are located on the 90 ft elevation of the containment spaced 180 degrees apart. The detectors are gas filled gamma ion chambers which are capable of detecting high intensity radiation up to 10^7 R/hr. These RMs do not have an initiating alarm setpoint They are also used as a backup source of information for calculating off-site dose and for core damage during an accident using EPIP-11. RMCS designates these monitors as AAG-640 & 641. The CHR monitors are required by plant Technical Specification 3.3.3.1 and are used in EPIP-01 for classifications of emergencies, EPIP-08 for protective action recommendations, for offsite dose assessment, and EPIP-11 for core damage assessment. These monitors are powered by 120VAC PPs-268/269 and as such will be available post loss of offsite power (LOOP).

Both monitors utilize a Digital High Range Monitoring System. Each digital high range monitoring system consists of an RD-23 gamma radiation detector (ion chamber), an RM-80 microprocessor, an RM-23 control/display module, and an RL-10 local indication/alarm assembly.

Containment Post-Accident (LOCA) Radiation Monitors (RIM-26-38 &39)

Additionally, two (2) Containment Post-Accident Radiation Monitors, located outside the Containment Building on the RAB 62 foot and the FHB 85 foot roof elevations, also provide post-accident monitoring of containment levels. They read up to 10^5 mR/hr and are the last resort for obtaining information for calculating off-site dose during an accident. These monitors are also used in EPIP-01 for classifications of emergencies. These monitors are high-range area monitors consisting of an RD-8 ion chamber detector assemblies. The RM-80 microprocessors used with the monitors are provided with operate, alert alarm, and high alarm indicating lamps, an alarm horn and alarm acknowledge pushbutton. The RM-80 microprocessor is also provided with an analog meter to provide radiation information in mR/hr. RMCS designates these monitors as

The pumping system can be electrically controlled from the Radiation Monitoring Panel or locally at the Condenser Air Ejector Sampler. The pumping system motor may be started and stopped from either control panel when the power switches on both panels are ON. If the power switch on either panel is OFF, the motor cannot be started from either panel. Other control panel indicators include a white power ON light, a red PUMP ON light and an amber FLOW ALARM light. The flow alarm will be actuated if either a high flow condition (low vacuum) or a low flow condition (high vacuum) should occur.

The pumping system air flow rate is adjustable via the bleed air valve located at the pump inlet. PCM 00056 provides an alternate sample point for the CAE monitor. The original sample point is from a common discharge header for the SJAE and the gland steam condenser. The alternate sample point allows samples to be taken only from the SJAE without dilution from the gland steam condenser.

PCM-91-507-1 installed a 55 gallon drum as a moisture separator on the inlet side of the Condenser Air Ejector radiation monitor. In the original configuration, water would accumulate in the detector chamber and render the monitor inoperable. This required frequent draining and purging of the detector chamber. These problems were defeating the use of the Condenser Air Ejector monitor as an effective early warning device for a steam generator tube rupture. Water is drained from the drum via a loop seal that accommodates small changes in sample pressure without drawing air back into the sample lines. This modification has no effect on the operation or safety function of the Condenser Air Ejector Radiation Monitor. Channel 35 is powered by 120VAC PP-120 and will be repowered post LOOP or SIAS (after SIAS is reset) after the MCC-1A6 non-essential load breaker is closed. The Condenser Air Ejector Radiation Monitor is required by section 3.3.3.10 of the ODCM and is used in EPIP-01 for classifications of emergencies.

Containment Atmosphere Monitors (Channels 31 and 32)

The Containment Atmosphere Monitors provide a continuous indication in the control room of the particulate and gaseous activity levels inside containment (Channel 31 and 32 respectively). An increase in activity inside containment indicates leakage of reactor coolant or the leakage of a contaminated secondary fluid system into the containment. This monitor is required by Tech. Specs 3.3.3.1 (RMS instrumentation) and 3.4.6.1

(RCS leakage detection). Both the particulate and gas channels are displayed on the Yokagawa process recorder.

The containment sample is obtained from inside containment through an isokinetic nozzle. The sample line then splits and the sample is directed through the particulate detector on one monitor skid (RM-26-31) and through the gas detector on the other monitor skid (RM-26-32) located on the RAB 19.5' elevation (Figure 18). The sample is then returned to the containment through a single sample return line. The Containment Atmosphere Monitors use solid state Silicon diode detectors.

Figure 19 shows the containment atmosphere sample flowpath from containment, through containment isolation valves 26-1, 26-2, 26-3 and 26-4, to the containment atmosphere monitor; then, through the containment isolation valves 26-5 and 26-6 to the containment atmosphere. These valves automatically close on CIS or loss of Instrument air. The valves are operated by two gang-switches on RTGB 105. CS 320-1 operates FCVs 26-1, 26-3 and 26-5 and CS 320-2 operates FCVs 26-2, 26-4 and 26-6. Only the return FCVs 26-5 and 26-6 may be opened with CIS present. If FCVs 26-1, 2, 3 and 4 go closed, the pumps will burn up. The reason FCVs 26-5 and 26-6 can be reopened is to allow PASS sample return. FCVs 26-5 and 26-6 have their position indication on the vertical part of RTGB-106. FCVs 26-1 and 26-3 and FCVs 26-2 and 26-4 have their valve position indicated on their respective control switch.

Power sources, indicating devices, and recorders are located on the control room radiation monitoring panel. The detectors are powered by 120VAC PP-120/121 and the recorders by PP-134. The sample pumps are powered by 120VAC PP-120 can also be operated locally. PPs-120/121 require the non essential load breaker to be closed to restore power following a LOOP or SIAS (after SIAS is reset).

24. 068 AK2.01 / Control Room Evac / Knowledge of the interrelations between the Control Room Evacuation and the following: Auxiliary shutdown panel layout

Given the following conditions:

- Unit 2 has evacuated the Control Room due to the presence of toxic fumes
- All Operator actions in the Control Room were performed prior to evacuation
- Critical actions from Appendix A through D of 2-ONP-100.02, Control Room Inaccessibility have been completed
- RCO A is maintaining Hot Standby conditions at the Remote Shutdown Panel

Which ONE of the following describes how RCS pressure is controlled and how subcooling is monitored?

Control pressurizer pressure in accordance with 2-ONP-100.02, Figure 1. RCS Pressure/Temperature, by utilizing Pressurizer ___(1)____.

Determine subcooling margin using 2-ONP-100.02, Figure 1, using Reactor Coolant System ____(2)____ and Pressurizer pressure.

A.	(1)	Backup Heaters ONLY
	(2)	Thot
B.	(1)	Backup Heaters ONLY
	(2)	Tcold + 50 °F
C.	(1)	Proportional and Backup Heaters
	(2)	Thot
D.	(1)	Proportional and Backup Heaters
	(2)	Tcold + 50 °F

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: See Analysis B. Part 2 incorrect: There's no value for Thot displayed on the HSDCP - must use Tcold + 50°F to determine subcooling. Thot would be used to verify subcooling margin with RCPs running per EOP-99, Fig 1A.
B.	Correct:	Part 1 correct: Only the backup heaters can be controlled from the HSDCP. Part 2 correct: There's no value for Thot displayed on the HSDCP - must use Tcold + 50°F to determine subcooling.
C.	Incorrect:	Part 1 incorrect: No proportional heater control on the HSDCP. This is plausible since Unit 2 does have proportional heater control. Part 2 incorrect: Also, there's no value for Thot displayed on the HSDCP - must use Tcold + 50°F to determine subcooling. Thot would be used to verify subcooling margin with RCPs running per EOP-99, Fig 1A.
D.	Incorrect:	Part 1 incorrect: No proportional heater control on the HSDCP. This is plausible since Unit 2 does have proportional heater control. Part 2 incorrect: Also, there's no value for Thot displayed on the HSDCP - must use Tcold + 50°F to determine subcooling

Question Number: 24

Tier: 1 Group: 2

K/A: 068 AK2.01 / Control Room Evac / Knowledge of the interrelations between the Control Room Evacuation and the following: Auxiliary shutdown panel layout

Importance Rating: 3.9 4.0

10 CFR Part 55: (CFR 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the HSDCP layout

Technical Reference: 2-ONP-100.02 Control Room Inaccessibility

Proposed references to be provided: None

Learning Objective: PSL OPS 0702846-01.b

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: #24 on 2012 NRC RO Exam: Enhanced stem to be more concise and enhanced distractor analysis.

APPENDIX C
US SUBSEQUENT ACTIONS
(Page 2 of 9)

2. **POSITION** the following components as indicated:

A. 2A3 480V LOAD CENTER, 2A Pressurizer Heater Bus, (East side cable spread room): (10 min)

BREAKER CUBICLE	COMPONENT NAME	CRI TAG #	POSITION	CHECK
2-40302	Pressurizer Backup Heater Bank B-1	1	ISOLATE	
2-40304	Pressurizer Backup Heater Bank B-3	2	ISOLATE	
2-40303	Pressurizer Backup Heater Bank B-2	3	ISOLATE	
Bkr 2-40305	Proportional Bank P-1	4	Bkr OFF	

B. 2B3 480V LOAD CENTER, 2B Pressurizer Heater Bus, (East side cable spread room) (10 min)

BREAKER CUBICLE	COMPONENT NAME	CRI TAG #	POSITION	CHECK
2-40603	Pressurizer Backup Heater Bank B-6	1	ISOLATE	
2-40604	Pressurizer Backup Heater Bank B-4	2	ISOLATE	
2-40605	Pressurizer Backup Heater Bank B-5	3	ISOLATE	
Bkr 2-40602	Proportional Bank P-2	4	Bkr OFF	

C. 2A2 480V LOAD CENTER, (Northeast Corner in 2A Switchgear Room): (10 min)

BREAKER CUBICLE	COMPONENT NAME	CRI TAG #	POSITION	CHECK
2-40218	Station Service Transf 2A2 main breaker	1	ISOLATE	
2-40218	Bus tie to 480V L.C. 2AB	2	ISOLATE	
2-40218	Charging Pump 2A	3	ISOLATE	
Bkr 2-40212	CEA Drive MG Set 2A	4	OPEN	

APPENDIX G
PLANT COOLDOWN & SHUTDOWN COOLING OPERATION
(Page 11 of 11)

16. (continued) INITIAL

M. Locally **CLOSE** V3536, A LP Hdr W/U Recirc to 2A LPSI Pump. _____

N. Locally **OPEN** HCV-3625, A LPSI Hdr to 2A1 Cntmt Loop, (J-box in 2A HPSI pump room). _____

O. **THROTTLE OPEN** HCV-3657 to maintain the desired cooldown rate using TI-3351Y. _____

P. WHEN HCV-3657 is full open, THEN **THROTTLE CLOSED** FCV-3306 to maintain the desired cooldown rate using TI-3351Y. _____

17. §1 **PERFORM** the following prior to reaching RCS temperature of 200°F:

A. IF 2A HPSI pump is OPERABLE, THEN **ENSURE** Bkr 2-20201, HPSI Pump 2A, close and trip fuses REMOVED. _____

B. IF2B HPSI pump is OPERABLE, THEN **ENSURE** Bkr 2-20405, HPSI Pump 2B, close and trip fuses REMOVED. _____

CAUTION
- Pressurizer must **NOT** go solid until Control Room access can be reestablished
- Tech Spec minimum bolt up temperature is 80°F

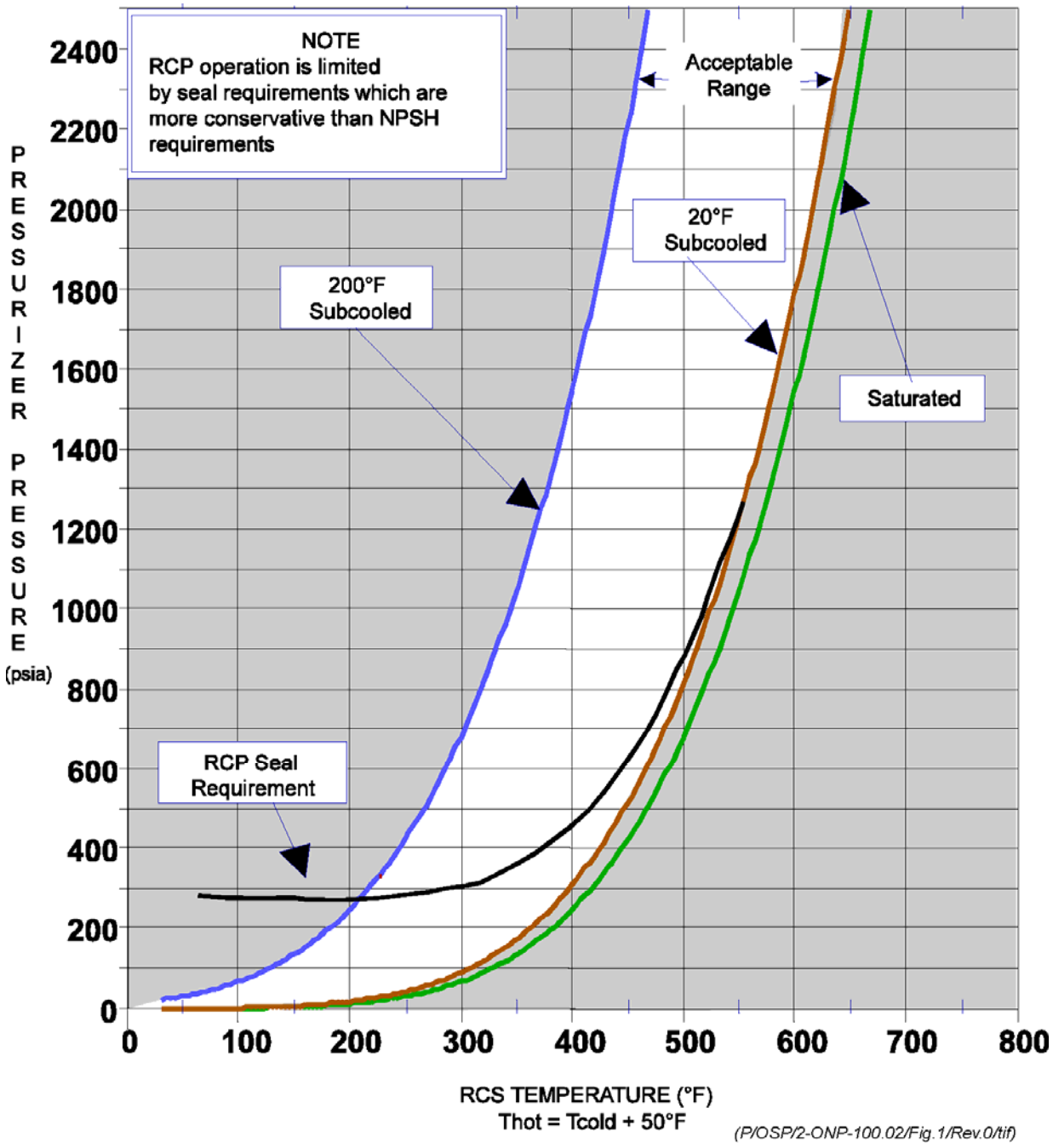
18. **STABILIZE** and **MAINTAIN** RCS parameters as follows until Control Room accessibility is possible and a complete evaluation has been performed by plant staff. _____

- RCS temperature 90 to 180°F
- RCS pressure within limits of Figure 1, RCS Pressure / Temperature

END OF APPENDIX G

FIGURE 1
RCS PRESSURE / TEMPERATURE
(Page 1 of 1)

CAUTION
When below the RCP seal requirement curve, RCP instrumentation should be monitored for indication of pump cavitation. For minimum seal requirements, RCP operation below 250 psia should be avoided.



(P/OSP/2-ONP-100.02/Fig.1/Rev.0/tif)

APPENDIX C
US SUBSEQUENT ACTIONS
(Page 2 of 10)

2. **POSITION** the following components as indicated: (Refer to Figure 5 for locations)

A. A3 Pressurizer Heaters - 480V LOAD CENTER 1A3 NORMAL/ISOLATE switches, **PLACE** all switches in ISOLATE: (10 min)

Located in North east corner Cable Spreading Room				
COMPONENT ID	**COMPONENT NAME**	**CRI TAG#**	**POSITION**	**CHECK**
1-40302	PRESSURIZER BACKUP HEATER BANK B-1	1	ISOLATE	
1-40303	PRESSURIZER BACKUP HEATER BANK B-2	2	ISOLATE	
1-40304	PRESSURIZER PROPORTIONAL HEATER BANK P-1	3	ISOLATE	
1-40305	PRESSURIZER BACKUP HEATER BANK B-3	4	ISOLATE	

B. B3 Pressurizer Heaters - 1B3 480V LOAD CENTER NORMAL/ISOLATE switches, **PLACE** all switches in ISOLATE: (10 min)

Located in South East corner cable Spreading Rooms				
COMPONENT ID	**COMPONENT NAME**	**CRI TAG#**	**POSITION**	**CHECK**
1-40602	PRESSURIZER PROPORTIONAL HEATER BANK P-2	1	ISOLATE	
1-40603	PRESSURIZER BACKUP HEATER BANK B-6	2	ISOLATE	
1-40604	PRESSURIZER BACKUP HEATER BANK B-4	3	ISOLATE	
1-40605	PRESSURIZER BACKUP HEATER BANK B-5	4	ISOLATE	

ORIGINAL QUESTION FROM 2012 NRC EXAM

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	068 AA1.12	
	Importance Rating	4.4	4.4

Ability to operate and / or monitor the following as they apply to the Control Room Evacuation: Auxiliary shutdown panel controls and indicators

Proposed Question: RO 24

Given the following:

- Unit 2 has evacuated the Control Room due to the presence of toxic fumes
- All Operator actions in the Control Room were performed prior to evacuation.
- Critical actions from Appendix A through D of 2-ONP-100.02 “Control Room Inaccessibility” have been completed
- RCO A is maintaining Hot Standby conditions at the Remote Shutdown Panel

Which ONE of the following describes how RCS pressure is controlled and how subcooling is monitored?

Control pressurizer pressure between 1800 and 1850 psia by operating Auxiliary Spray valves along with ___(1)____.

Determine subcooling margin using 2-ONP-100.02 “Control Room Inaccessibility”, Figure 1 using Reactor Coolant System ____(2)____ and Pressurizer pressure.

A. 1) Proportional and backup heaters
   2) T-hot

B. 1) backup heaters ONLY
   2) T-cold + 50°F

C. 1) Proportional and backup heaters
   2)T-cold + 50°F

D. 1) backup heaters ONLY
   2) T-hot

Proposed Answer: B

Explanation (Optional):

A. Incorrect. No proportional heater control on the HSDCP. Also, there's no value for Thot displayed on the HSDCP - must use Tcold + 50°F to determine subcooling.

A. Correct.

B. Incorrect. No proportional heater control on the HSDCP

D. Incorrect. Also, there's no value for Thot displayed on the HSDCP - must use Tcold + 50°F to determine subcooling.

Technical Reference(s): 2-0NP-100.02 Control Room Inaccessibility (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: 0702846-01.b (As available)

Question Source: Bank #

Modified Bank # 4193 (Note changes or attach parent)

New

Question History: Last NRC Exam

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7

55.43

Comments:

25. 074 EK1.02 / Inad. Core Cooling / Knowledge of the operational implications of the following concepts as they apply to the Inadequate Core Cooling: Potential consequences of uncovering the core

Which ONE of the following completes the statements below?

During Severe Accidents, the Core becoming uncovered is indicated by ____(1)____.

If clad failure were to occur due to the core becoming uncovered, this is indicated by the RCS specific activity isotopes ____(2)____.

A.	(1)	CET Temperatures > 1200 °F
	(2)	Xenon and Iodine
B.	(1)	CET Temperatures > 1200 °F
	(2)	Rubidium and Tellurium
C.	(1)	RVLMS Sensors 1-8 are uncovered
	(2)	Xenon and Iodine
D.	(1)	RVLMS Sensors 1-8 are uncovered
	(2)	Rubidium and Tellurium

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: Since clad temperature is not directly measured, a parameter to which cladding temperature may be related is measured. This parameter is the fluid temperature at the core exit. After the core becomes uncovered, the fluid leaving the core is superheated steam and the amount of superheat is related to the fuel length exposed and to the cladding temperature. Part 2 correct: IAW EPIP-11 Xe and I are the isotopes to be produced in the fuel clad failure stage.
B.	Incorrect:	Part 1 correct: See analysis A. Part 2 incorrect: IAW EPIP-11 Rb and Te are the isotopes to that indicate high fuel temperature.
C.	Incorrect:	Part 1 incorrect: RVLMS Sensors 1-8 are above the fuel alignment plate so if they are showing voiding that doesn't indicate the core is uncovered. Part 2 correct: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 25

Tier: 1 Group: 2

K/A: 074 EK1.02 / Inad. Core Cooling / Knowledge of the operational implications of the following concepts as they apply to the Inadequate Core Cooling : Potential consequences of uncovering the core

Importance Rating: 4.6 4.8

10 CFR Part 55: (CFR 41.8 / 41.10 / 45.3)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the potential consequences of uncovering the core

Technical Reference: EPIP-11

Proposed references to be provided: None

Learning Objective: PSL OPS 0702832-G1

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

CETs can be used to monitor this condition by providing a temperature that indicates the steam has entered the superheat region. Pressurizer pressure and steam tables would have to be used in conjunction with the indicated temperature to determine that the steam is being superheated. The CETs can be read directly on QSPDS.

Unheated Junction Thermocouples Indicating Superheat

As discussed above, thermocouples can be used to determine if superheated conditions exist in the reactor core. The RVLMS uses both heated and unheated thermocouples to determine reactor vessel level. If the unheated thermocouples are available, they can be used and temperatures read from QSPDS.

Fuel Cladding Heatup

The overall intent of ICC detection is to detect the potential for fission product release from the reactor fuel. The parameter which is most directlyrelated to the potential for fission product release is the cladding temperature rather than the uncovery of the core by coolant.

Since clad temperature is not directly measured, a parameter to which cladding temperature may be related is measured. This parameter is the fluid temperature at the core exit. After the core becomes uncovered, the fluid leaving the core is superheated steam and the amount of superheat is related to the fuel length exposed and to the cladding temperature.

The amount of superheat of the steam leaving the core is measured by the core exit thermocouples. The time behavior of the superheat temperature is, with the exception of an acceptably small time delay, similar to the time behavior of the cladding temperature. Thus, from the observation of the steam superheat, the behavior of the cladding temperature can be inferred. Observation of the cladding temperature trends during an accident is considered to be of more value to the operator than information on the absolute value of the cladding temperature.

The core exit steam temperature is measured with the thermocouples included in the Incore Instrument (ICI) string. They are located inside the ICI support tube above the fuel alignment plate. Calculations for representative uncovery events show that the thermocouples respond sufficiently fast to the increasing steam temperature.

The required temperature range of the thermocouples extends from the lowest saturation temperature at which uncovery may occur up to the maximum core average exit temperature which occurs when the peak clad temperature reaches 2200°F. The actual thermocouple range encompasses the required range, which extends from 32°F to about 1800°F. Thermocouples function with reduced accuracy at even higher temperatures, so the range for processing the thermocouple output extends to about

F. HYDROGEN IN THE PRIMARY SYSTEM

1. Could prevent natural circulation.

2. Low possibility of explosion due to lack of free O_2.
   - Excess H_2 improves recombination with free oxygen present in the system.

3. RCS gas vent system.

>0.5% - recombiners

>~~3.5~~ 3.0% - Consider H_2 Purge

Discuss the TCGVS flowpaths to mitigate gas build up in RCS.

Discuss use of H_2 Recombiners and Purge System for Containment H_2 mitigation.

- Explain UFSAR [U2] Post LOCA H_2

G. PRIMARY CHEMISTRY INDICATIONS

EO-5

1. Indications:

Discuss:

a. Noble gases and Iodine indicate fuel clad failure.

10μCi/ml I, 50μ/Cl/ml and other gases (I-131, 1-133, Xe-131, Xe-133, et. all)
- Gas gap release

b. Rubidium, Tellurium and Cesium indicate high fuel temperature.

>1 μ/Cl/ml
(Rb-88, Te-129, Te-132, Cs-134)
- Note that higher fuel temperatures will increase thermally activity migration.

PELLET RELEASE MECHANISM
1. Recoil
2. Knockout
3. Thermal Activated Migration

c. Non-volatiles (uranium) indicate fuel melt.

And others released during liquefaction of the pellet.

Any:

- Ba-140
- La-140, La-142

ATTACHMENT 1
CHARACTERISTICS OF NRC CATEGORIES OF FUEL DAMAGE
(Page 1 of 3)

TABLE 1. CHARACTERISTIC ISOTOPES

GENERAL CATEGORY	NRC CATEGORY OF FUEL DAMAGE	MECHANISM OF RELEASE	SOURCE OF RELEASE	CHARACTERISTIC ISOTOPE	RELEASE OF CHARACTERISTIC ISOTOPE EXPRESSED AS PERCENT OF SOURCE INVENTORY
Normal Operation	1. No Fuel Damage	Halogen Spiking Tramp Uranium	Gas Gap	I-131, Cs-137 Rb 88	Less than 1
Core Damage	2. Initial Cladding Failure	Clad Burst and Gas Gap Diffusion Release	Gas Gap	Xe-131m, Xe-133, I-131, I-133	Less than 10
	3. Intermediate Cladding Failure		Gas Gap		10 to 50
	4. Major Cladding Failure		Gas Gap		Greater than 50
Severe Core Damage	5. Initial Fuel Pellet Overheating	Grain Boundary Diffusion	Fuel Pellet	Cs-134, Rb-88, Te-129, Te-132	Less than 10
	6. Intermediate Fuel Pellet Overheating		Fuel Pellet		10 to 50
	7. Major Fuel Pellet Overheating	Diffusionals Release Fuel UO_2 Grains	Fuel Pellet		Greater than 50
	8. Fuel Pellet Melt	Escape from Molten Fuel	Fuel Pellet	Ba-140, La-140, La-142, Pr-144	Less than 10
	9. Intermediate Fuel Pellet Melt		Fuel Pellet		10 to 50
	10. Major Fuel Pellet Melt		Fuel Pellet		Greater than 50

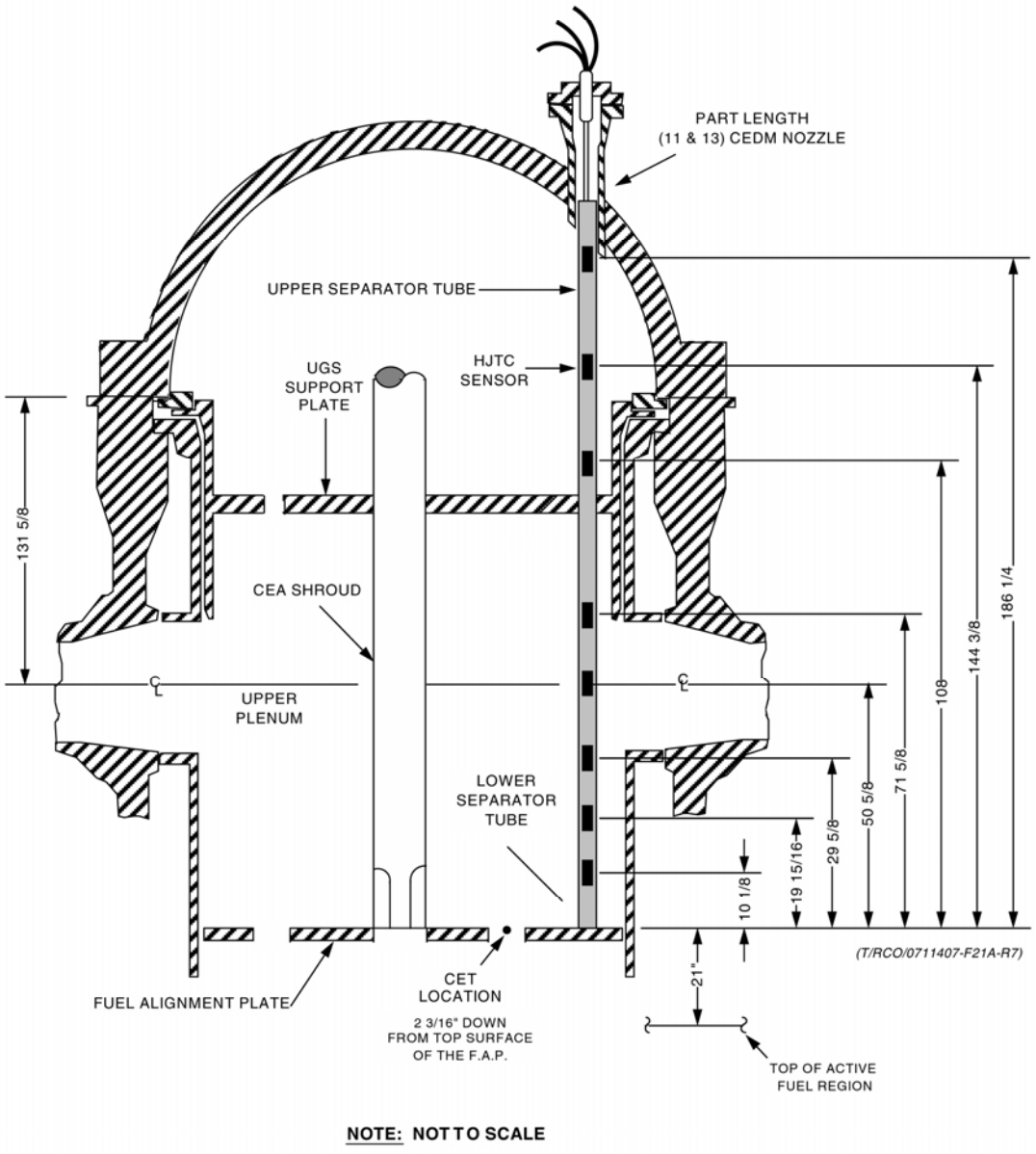
ATTACHMENT 1
CHARACTERISTICS OF NRC CATEGORIES OF FUEL DAMAGE
(Page 2 of 3)

TABLE 2. CLADDING DAMAGE CHARACTERISTICS

NRC Category of Fuel Damage	Temperature Range (F)	Mechanism of Damage	Characteristic Measurement	Measurement Range	Percent of Damage Rods
1. No Fuel Damage	Approximately 750	None	N/A	N/A	less than 1
2. Initial Cladding Failure	1200 to 1800	Rupture Due to Gas Gap Over-pressurization	Maximum Core Exit Thermocouple Temperature	less than 1550 F *	less than 10
3. Intermediate Cladding Failure				less than 1700 F *	10 to 50
4. Major Cladding Failure				less than 2300 F less than 2 percent Oxidation	greater than 50
5. Initial Fuel Pellet Overheating	1800 to 3350	Loss of Structural Integrity Due to Fuel Clad Oxidation	Amount of Hydrogen Gas Produced (Equivalent to Percent Oxidation of Core)	Equivalent Core Oxidation less than 3 percent	less than 10
6. Intermediate Fuel Pellet Overheating				less than 18 percent	10 to 50
7. Major Fuel Pellet Overheating				less than 65 percent	greater than 50

* Depends on Reactor Pressure and Fuel Burnup Values Given for Pressure less than or equal to 1200 psia and Burnup greater than or equal to 0.

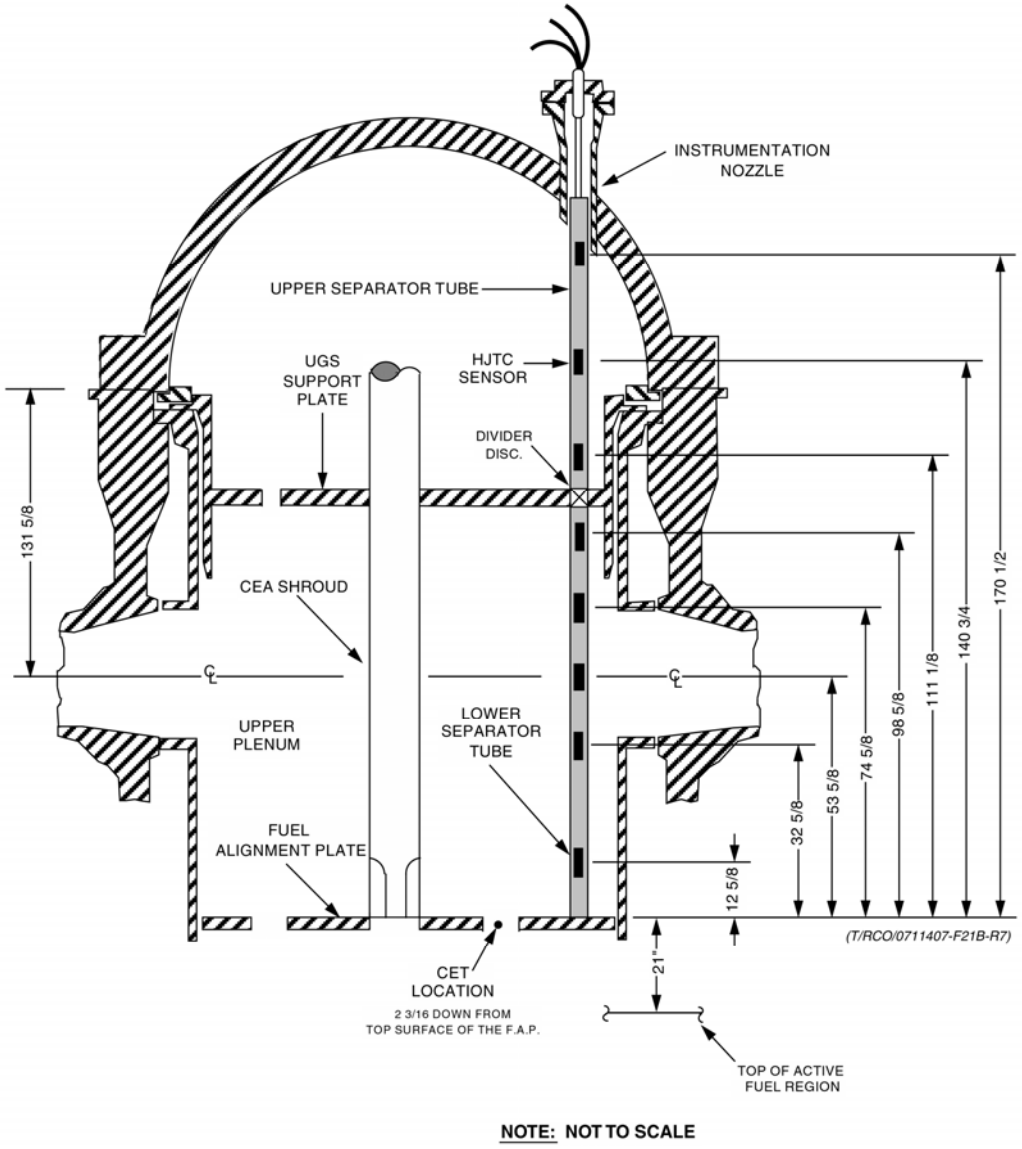
UNIT 1 - HJTC SENSOR POSITIONS



NOTE: NOT TO SCALE

FIGURE 21

UNIT 2 - HJTC SENSOR POSITIONS



NOTE: NOT TO SCALE

FIGURE 22

REACTOR VESSEL LEVELS

UNIT 1

Sensor	Location*	Liquid Inventory (%)	Value If Uncovered (%)	
None			100	
1	187 1/4	20	80	
2	144 3/8	19	61	
3	108	18	43	
				} Top
4	71 5/8	14	29	}
5	50 5/8	10	19	} Hot Leg Region
6	29 5/8	7	12	}
				} Bottom
7	19 15/16	5	7	
8	10 1/8	7	0	

UNIT 2

	Sensor	Location*	Liquid Inventory (%)	Value If Uncovered (%)	
	None			100	
	1	170 1/4	52	48	Upper
	2	140 3/4	28	20	Head Level
	3	111 1/8	20	0	
	None			100	
	4	98 5/8	18	82	
					} Top
Plenum	5	74 5/8	21	61	}
Level	6	53 5/8	20	41	} Hot Leg Region
	7	32 6/8	19	22	}
					} Bottom
	8	12 5/8	22	0	

*Inches to fuel alignment plate

26. CA13 AA1.2 / Natural Circ. / Ability to operate and / or monitor the following as they apply to the (Natural Circulation Operations): Operating behavior characteristics of the facility.

Given the following conditions:

- Unit 2 is at 100% power
- Loss of Off-Site Power occurs

Ten minutes later:

- AFW is feeding BOTH S/Gs
- 2A SG Pressure is 950 psia and STABLE
- 2B SG Pressure is 950 psia and STABLE
- PZR Pressure is 2200 psia and slowly LOWERING
- T-hot is approximately 565°F in BOTH loops and STABLE
- Rep CET is 582 °F and STABLE
- T-cold is approximately 550°F in BOTH loops and STABLE
- Reactor Vessel Level is 100%

In accordance with 2-EOP-99, which ONE of the following completes the statements below?

Natural Circulation ____(1)____ exist.

RCS Heat Removal is maintained / can be established by ____(2)____.

A.	(1)	does
	(2)	ADVs
B.	(1)	does
	(2)	SBCS
C.	(1)	does NOT
	(2)	ADVs
D.	(1)	does NOT
	(2)	SBCS

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: IAW 2-EOP-09, Step 4.16.B, single phase natural circulation cooling is established. Part 2 correct: ADVs must be used due to the Main Condenser not being available due to the LOOP.
B.	Incorrect:	Part 1 correct: See analysis A. Part 2 incorrect: ADVs must be used due to the Main Condenser not being available due to the LOOP. It is plausible that the applicant does not correlate the LOOP with loss of cooling water flow to the Main Condenser.
C.	Incorrect:	Part 1 incorrect: IAW 2-EOP-09, Step 4.16.B, single phase natural circulation cooling is established. It is plausible that the applicant does not know all the requirements for NC. Part 2 correct: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 26

Tier: 1 Group: 2

K/A: CA13 AA1.2 / Natural Circ. / Ability to operate and / or monitor the following as they apply to the (Natural Circulation Operations): Operating behavior characteristics of the facility.

Importance Rating: 3.1 3.6

10 CFR Part 55: (CFR 41.7 / 45.5 / 45.6)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to operate and monitor the operating characteristics of the facility in Nat Circ.

Technical Reference: 2-EOP-09

Proposed references to be provided: None

Learning Objective: PSL OPS 0702835-07

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: PSL Bank question for the 2019 NRC Exam

Comments:

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

* **16.** **CHECK** if single-phase natural circulation cooling is established:

A. **VERIFY** all RCPs STOPPED.

A.1 **GO TO** Section 4.0, Step 17.

B. **VERIFY** at least one loop meets all of the following conditions:

- Loop ΔT (T_{hot} minus T_{cold}) less than 50°F
- Hot leg temperature stable or lowering
- Cold leg temperature stable or lowering
- RCS subcooling greater than or equal to minimum subcooling based on Rep CET temperature
- RCS T_{hot} and Rep CET temperature difference within 20°F

B.1 **CONTROL** S/G feeding and steaming to establish natural circulation.

27.CE09 G2.4.6 /Functional Recovery / Knowledge of symptom based EOP mitigation strategies.

Given the following conditions:

- Unit 2 has tripped due to the loss of the 2B Main Feedwater Pump
- A Steam Leak has occurred on the 2B Steam Generator
- A Steam Generator Tube leak on the 2A S/G was identified post trip
- The crew has entered 2-EOP-15, Functional Recovery, RCS and Core Heat Removal, HR-2
- The MSIVs are CLOSED
- 2A S/G pressure is 675 psia STABLE
- 2B S/G pressure is 625 psia LOWERING
- Containment Temperature is 208 °F

Which ONE of the following completes the statements below?

The ____(1)____ is the MOST affected S/G.

In accordance with 2-EOP-99, the crew is required to use ____(2)____ to perform the cooldown.

A.	(1)	2A S/G
	(2)	Figure 1A
B.	(1)	2A S/G
	(2)	Figure 1B
C.	(1)	2B S/G
	(2)	Figure 1A
D.	(1)	2B S/G
	(2)	Figure 1B

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: The 2B S/G is the most affected S/G because it is the S/G with the ESDE event in progress. The 2A S/G is the faulted (SGTL) S/G but not the most affected. Part 2 incorrect: IAW 2-EOP-99, Figure 1B is used with Containment Temp > 200 °F
B.	Incorrect:	Part 1 incorrect: The 2B S/G is the most affected S/G because it is the S/G with the ESDE event in progress. The 2A S/G is the faulted (SGTL) S/G but not the most affected. Part 2 correct: IAW 2-EOP-99, Figure 1B is used with Containment Temp > 200 °F
C.	Incorrect:	Part 1 correct: The 2B S/G is the most affected S/G because it is the S/G with the ESDE event in progress. The 2A S/G is the faulted (SGTL) S/G but not the most affected. Part 2 incorrect: IAW 2-EOP-99, Figure 1B is used with Containment Temp > 200 °F
D.	Correct:	Part 1 correct: The 2B S/G is the most affected S/G because it is the S/G with the ESDE event in progress. Determination of the most affected S/G is a critical point for the overall mitigation strategy for S/G isolation. A S/G with an ESD is always the most affected, over a SGTR, and will be the S/G isolated. Part 2 correct: IAW 2-EOP-99, Figure 1B is used with Containment Temp > 200 °F

Question Number: 27

Tier: 1 Group: 2

K/A: CE09 G2.4.6 /Functional Recovery / Knowledge of symptom based EOP mitigation strategies.

Importance Rating: 3.7 4.7

10 CFR Part 55: (CFR 41.10 / 43.5 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required know the EOP mitigation strategy while implementing the Functional Recovery Procedure.

Technical Reference: 2-EOP-15, 2-EOP-99

Proposed references to be provided: None

Learning Objective: PSL OPS 0702826-14

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

4.6 RCS and CORE HEAT REMOVAL – HR-2 (continued) **Success Path 2 – S/G With SIAS** (continued)

INSTRUCTIONS **CONTINGENCY ACTIONS**

CAUTION

If there is a conflict between isolating a S/G with indications of S/G tube leakage or isolating a S/G with an unisolable steam leak,
Then the S/G with the ESD should be isolated. At least **ONE** S/G must remain available for heat removal.

* **9. Determine If ESD Present**

If an ESD has occurred as indicated by **ANY** of the following,

- High steam flow from S/G
- Lowering S/G pressure
- Lowering S/G level
- Lowering RCS cold leg temperature
- Lowering Pressurizer pressure
- Lowering Pressurizer level

Then DETERMINE the **MOST** affected steam generator.

☐ **10. If No ESD, GO TO Step 15**

If there are NO ESD indications,
Then GO TO Step 15.

* **11. Isolate the MOST Affected S/G**

If MSIS has NOT isolated the leak,
Then ISOLATE the **MOST** affected S/G.
REFER TO Appendix R, Steam Generator Isolation.

4.6 RCS and CORE HEAT REMOVAL – HR-2 (continued) **Success Path 2 – S/G With SIAS** (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE
Cooldown rates up to 100°F in **ANY** 1 hour period are permitted to regain or maintain minimum subcooling.

☐ **14. Cooldown RCS**

If indication of a LOCA or SGTR exists,
Then PERFORM the following:

A. COOLDOWN the RCS using SBCS.

1. If RCPs are operating, Then COOLDOWN not to exceed 100°F in **ANY** 1 hour period.

2. If RCPs are NOT operating, Then COOLDOWN not to exceed 50°F in **ANY** 1 hour period.

3. If RCPs are NOT operating, and a S/G is ISOLATED for a SGTR event, Then COOLDOWN not to exceed 30°F in **ANY** 1 hour period.

B. BORATE the RCS until Shutdown Margin is greater than the value required by the COLR. **REFER TO** 2-NOP-02.24, Boron Concentration Control.

A.1 COOLDOWN using ADVs.

A.2 COOLDOWN using alternate steaming paths. **REFER TO** Table 12, Alternate S/G Heat Removal Paths.

The purpose of this guidance is to precisely control the plant during EOP RCS cooldowns. All other cooldowns are controlled via the general operating procedures.

The limit at which the RCS is cooled is determined by the plant configuration (e.g., forced or natural circulation, number of SGs available, status of subcooling, etc). The method of cooldown will be determined by the availability of condenser vacuum, SBCS, ADVs, and Safety Injection flow rate.

When cooling down the RCS:

The US will:

1. Direct the RCO to commence a cooldown of the RCS using ADVs or SBCS.

2. Give the RCO a cooldown limit (for example “Do not exceed 100°F in any one hour period”).

3. Give the RCO updated cooldown limits as plant conditions change.

4. Review lowest Tcold and the cooldown rate and initial Table 1 every 12 minutes.

The RCO will:

NOTE

- The starting time of the cooldown is the time the RCO takes positive action to begin the cooldown after the direction to commence a cooldown has been given.
- The starting point for Tcold will always be 532°F post-trip.

1. Record the starting time the cooldown is commenced, the lowest Tcold and REP CET in Table 1.

2. Determine if subcooling is lost and circle the appropriate answer on Table 1.

3. Circle the cooldown limit in effect on Table 1.

4. Commence a cooldown of the RCS. Ensure that the limits of EOP-99 Figure 1A or 1B are being restored or maintained.

5. Record data in Table 1 every 6 minutes.

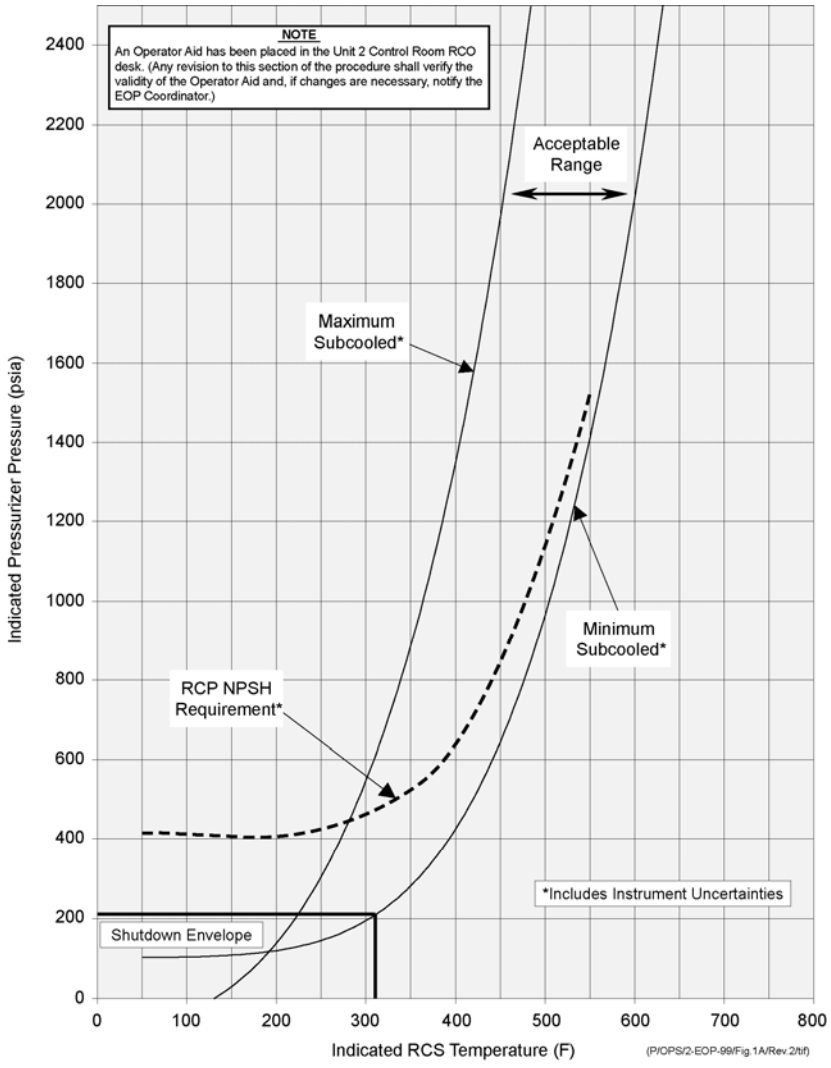
6. Calculate the actual cooldown rate and record this value in Table 1 every 6 minutes.

FIGURE 1A
RCS PRESSURE TEMPERATURE
(Page 1 of 1)

(Containment Temperature Less Than or Equal to 200°F)

CAUTION

The RCP NPSH curve assumes one pump is operating in each loop. RCP instrumentation should be monitored for seal and pump performance in accordance with 2-EOP-99, Table 13.



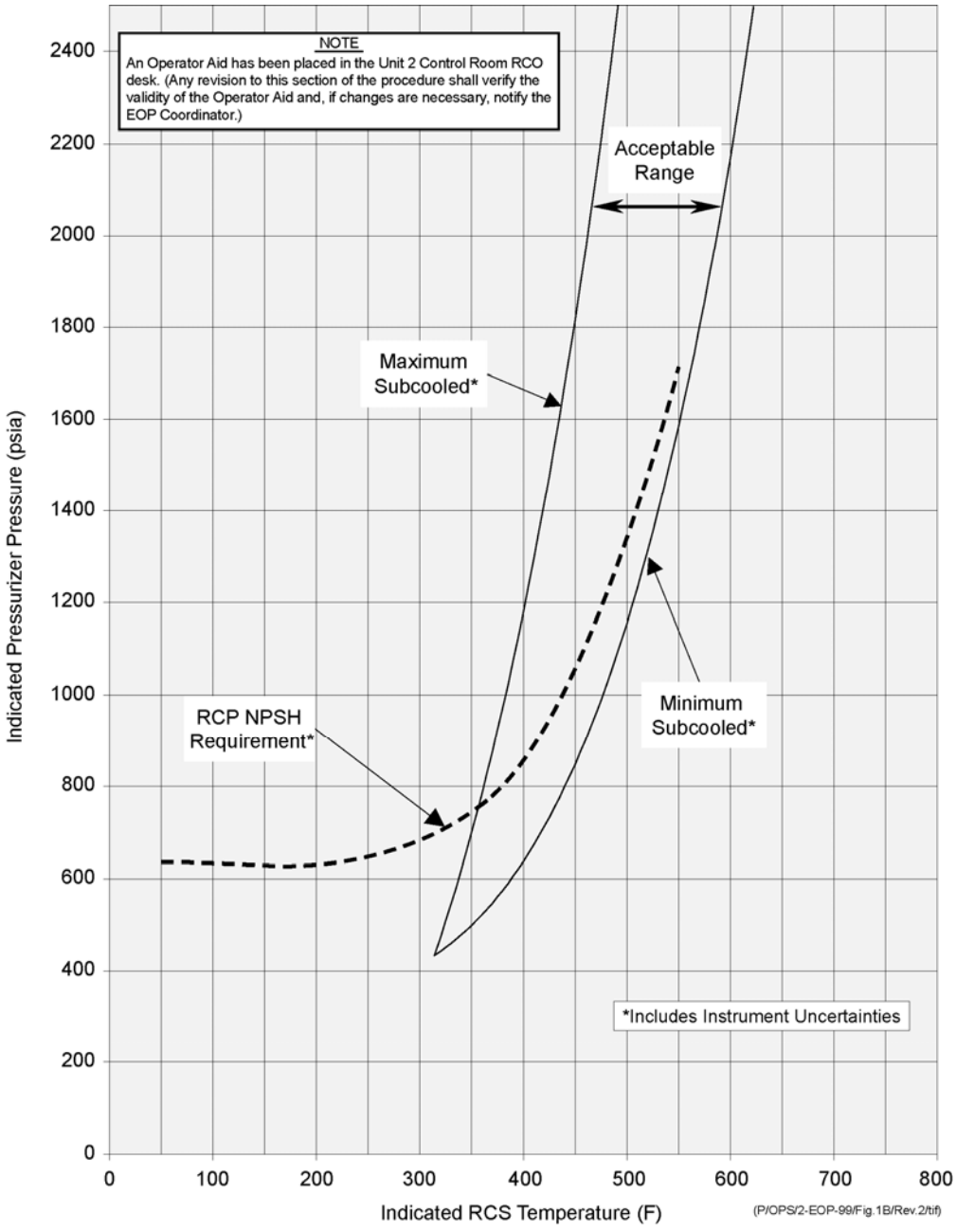
RCS Pressure Range	Required QSPDS Subcooled Margin Reading (Rep CET)
2250 psia to 1000 psia	40 to 180°F
1000 psia to 500 psia	50 to 170°F
Less than 500 psia	80 to 160°F

FIGURE 1B
RCS PRESSURE TEMPERATURE
(Page 1 of 1)

(Containment Temperature Greater Than 200°F)

CAUTION

The RCP NPSH curve assumes one pump is operating in each loop. RCP instrumentation should be monitored for seal and pump performance in accordance with 2-EOP-99, Table 13.



28.

003 A3.05 / Reactor Coolant Pump / Ability to monitor automatic operation of the RCPS, including: RCP lube oil and bearing lift pumps

Given the following conditions:

- Unit 1 is at 100% power

Subsequently:

- A Loss of Offsite Power (LOOP) occurs
- Safety Injection Actuation Signal (SIAS) actuates

Which ONE of the following describes response of the Reactor Coolant Pump (RCP) Oil Lift pumps?

A.	ALL RCP Oil Lift pumps will AUTOMATICALLY start
B.	NO RCP Oil Lift pumps will AUTOMATICALLY start, but ALL RCP Oil Lift pumps CAN be MANUALLY started
C.	ONE RCP Oil Lift pump on each RCP will AUTOMATICALLY start. The other RCP Oil Lift pumps CAN be MANUALLY started
D.	ONE RCP Oil Lift pump on each RCP will AUTOMATICALLY start. The other RCP Oil Lift pumps CANNOT be MANUALLY started

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Plausible – this is the normal response when the RCP breaker opens. Additionally, this is the expected response with an SIAS signal with off-site power available. The applicant must apply the LOOP impact on the expected oil pump response.
B.	Incorrect:	Plausible – if the applicant has the misconception on RCP oil lift pump response with a LOOP/SIAS. This is the expected response of the lag pump only.
C.	Correct:	The expected response is automatic start of the lead pump, and the lag pump can be manually started.
D.	Incorrect:	Plausible, this is the expected response on Unit 2.

Question Number: 28

Tier: 2 Group: 1

K/A: 003 A3.05 / Reactor Coolant Pump / Ability to monitor automatic operation of the RCPS, including: RCP lube oil and bearing lift pumps

Importance Rating: 2.7 2.6

10 CFR Part 55: (CFR 41.7 / 45.5)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to monitor the automatic operation of the RCP lube oil lift pumps

Technical Reference: PSL OPS 0702202-04

Proposed references to be provided: None

Learning Objective: PSL OPS 0702202-04

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: PSL BANK question for the 2019 NRC Exam

Comments:

The oil lift pumps designated below as A are the lead pumps while those designated as B are the lag pumps. On Unit 1 RTGB-103, the bottom row of indicating lights are for the lead pumps and the top row provides indication for the lag pumps. [Unit 2 RTGB-203 arrangement is opposite from the scheme used on Unit 1 (i.e., the top row provides indication for the lead pumps.)] The oil lift pumps use 10-HP motors supplied from 480 VAC power supplies as follows:

RCP	Oil Lift Pump	480V AC MCC
1A1 [2A1]	P-1[2]A1-A	1A5 [2A5]
	P-1[2]A1-B	1B5 [2B5]
1A2 [2A2]	P-1[2]A2-A	1B6 [2B6]
	P-1[2]A2-B	1A6 [2A6]
1B1 [2B1]	P-1[2]B1-A	1B5 [2B5]
	P-1[2]B1-B	1A5 [2A5]
1B2 [2B2]	P-1[2]B2-A	1A6 [2A6]
	P-1[2]B2-B	1B6 [2B6]

It should be noted that the lead pumps (designated A) are powered from the same electrical train as their respective RCP, with the lag pumps (designated B) powered from the other train. These pumps can be powered from the EDGs during a LOOP.

Each set of oil lift pumps is controlled by a maintained contact control switch on RTGB-103 [203] with positions of OFF, AUTO and RUN.

- **OFF** – This position is used during periods when the RCP is secured. Neither oil lift pump will be running. (The RTGB annunciator for oil lift pump low discharge pressure and/or low oil flow is blocked in this position.)

- **AUTO** - During normal operation, this position ensures automatic start of the oil lift pumps if the RCP breaker opens; the pumps then run until stopped.

- **RUN** - This position is selected when starting or stopping the associated RCP. Both oil lift pumps start and run until stopped.

Automatic operation of the oil lift pumps is also impacted during emergency conditions. If the associated RCP breaker opens, the lead pump automatically starts (when

electrical power is available) and runs until stopped. Operation of the lag pump is determined by plant conditions as follows:

- NO SIAS Present OR SIAS is Present with Offsite Power Available – The lag pump automatically starts when the RCP breaker opens and runs until stopped.

- Loss of Offsite Power (LOOP)
  - Unit 1: The lag pump automatically starts when electrical power is restored.
  - Unit 2: When electrical power is restored, the control switch can be positioned to OFF before selecting AUTO (or RUN) to start the lag pump. {Note that this action should only be considered if the lead pump did not start since the lead pump would stop when OFF is selected.}

NOTE: Automatic [and manual] start of the lag pump is blocked when there is an SIAS present with the associated EDG output breaker closed (indicating a LOOP). Starting only two of the four oil lift pumps on each EDG limits diesel load during safeguards actuations.

- SIAS Concurrent With LOOP
  - Unit 1: The lag pump will start if the control switch is placed in RUN (when electrical power is available) and run until stopped.

  - Unit 2: The lag pump CANNOT be started.

RCP OIL LIFT PUMP RESPONSE SUMMARY

CONDITION: RCP BREAKER OPENS WITH:	UNIT 1		UNIT 2	
	LEAD -- A	LAG -- B	LEAD – A	LAG -- B
NO ESFAS Signals	START	START	START	START
SIAS Present	START	START	START	START
LOOP Present (EDG Breaker Closed)	START	START	START	Can START If Select OFF First
LOOP and SIAS Present	START	Can START If Select RUN	START	CANNOT BE STARTED

Using the information presented above, operation of the oil lift pumps can also be evaluated for malfunctions. For example:

- Failure of One EDG to Start (or Load) Following LOOP
  - Unit 1: The two lead pumps and the two lag pumps powered by the operating emergency diesel generator will be running. (i.e., One oil lift pump will be running for each RCP.)

29.

003 G2.4.21 / RCPs / 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

Given the following conditions:

- Unit 1 tripped from 100% power
- 1B1 6.9 KV Bus did not automatically transfer to the Startup Transformer
- 1-EOP-01, SPTAs are in progress at Step 6, Core Heat Removal
- Thot is 542 °F
- Tcold is 536 °F

Which ONE of the following completes the statements below?

The 1A1 and ____(1)____ RCPs are operating.

The Core Heat Removal Safety Function ____(2)____ MET.

A.	(1)	1A2
	(2)	is
B.	(1)	1A2
	(2)	is NOT
C.	(1)	1B2
	(2)	is
D.	(1)	1B2
	(2)	is NOT

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: It is plausible that the applicant believes that the 1A bus supplies power to both 1A1 and 1A2 RCPs. Part 2 correct: With RCPs operating, the Delta T must be < 10 °F to meet the core heat removal safety function.
B.	Incorrect:	Part 1 incorrect: It is plausible that the applicant believes that the 1A bus supplies power to both 1A1 and 1A2 RCPs. Part 2 incorrect: Normal Delta T is 1-2 °F. The applicant must know that the Delta T must be < 10 °F to meet the safety function.
C.	Correct:	Part 1 correct: the 1A bus supplies power to the 1A1 and 1B2 RCPs Part 2 correct: Delta T must be < 10 °F to meet the safety function.
D.	Incorrect:	Part 1 correct: the 1A bus supplies power to the 1A1 and 1B2 RCPs Part 2 incorrect: Normal Delta T is 1-2 °F. The applicant must know that the Delta T must be < 10 °F to meet the safety function.

Question Number: 29

Tier: 2 Group: 1

K/A: 003 G2.4.21 / RCPs / 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.

Importance Rating: 4.0 4.6

10 CFR Part 55: (CFR 41.7 / 43.5 / 45.12)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the status of the CHR SF

Technical Reference: 1-EOP-01

Proposed references to be provided: None

Learning Objective: PSL OPS 0702822-9

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

minute timer starts to count down and alarms to alert the operators. An automatic reactor trip will occur if two or more RPS channels still indicate less than 1220 gpm CCW flow after 10 minutes. Therefore, if the condition cannot be corrected, operator actions would be taken to manually trip the reactor and turbine. Operator action must then be taken to stop the RCPs after the reactor is tripped.] Even though Unit 1 does NOT have this reactor trip feature, the same operator actions are required.

RCP Breakers and Control

The RCP breakers are 75DHP500 type breakers rated at 1200 amps continuous service. Magnetic, air type, draw out breakers with a motor-operated stored energy closing mechanism are utilized. The motors are powered from the 6.9 kV busses as shown in the following table.

RCP	6.9 KV BUS
A1	A1
A2	B1
B1	B1
B2	A1

NOTE: Enter Unit number before each designator.

With this power supply arrangement, a loss of one 6.9 kV bus results in one RCP still running in each RCS loop. The running pumps will be diametrically opposed (i.e., 180° across the reactor vessel) which improves mixing in the downcomer reducing thermal stresses on the reactor vessel wall.

RTGB-103 [203] Controls and Indications
Each RCP has a control switch, ammeter (0 - 800 Amps) and indicating lights:

- Green or red indicating light ON indicates breaker open or closed respectively (and tripping power is available).

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

CORE HEAT REMOVAL

☐ **6.** **VERIFY** Core Heat Removal:

A.	At least one RCP is RUNNING **and** all RUNNING RCPs are supplied with CCW.	**A.1**	IF CCW can **NOT** be restored to an RCP within 10 minutes, THEN **TRIP** affected RCP.
B.	Loop ΔT is less than 10°F.		
C.	RCS subcooling greater than or equal to 20°F.	**C.1**	IF RCS subcooling is less than 20°F, THEN **TRIP** all RCPs.
D.	**NO** indication of RCP cavitation.	**D.1**	IF RCP(s) exhibit cavitation, THEN **TRIP** all RCPs.

CORE HEAT REMOVAL COMPLETE

30. 004 A2.24 / Chemical and Volume Control / Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Isolation of both letdown filters at one time: down-stream relief lifts

Given the following conditions:

- Unit 2 is at 100% power
- 2A Charging pump is running

Subsequently:

- 2B Purification Filter is inadvertently isolated
- Annunciator, M-2, 2B CVCS Purification Filter DP High alarms

Which ONE of the following completes the statements below?

V2345, Safety Relief valve to Letdown Control Vlv Station will lift at a setpoint of ____(1)____.

In accordance with 2-ARP-01-M00-M-2, the crew is required to BYPASS the 2B Filter ____(2)____.

A.	(1)	200 psig
	(2)	ONLY
B.	(1)	200 psig
	(2)	and Place V2520, Ion Exchanger Bypass Valve in Bypass to bypass the Ion Exchanger
C.	(1)	600 psig
	(2)	ONLY
D.	(1)	600 psig
	(2)	and Place V2520, Ion Exchanger Bypass Valve in Bypass to bypass the Ion Exchanger

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: See analysis B. Part 2 incorrect: It is plausible that the applicant may not know that IAW 2-ARP-01-M02, bypass the filter and the IX since IX operation is not allowed without a filter in service and the 1A filter is always bypassed.
B.	Incorrect:	Part 1 incorrect: This is plausible since the pressure at which Letdown automatically isolates is 200 psig is the setpoint of the next relief valve in the system low pressure letdown relief valve V2354 Part 2 correct: See analysis B.
C.	Incorrect:	Part 1 correct: See analysis D. Part 2 incorrect: See analysis A.
D.	Correct:	Part 1 correct: intermediate pressure letdown relief valve, V2345. The relief valve upstream of the letdown pressure control valves protects the low pressure piping, purification filters, ion exchangers and letdown strainer from overpressure. The valve capacity is equal to capacity of low pressure letdown relief valve V2354. The set pressure is equal to the design pressure (600 psig) of the intermediate pressure piping and components. Part 2 correct: IAW 2-ARP-01-M02, bypass the filter and the IX since IX operation is not allowed without a filter in service and the 2A filter is always bypassed.

Question Number: 30

Tier: 2 Group: 1

K/A: 004 A2.24 / Chemical and Volume Control / Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Isolation of both letdown filters at one time: down-stream relief lifts

Importance Rating: 2.8 2.8

10 CFR Part 55: (CFR: 41.5/ 43/5 / 45/3 / 45/5)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the actions for the downstream filter being isolated

Technical Reference: 2-ARP-01-M02

Proposed references to be provided: None

Learning Objective: PSL OPS 0702205 - 3

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

Intermediate Pressure Letdown Relief Valve, V2345

The relief valve downstream of the letdown level control valves protects the intermediate pressure letdown piping and letdown heat exchanger from overpressure. The valve capacity is equal to the capacity of one letdown control valve in the wide open position during normal operation. The other letdown control valve must be closed and isolated before plant pressure exceeds 1500 psig as required by FSAR 9.3.4.2.2.M.1. The relief valve set pressure of 600 psig is below the design pressure (650 psig) of the intermediate pressure letdown piping and letdown heat exchanger. (The blowdown of V2345 is set at 15% rather the standard 25% to ensure the valve reseats following a high pressure transient followed by normal pressures.)

Low-Pressure Letdown Relief Valve, V2354[V2531]

The relief valve downstream of the letdown pressure control valves protects the low pressure piping, purification filters, ion exchangers and letdown strainer from overpressure. The valve capacity is equal to capacity of intermediate pressure letdown relief valve V2345. The set pressure is equal to the design pressure (200 psig) of the low pressure piping and components.

Charging Pump Discharge Relief Valves, V2324, V2325, V2326

The relief valves on the discharge side of the charging pumps are sized to pass the maximum rated flow of the associated pump with maximum backpressure without exceeding the maximum rated total head for the pump assembly. The relief valves are set to open when the discharge pressure exceeds the RCS design pressure (2735 psig).

Charging Pump Suction Relief Valves, V2315, V2318, V2321

The relief valves on the suction side of the charging pumps are set at 150PSIG and sized to pass the maximum fluid thermal expansion rate that would occur if the pump was operated with the suction and discharge isolation valves closed. The set pressure is less than design pressure of charging pump suction piping.

Charging Line Thermal Relief Valve, V2435

The relief valve on the charging line downstream of the regenerative heat exchanger is sized to relieve the maximum fluid thermal expansion rate (44 gpm) that would occur if hot letdown flow continued after charging flow was stopped and if the normally open SE-02-2 was closed. The valve is a spring-loaded check valve designed to open with a

CAUSES: Alarm is caused by fouling of the filter element in 2B CVCS filter housing.

2B CVCS PURIFICATION FILTER ΔP HIGH

M-2

DEVICE:	**SETPOINT:**	**LOCATION:**
PDIS-2210/152	10 psid	RAB/24/S-RA2/W-RAD

ALARM CONFIRMATION

1. PDIS-2210, 2B PURIF FLTR D/P

OPERATOR ACTIONS

CAUTION

- Filter damage may occur between 60 and 70 psid.
- CVCS ion exchangers shall not be inservice without a downstream filter.

1. Locally **CHECK** PDIS-2210, 2B PURIF FLTR D/P.
2. IF SDC Purification is **NOT** in service AND one of the following conditions exist:
   - Letdown flow is less than 41 gpm AND PDIS-2210, 2B PURIF FLTR D/P, indicates 10 psid or higher
   - Letdown flow is 41 to 84 gpm and PDIS-2210, 2B PURIF FLTR D/P, indicates 20 psid or higher
   - Letdown flow is 85 to 128 gpm and PDIS-2210, 2B PURIF FLTR D/P, indicates 30 psid or higher

   THEN **PERFORM** the following:
   A. **PLACE** V2520, ION EXCHANGER BYPASS VALVE, in BYPASS. (RTGB-205)
   B. **NOTIFY** the Control Room 2B CVCS Purification filter will by bypassed.
   C. **OPEN** V2454, 2B PURIF FLTR BYPASS. (RAB/32/N-RA2/W-RAD)
   D. **CLOSE** V2418, 2B PURIF FLTR UPSTRM ISOL. (RAB/31/N-RA2/W-RAD)
   E. **CLOSE** V2452, 2B PURIF FLTR DWNSTRM ISOI. (RAB/31/N-RA2/W-RAD)
   F. **INITIATE** action to have 2B CVCS Purification Filter changed.
3. IF SDC Purification is in service and PDIS-2210, 2B PURIF FLTR D/P, indicates 36 psid or higher, THEN **PERFORM** either of the following as directed by the US / SM:
   A. **REDUCE** letdown flow to lower 2B CVCS filter differential pressure within acceptable limit.
   B. **PERFORM** the following to remove 2B CVCS Purification Filter from service:
      (1) **PLACE** V2520, ION EXCHANGER BYPASS VALVE, in BYPASS. (RTGB-205)
      (2) **NOTIFY** the Control Room the IX and 2B CVCS Purification filter will by bypassed.
      (3) **OPEN** V2454, 2B PURIF FLTR BYPASS.
      (4) **CLOSE** V2418, 2B PURIF FLTR UPSTRM ISOL.
      (5) **CLOSE** V2452, 2B PURIF FLTR DWNSTRM ISOL.
      (6) **INITIATE** action to have 2B CVCS Purification filter changed.
4. IF PDIS-2210 indicated below the differential pressure allowed for current letdown flow, THEN **INITIATE** increased monitoring of 2B CVCS Purification Filter differential pressure as directed by the US / SM until annunciator clears.

REFERENCES:

1. CWD 2998-B-327 sheet 152
2. P&ID 2998-G-078 sheet 120
3. PSL-ENG-SENS-00-013, Rev. 4

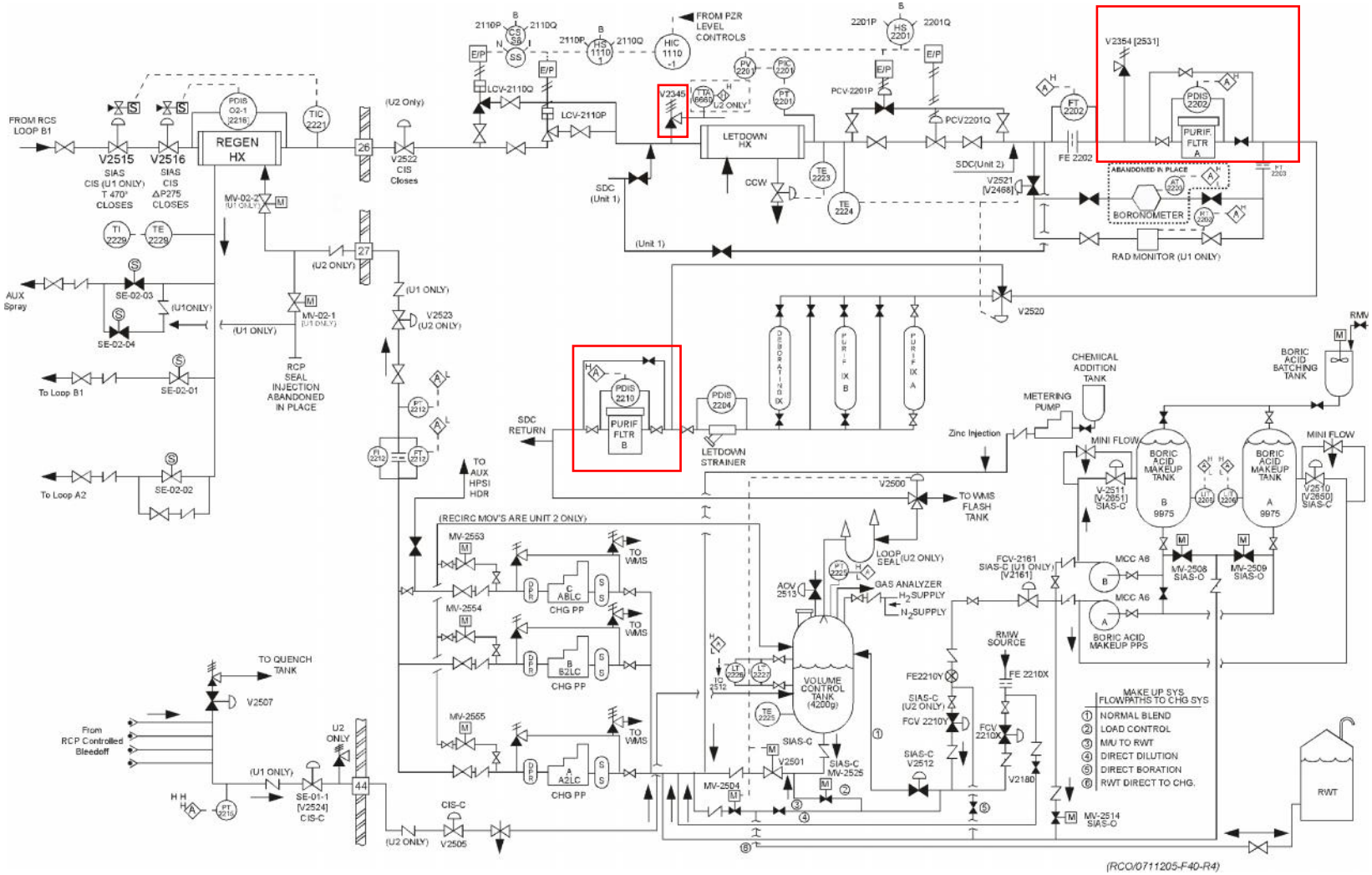

FROM RCS LOOP B1
V2515
SIAS CIS (U1 ONLY) T 470° CLOSES
V2516
SIAS CIS ΔP275 CLOSES
REGEN HX
TIC 2221
(U2 Only)
V2522 CIS Closes
LCV-2110Q
LCV-2110P
FROM PZR LEVEL CONTROLS
HIC 1110 -1
HS 1110 1
V2345
LETDOWN HX
SDC (Unit 1)
CCW
TE 2223
TE 2224
PCV-2201P
PCV2201Q
SDC(Unit 2)
V2521 [V2468]
FE 2202
FT 2202
V2354 [2531]
PDIS 2202
PURIF FLTR A
ABANDONED IN PLACE
BORONOMETER
RAD MONITOR (U1 ONLY)
V2520
AUX Spray
SE-02-03
SE-02-04
SE-02-01
SE-02-02
To Loop B1
To Loop A2
RCP SEAL INJECTION ABANDONED IN PLACE
V2523 (U2 ONLY)
TO AUX HPSI HDR
SDC RETURN
PDIS 2210
PURIF FLTR B
PDIS 2204
LETDOWN STRAINER
DEBORATING IX
PURIF IX B
PURIF IX A
CHEMICAL ADDITION TANK
METERING PUMP
Zinc Injection
BORIC ACID BATCHING TANK
MINI FLOW
BORIC ACID MAKEUP TANK B 9975
BORIC ACID MAKEUP TANK A 9975
V2511 (V-2851) SIAS-C
V2510 (V2650) SIAS-C
V2500
TO WMS FLASH TANK
(RECIRC MOV'S ARE UNIT 2 ONLY)
MV-2553
MV-2554
MV-2555
MV-2504
CHG PP
TO WMS
LOOP SEAL (U2 ONLY)
GAS ANALYZER
VOLUME CONTROL TANK (4200g)
AOV 2513
FCV-2161 SIAS-C (U1 ONLY) [V2161]
MCC A8
MCC A6
MV-2508 SIAS-O
MV-2509 SIAS-O
BORIC ACID MAKEUP PPS
RMW SOURCE
FE 2210X
FCV 2210Y
V2180
V2501
V2512
MV-2525
MV-2514 SIAS-O
MAKE UP SYS FLOWPATHS TO CHG SYS
① NORMAL BLEND
② LOAD CONTROL
③ MU TO RWT
④ DIRECT DILUTION
⑤ DIRECT BORATION
⑥ RWT DIRECT TO CHG.
RWT
TO QUENCH TANK
V2507
From RCP Controlled Bleedoff
SE-01-1 [V2524] CIS-C
CIS-C
V2505
(U2 ONLY)
(U1 ONLY)
(RCO/0711205-F40-R4)

FIGURE 1

31.

004 K3.07 / CVCS / Knowledge of the effect that a loss or malfunction of the CVCS will have on the following: PZR level and pressure

Given the following conditions:

- Unit 1 is at 100% power
- Regenerative HX outlet Temperature is 430 °F and RISING at 10 °F/min
- 1-AOP-02.03, Charging and Letdown has been entered

Which ONE of the following describes the system response and the impact on Pressurizer Level?

Letdown will automatically isolate at ____(1)____, AFTER the Immediate Operator Actions of 1-AOP-02.03, have been completed Pressurizer Level will ____(2)____.

A.	(1)	460 °F
	(2)	lower
B.	(1)	460 °F
	(2)	remain constant
C.	(1)	470 °F
	(2)	lower
D.	(1)	470 °F
	(2)	remain constant

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: This is the alarm setpoint for M-28 Part 2 correct: With Letdown isolated Pzr level will lower due to CBO
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 incorrect: Plausible that with letdown isolated the applicant would believe that Pzr level would remain constant based on the immediate operator actions being completed to secure charging.
C.	Correct:	Part 1 correct: Setpoint is 470 Part 2 correct: With Letdown isolated Pzr level will lower due to CBO
D.	Incorrect:	Part 1 correct: See analysis C. Part 2 incorrect: Plausible that with letdown isolated the applicant would believe that Pzr level would remain constant based on the immediate operator actions being completed to secure charging.

Question Number: 31

Tier: 2 Group: 1

K/A: 004 K3.07 / CVCS / Knowledge of the effect that a loss or malfunction of the CVCS will have on the following: PZR level and pressure

Importance Rating: 3.8 4.1

10 CFR Part 55: (CFR 41.7 / 45.6)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know what a CVCS malfunction will have on Lpzr

Technical Reference: 1-AOP-02.03

Proposed references to be provided: None

Learning Objective: PSL OPS 0702205 - 6

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

thermal stress on the charging line penetrations into the RCS.

Normally, the regenerative heat exchanger reduces the letdown flow temperature to about 265°F. This letdown outlet temperature is maintained via the heat exchange process between returning charging water and the RCS letdown. If the Regenerative Hx outlet temperature exceeds 460°F, an alarm on RTGB-105 annunciator M-28 will actuate. If the temperature reaches 470°F, a close signal to isolation valve V2515, is provided. The pressure on the tube side of the regenerative heat exchanger is approximately that of the RCS. The tube side of the heat exchanger is monitored for ΔP, which will cause the letdown flow to be isolated by closing V2516 at 275 psid. On Unit 1, an anticipatory alarm at 215 psid (annunciator M-7) will alert the operator to an abnormally high differential pressure.

Letdown Level Control Valves – LCV-2110P/Q

LCVs 2110P and Q are used during normal and abnormal operations in conjunction with the backpressure control valves PCVs 2201-P and Q, and the charging pumps to maintain pressurizer water level.

The letdown flow rate is maintained by level control valves LCV-2110P and Q. These valves are normally controlled via the signals received from the Pressurizer Level Control System, which is discussed in detail in Lesson Text 0711206. Normal letdown flow is 40 GPM.

On Unit-1 a device known as the “letdown limiter” (LY-1110) limits the position of the LCVs in order to maintain flows between 29 and 128 GPM [Letdown Limits are set in LIC-2110]. The flow rate of 29 GPM corresponds to a –1.0% pressurizer level deviation and the 128 GPM flow rate corresponds to a +9.0% pressurizer level deviation. Hence, when level is decreasing and reaches –1.0%, the control system will limit flow from the pressurizer to 29 GPM, and when pressurizer level is increasing and reaches +9.0%, the control system will open the LCV to allow a maximum of 128 GPM outflow from the pressurizer. 29 GPM was established as the minimum flow necessary to prevent excessive thermal stresses on the regenerative and letdown heat exchangers during anticipated transients. 128 GPM is closely associated with the maximum charging flow of 132 GPM minus the 4 GPM leakage flow from the RCP seals.

CAUSES: Any of the following:
- Reduction or loss of charging flow due to pump or system failure
- Excessive letdown flow due to valve or system failure

REGENERATIVE HEAT EXCHANGER OUTLET TEMP HIGH

M-28

DEVICE: TIC-2221/150

SETPOINT: 460°F

LOCATION: RTGB-105

ALARM CONFIRMATION

1. TIC-2221, LTDN TEMP REGEN HX TUBE OUT.

OPERATOR ACTIONS

NOTE

V2515, LETDOWN STOP VALVE, automatically closes when letdown temperature reaches 470°F.

1. **GO TO** 1-AOP-02.03, Charging and Letdown.

REFERENCES:
1. CWD 8770-B-327 sheet 150
2. P&ID 8770-G-078 sheet 120B

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS

4.1 Immediate Operator Actions

☐ **1.** IF letdown flow is lost,
THEN **PERFORM** the following:

A. **STOP** the charging pumps.

B. **RETURN** the charging pump control switches to AUTO.

CAUTION

Severe thermal stress and flashing may occur in the Regenerative Heat Exchanger if letdown flow is **NOT** immediately isolated.

☐ **2.** IF charging flow is lost,
THEN **ISOLATE** letdown by performing the following:

A. **CLOSE** V2515, LETDOWN STOP VALVE.

B. **CLOSE** V2516, LETDOWN CNTMT ISOLATION VALVE.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2 Subsequent Operator Actions

4.2.1 General Actions

NOTE

With Charging and Letdown isolated, pressurizer level will lower slowly due to RCP controlled bleedoff flow.

☐ **1.** IF charging and letdown flow has been lost,
THEN, **PERFORM** the following:

A. **MAINTAIN** reactor power and RCS temperature constant to minimize pressurizer level deviations.

B. IF a charging pump(s) has tripped, THEN **PLACE** its control switch in STOP.

32. 005 A2.01 / RHR / Ability to (a) predict the impacts of the following malfunctions or operations on the RHRS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Failure modes for pressure, flow, pump motor amps, motor temperature, and tank level instrumentation

Given the following conditions:

- Unit 1 is in Mode 5
- Reduced Inventory Operations are in progress
- 1A LPSI pump is operating
- SDC flow was initially at 1800 GPM
- RCS level is 29 feet 10 inches

Subsequently:

- 1A LPSI pump discharge flow is oscillating between 50 and 800 GPM
- 1A LPSI pump motor amps are oscillating and discharge pressure is fluctuating
- RCS temperature is 110 °F and slowly RISING
- The crew enters 1-AOP-03.02, Shutdown Cooling Abnormal Operations

Which ONE of the following describes the event in progress and the action(s) required in accordance with 1-AOP-03.02?

1A LPSI pump is experiencing ____(1)____.

The crew is required to FIRST ____(2)____.

A.	(1)	runout conditions
	(2)	secure the LPSI pump
B.	(1)	runout conditions
	(2)	throttle close LPSI header injection valves
C.	(1)	suction line air entrapment
	(2)	secure the LPSI pump
D.	(1)	suction line air entrapment
	(2)	throttle close LPSI header injection valves

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: Pump runout would be indicated by high amps and low discharge pressure, it is plausible that the applicant has a misconception on the indications presented. Part 2 incorrect: This is the correct action as the crew progresses through the AOP and the initial action of throttling doesn't remedy the issue and RCS Level is < 29' 9 ½". The applicant may think that due to the RCS Level stopping the LPSI pump is required FIRST.
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 correct: See analysis D.
C.	Incorrect:	Part 1 correct: See analysis D. Part 2 incorrect: See analysis A.
D.	Correct:	Part 1 correct: Suction line air entrapment is indicated by the parameters in the stem. Part 2 correct: IAW 1-AOP-03.02, Immediate Operator Action step 1.

Question Number: 32

Tier: 2 Group: 1

K/A: 005 A2.01 / RHR / Ability to (a) predict the impacts of the following malfunctions or operations on the RHRS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Failure modes for pressure, flow, pump motor amps, motor temperature, and tank level instrumentation

Importance Rating: 2.7 2.9

10 CFR Part 55: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to predict the impacts of a suction line air issue and correct using AOP

Technical Reference: 1-AOP-03.02

Proposed references to be provided: None

Learning Objective: PSL OPS 0702813-3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

1.0 PURPOSE

This procedure provides actions for responding to a loss of Shutdown Cooling (SDC). The Reactor Coolant System (RCS) may be either in a loops-filled, partial-filled, or in a refueling condition. This procedure addresses the following causes (Section 6.2, Commitment 1):

- Leak (RCS or SDC System)
- Loss of electrical power
- System misalignment
- Loss of Component Cooling Water (CCW)
- Loss of Intake Cooling Water (ICW)
- Loss of Instrument Air

Attachment 6, Unit 1 SDC Simplified Diagram is available for reference.

2.0 ENTRY CONDITIONS

2.1 Indications

- Loss of Shutdown Cooling flow
- Fluctuating LPSI pump amps
- Rising Shutdown Cooling temperature
- Low refueling water level

2.2 Annunciators

- R-19, 1A LPSI PUMP RUNNING V3480/V3481 CLOSING
- R-29, SDC PRESS HIGH V3480/3481 NOT FULL CLOSED
- R-30, 1B LPSI PUMP RUNNING V3651/V3652 CLOSING
- R-40, SDC PRESS HIGH V3651/V3652 NOT FULL CLOSED
- R-48, 1A LPSI PUMP OVRLD/TRIP
- R-49, 1B LPSI PUMP OVRLD/TRIP
- S-23, 1A SDC HX CCW FLOW HIGH/LOW
- S-34, 1B SDC HX CCW FLOW HIGH/LOW
- Z-19, REFUELING LEVEL LOW

3.0 EXIT CONDITIONS

Any of the following conditions are met:

- Any of the Safety Function Status Checks Acceptance Criteria from the Low Mode Off-Normal Procedures for the current plant condition are NOT met.
- Normal decay heat removal is established with the Shutdown Cooling System.
- Decay heat removal is accomplished via the S/Gs.

	INSTRUCTIONS	CONTINGENCY ACTIONS
4.0	**OPERATOR ACTIONS**	
4.1	**Immediate Operator Actions**	
*	**1.** IF LPSI Pump 1A is operating, THEN **VERIFY** AM-251, LPSI PUMP 1A AMPERES, indicates amps stable.	**1.1** **THROTTLE CLOSED** the following until amps stabilize: • HCV-3615, LPSI HEADER TO LOOP 1A2 VALVE • HCV-3625, LPSI HEADER TO LOOP 1A1 VALVE • HCV-3635, LPSI HEADER TO LOOP 1B1 VALVE • HCV-3645, LPSI HEADER TO LOOP 1B2 VALVE **1.2** IF pump amps do **NOT** stabilize, THEN **STOP** LPSI Pump 1A.
*	**2.** IF LPSI Pump 1B is operating, THEN **VERIFY** AM-252, LPSI PUMP 1B AMPERES, indicates amps stable.	**2.1** **THROTTLE CLOSED** the following until amps stabilize: • HCV-3615, LPSI HEADER TO LOOP 1A2 VALVE • HCV-3625, LPSI HEADER TO LOOP 1A1 VALVE • HCV-3635, LPSI HEADER TO LOOP 1B1 VALVE • HCV-3645, LPSI HEADER TO LOOP 1B2 VALVE **2.2** IF pump amps do **NOT** stabilize, THEN **STOP** LPSI Pump 1B.

INSTRUCTIONS	CONTINGENCY ACTIONS

4.1 Immediate Operator Actions (continued)

NOTE

Attachment 1, Estimated Time to Core Boiling, provides instructions for determining time to core boiling.

☐ **3.** **VERIFY** at least one LPSI pump operating.

3.1 IF estimated time to core boiling is less than 30 minutes,
THEN **INITIATE** the following:

- Containment evacuation.
- Containment closure.

4.2 Subsequent Operator Actions

[*] **1.** IF all of the following conditions exist:

- Unit 1 is in Mode 3 thru 6
- SIAS blocked

THEN **VERIFY** at 15 minute intervals that SFSC criteria are met per Low Mode ONP for current plant conditions.

1.1 **GO TO** Low Mode ONP for current plant conditions.

☐ **2.** **RECORD** the following:

- Time SDC was lost:__:__
- RCS Temperature:_____°F

	INSTRUCTIONS	CONTINGENCY ACTIONS

4.2 Subsequent Operator Actions (continued)

*	**3.**	WHEN Plant conditions have stabilized, THEN **REVIEW** Technical Specifications for any required actions.	**3.1**
☐	**4.**	**VERIFY** core alterations are **NOT** in progress.	**4.1** **STOP** core alterations.
☐	**5.**	**VERIFY** RCS dilution is **NOT** in progress.	**5.1** **STOP** RCS dilution.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2 Subsequent Operator Actions (continued)

NOTE

- Attachment 2, RCS Level Indications versus Elevation, provides correlation between RCS actual level (elevation) and indicated level.
- Attachment 3, Minimum Flow to Make Up for Boil Off, provides minimum required RCS makeup flow.

WARNING

If core boiling is occurring, the RCS could pressurize, resulting in indicated RCS level being higher than the actual level. (Section 6.2, Commitment 2)

* **6.** **VERIFY** RCS level is stable or rising, based on available instrumentation for current plant conditions:

- Tygon hose greater than 29 ft 9½ in
- LI-1103, Level Cold Condition, greater than 0%
- LI-1117, RX REFUELING WATER LEVEL (NR), greater than 24½ in. (ERDADS, CRAC)
- LI-1117-1, RX REFUELING WATER LEVEL (WR), greater than 24½ in. (ERDADS, CRAC)

6.1 IF RCS level is less than 29 ft 9 ½ inches, THEN **ENSURE** LPSI pumps stopped:

- LPSI Pump 1A
- LPSI Pump 1B

6.2 IF time to core boiling OR uncovery of Reactor Vessel internals is less than 30 minutes, THEN **PERFORM** the following:

1. **ENSURE** Containment evacuation initiated.

2. IF core alterations in progress AND time permits, THEN **DIRECT** lowering of fuel or RV internals to lowest level under water.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2 Subsequent Operator Actions (continued)

6. (continued)

3. IF RCS is **NOT** open to Containment,
THEN **ENSURE** tygon level hose isolated to prevent overpressurizing.

4. **VERIFY** with Emergency Closure Supervisor that 1-GMM-68.02, Emergency Closure of Containment Penetrations, Personnel Hatch and Equipment Hatch, in progress.

5. **CLOSE** all penetrations in the Open Penetration Log.

6.3 **ENSURE** draining of the RCS is **NOT** in progress.

6.4 IF RCS level continues to lower OR boiling is occurring,
THEN **IMPLEMENT** 1-AOP-01.08, RCS Leakage Abnormal Operations, to maintain and recover level.

6.5 WHEN RCS level is greater than 29 ft 9 ½ in,
THEN **ENSURE** SDC in service per Attachment 4, Restoration of SDC.

33.

006 K5.05 / ECCS / Knowledge of the operational implications of the following concepts as they apply to ECCS: Effects of pressure on a solid system

Given the following conditions:

- Unit 1 is in a Forced Outage
- RCS is on Shutdown Cooling
- RCS Temp is 145 °F
- The crew is taking the RCS solid in accordance with 1-GOP-305, Reactor Plant Cooldown – Hot Standby to Cold Shutdown, Attachment 4
- 1A Charging Pump is running

Which ONE of the following completes the statements below?

In accordance with 1-GOP-305, ____(1)____ HPSI pump(s) have been removed from service AND/OR disabled.

In accordance with 1-GOP-305, Att. 4, ____(2)____ is the prescribed indication to be used to determine the pressurizer is solid.

A.	(1)	One
	(2)	LI-1103, Level Cold Condition indicates 100%
B.	(1)	One
	(2)	PIC-2201, Letdown Pressure output starts increasing
C.	(1)	Two
	(2)	LI-1103, Level Cold Condition indicates 100%
D.	(1)	Two
	(2)	PIC-2201, Letdown Pressure output starts increasing

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect. This is plausible because for these conditions on Unit 2 only 1 HPSI pump would be disabled. Also, if all CCPs are disabled only 1 HPSI pump is allowed to be disabled. Part 2 incorrect: It is plausible that the applicant thinks that 100% on the Pressurizer would be indication that the RCS is solid.
B.	Incorrect:	Part 1 incorrect. This is plausible because for these conditions on Unit 2 only 1 HPSI pump would be disabled. Part 2 correct: See analysis D.
C.	Incorrect:	Part 1 correct. See analysis D. Part 2 incorrect: It is plausible that the applicant thinks that 100% on the Pressurizer would be indication that the RCS is solid.
D.	Correct:	Part 1 correct. For these conditions on Unit 1 2 HPSI pump would be disabled IAW TS 3.5.3 Part 2 correct: IAW Att.4 , Step 26 Note: Any of the following indications may be used to determine that pressurizer has become solid: PIC-2201, LETDOWN PRESSURE, output starts increasing to limit RCS pressure rise. Letdown flow begins to rise. Letdown and RCS pressure begin to rise. With PIC-2201, LTDN PRESSURE, in AUTO, pressure can be expected to rise to 150 PSIG before controller and valve response times stabilize system pressure.

Question Number: 33

Tier: 2 Group: 1

K/A: 006 K5.05 / ECCS / Knowledge of the operational implications of the following concepts as they apply to ECCS: Effects of pressure on a solid system

Importance Rating: 3.4 3.8

10 CFR Part 55: (CFR: 41.5 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the effects of a solid system on ECCS pump operations

Technical Reference: TS 3.5.3, 1-GOP-305

Proposed references to be provided: None

Learning Objective: PSL OPS 0720801-3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

4.9 Removing High Pressure Safety Injection (HPSI) From Service

1. Prior to decreasing RCS temperature below 270°F, **REMOVE** one HPSI Pump from service for compliance with Technical Specification 3.5.3.b, Emergency Core Cooling Systems, ECCS Subsystems - Shutdown, as follows:

A. IF HPSI PUMP 1A is to be removed from service, THEN **PERFORM** the following:

(1) **CLOSE** V3656, HPSI PUMP 1A DISCHARGE. (KEY 54) _____

(2) **PERFORM** Attachment 3, Section 3.0, 1A HPSI PUMP

B. IF HPSI PUMP 1B is to be removed from service, THEN **PERFORM** the following:

(1) **CLOSE** V3654, HPSI PUMP 1B DISCHARGE VALVE. (KEY 52) _____

(2) **PERFORM** Attachment 3, Section 4.0, 1B HPSI PUMP.

C. **PLACE** a caution tag with the following information on 4.16 KV breaker for HPSI Pump removed from service:

"The breaker for this HPSI pump is racked out to ensure compliance with Technical Specification 3.5.3.b. The pump breaker SHALL remain RACKED OUT below 270°F RCS temperature unless either the pressurizer manway cover or the reactor vessel head is removed."

D. **VERIFY** OPERABLE HPSI Pump aligned for safety injection per 1-NOP-03.11, HPSI System Initial Alignment.

2. WHEN RCS temperature is between 250°F and 236°F, THEN **DISABLE** remaining HPSI Pump as follows for compliance with the following Technical Specifications:

- 3.5.3.c, Emergency Core Cooling Systems, ECCS Subsystems - Shutdown
- 3.1.2.1.b, Reactivity Control Systems, Boration Systems, Flow Path - Shutdown

4.9 Removing High Pressure Safety Injection (HPSI) From Service (continued)

2. (continued)

- 3.1.2.3, Reactivity Control Systems, Charging Pumps - Shutdown

A. IF the 1A HPSI Pump has **NOT** been previously disabled, THEN **PERFORM** the following:

(1) **PLACE** HPSI PUMP 1A control switch in STOP position. _____

(2) **PLACE** caution tag with the following information on control switch for HPSI PUMP 1A:

"This HPSI Pump is disabled to ensure compliance with Technical Specifications 3.5.3.c, 3.1.2.1.b, and 3.1.2.3. The control switch for this HPSI Pump SHALL **NOT** be moved from the STOP position unless (a) either the pressurizer manway cover or the reactor vessel head is removed, or (b) **NO** Charging Pumps are OPERABLE. Refer to the listed Technical Specifications for further guidance PRIOR TO moving the control switch from the STOP position."

(3) **CLOSE** V3656, HPSI PUMP 1A DISCHARGE. (KEY 54) _____

(4) **PLACE** caution tag with the following information on key switch for V3656, HPSI PUMP 1A DISCHARGE:

"This HPSI Pump Discharge Valve is positioned to ensure compliance with Tech Spec 3.5.3.c. This key switch SHALL **NOT** be moved from the LOCKED CLOSED position unless the associated HPSI Pump is allowed to be OPERABLE per Technical Specifications 3.1.2.1.b, 3.1.2.3 and 3.5.3. DO **NOT** remove this Caution Tag until MODE 4."

ATTACHMENT 4
Pressurizer Cooling And Solid Pressure Operation
(Page 5 of 8)

25. At 95% Pressurizer level, **ENSURE** the following valves are LOCKED CLOSED.

- SE-02-3, PRESSURIZER AUXILIARY SPRAY
- SE-02-4, PRESSURIZER AUXILIARY SPRAY

26. Prior to reaching 100% Pressurizer level as indicated on LI-1103, LEVEL COLD CONDITION, **ENSURE** only ONE Charging Pump is running.

NOTE

Any of the following indications may be used to determine that pressurizer has become solid:

- PIC-2201, LETDOWN PRESSURE, output starts increasing to limit RCS pressure rise.
- Letdown flow begins to rise.
- Letdown and RCS pressure begin to rise. With PIC-2201, LTDN PRESSURE, in AUTO, pressure can be expected to rise to 150 PSIG before controller and valve response times stabilize system pressure.

27. WHEN indications are noted that pressurizer has become solid, THEN **ADJUST** PIC-2201, LTDN PRESSURE, setpoint as necessary to stabilize RCS Pressure 150 - 200 PSIG.

4.9 Removing High Pressure Safety Injection (HPSI) From Service

1. Prior to decreasing RCS temperature below 200°F, **REMOVE** one HPSI Pump from service for compliance with Technical Specification 3.5.3, Emergency Core Cooling Systems, ECCS Subsystems - Shutdown, as follows:

   A. IF HPSI PUMP 2A is to be removed from service, THEN **PERFORM** Attachment 3, Section 2.0, 2A HPSI PUMP.

   B. IF HPSI PUMP 2B is to be removed from service, THEN **PERFORM** Attachment 3, Section 3.0, 2B HPSI PUMP.

   C. **PLACE** caution tag with the following information on 4.16 KV breaker for HPSI Pump removed from service:

   "The breaker for this HPSI pump is racked out to ensure compliance with Technical Specification 3.5.3, Emergency Core Cooling Systems, ECCS Subsystems - Shutdown. The pump breaker SHALL remain RACKED OUT unless either the pressurizer manway cover or the reactor vessel head is removed."

   D. **VERIFY** OPERABLE HPSI Pump is aligned for safety injection per 2-NOP-03.11, HPSI System Initial Alignment.

EMERGENCY CORE COOLING SYSTEMS

ECCS SUBSYSTEMS - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.5.3 As a minimum, one ECCS subsystem comprised of the following shall be OPERABLE:

a. In MODES 3* and 4#, one ECCS subsystem composed of one OPERABLE high pressure safety injection pump and one OPERABLE flow path capable of taking suction from the refueling water storage tank on a safety injection actuation signal and automatically transferring suction to the containment sump on a sump recirculation actuation signal.

b. Prior to decreasing the reactor coolant system temperature below 270°F a maximum of only one high pressure safety injection pump shall be OPERABLE with its associated header stop valve open.

c. Prior to decreasing the reactor coolant system temperature below 236°F all high pressure safety injection pumps shall be disabled and their associated header stop valves closed except as allowed by Specifications 3.1.2.1 and 3.1.2.3.

APPLICABILITY: MODES 3* and 4.
MODES 5 and 6 when the Pressurizer manway cover is in place and the reactor vessel head is on.

ACTION:

a. With no ECCS subsystems OPERABLE in MODES 3* and 4#, immediately restore one ECCS subsystem to OPERABLE status or be in COLD SHUTDOWN within 20 hours.

b. With RCS temperature below 270°F and with more than the allowed high pressure safety injection pump OPERABLE or injection valves and header isolation valves open, immediately disable the high pressure safety injection pump(s) or close the header isolation valves.

c. In the event the ECCS is actuated and injects water into the Reactor Coolant System, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 90 days describing the circumstances of the actuation and the total accumulated actuation cycles to date.

d. LCO 3.0.4.b is not applicable to ECCS High Pressure Safety Injection subsystem when entering MODE 4.

SURVEILLANCE REQUIREMENTS

4.5.3.1 The ECCS subsystem shall be demonstrated OPERABLE per the applicable Surveillance Requirements of 4.5.2.

4.5.3.2 The high pressure safety injection pumps shall be verified inoperable and the associated header stop valves closed prior to decreasing below the above specified Reactor Coolant System temperature and once per month when the Reactor Coolant System is at refueling temperatures.

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* With pressurizer pressure < 1750 psia.

\# REACTOR COOLANT SYSTEM cold leg temperature above 250°F.

34.

007 G2.1.20 Pressurizer Relief/Quench Tank / Ability to execute procedure steps

Given the following conditions:

- Unit 2 is at 100% power
- Annunciator H-32, Quench Tank Level High/Low is received due to minor in-leakage
- Quench Tank (QT) pressure is 3 psig and RISING slowly
- QT level is 70% and RISING slowly
- The crew is restoring the QT to the normal bands in accordance with 2-NOP-01.07, Quench Tank Operation

Which ONE of the following completes the statements below?

The QT is drained to the ___(1)___

In accordance with 2-NOP-01.07, during draining, if the QT lowers to a pressure of ____(2)____, the draining MUST be secured to reduce the possibility of PORV leakage.

A.	(1)	Reactor Drain Tank
	(2)	1.0 psig
B.	(1)	Equipment Drain Tank
	(2)	1.0 psig
C.	(1)	Reactor Drain Tank
	(2)	2.0 psig
D.	(1)	Equipment Drain Tank
	(2)	2.0 psig

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: Per the attached figure 23. The Quench Tank is drained to the Reactor Drain Tank (RDT) Part 2 correct: 6. IF Quench Tank pressure lowers to less than 1 psig, THEN PERFORM the following: A. CLOSE V1401, Quench Tank Drain. RTGB-203
B.	Incorrect:	Part 1 incorrect: The EDT is plausible because the containment sumps and the RDT go to the EDT Part 2 correct: See explanation A.
C.	Correct:	Part 1 correct: Per the attached figure 23. The Quench Tank is drained to the Reactor Drain Tank (RDT) Part 2 incorrect: Normal band for the QT is 2-4 psig therefore it is plausible that the applicant believe this is correct.
D.	Incorrect:	Part 1 correct: See explanation B. Part 2 incorrect: See explanation B.

Question Number: 34

Tier: 2 Group: 1

K/A: 007 G2.1.20 Pressurizer Relief/Quench Tank / Ability to execute procedure steps

Importance Rating: 3.4 3.4

10 CFR Part 55: (CFR 41.7 / 45.5 / 45.6)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to execute procedure steps related to PRT/QT operations.

Technical Reference: 2-NOP-01.07 Quench Tank Operation

Proposed references to be provided: None

Learning Objective: PSL OPS 0711206 - 6

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	
Bank	X

Question History: PSL BANK question for the 2019 NRC Exam

Comments:

1.0 PURPOSE AND SCOPE

1. This procedure provides the instructions for placing the Quench Tank in service. Sections are provided to adjust the Quench Tank water level, pressure and temperature and to fill the reactor drain tank for shielding. Guidance is also included in these sections to minimize the cyclic stresses on the rupture disc and Power Operated Relief Valve (PORV)and Pressurizer Safety Valve discs and seats that result from any in leakage from these valves.

2.0 PRECAUTIONS AND LIMITATIONS

2.1 Precautions

1. The Quench Tank rupture disc blow out pressure is 85 psig.

2. Quench Tank pressures of less than 1 psig could raise the possibility of PORV and Pressurizer Safety Valve leakage.

3. Cooling the Quench Tank to less than 115º F could raise the possibility of PORV and Pressurizer Safety Valve leakage.

4. Normal Quench Tank level is 60% to 70%. If normal level is not maintained, the rupture disc blow out pressure could be exceeded during a Quench Tank design event.

5. If the Quench Tank water level is less than 40%, the inlet sparger will be completely uncovered.

6. V1242, Quench Tank Relief Valve, setpoint is 70 psig. This relief valve discharges to the Containment atmosphere.

7. V7310, Quench Tank for N2 Press Reg, is normally set to maintain 3 psig (2 to 4 psig) pressure in the Quench Tank.

2.2 Limitations

1. The Quench Tank temperature should be maintained less than 120º F to ensure design limits for the Quench Tank are not exceeded.

2. The Pressurizer Safety Valve tail pipe header can be filled when Quench Tank level exceeds 80%.

4.4 Lowering Quench Tank Level

1. **ENSURE** Section 2.0 Precautions and Limitations, has been reviewed. _____

2. **ENSURE** Section 3.0, Prerequisites and Initial Conditions, has been reviewed. _____

3. **MONITOR** the Reactor Drain Tank as Quench Tank is drained to ensure there is ample volume to hold the water drained from the Quench Tank. _____

4. **OPEN** V6741, NITROGEN HEADER. RTGB-205 _____

5. **OPEN** V1401, QUENCH TANK DRAIN. RTGB-203 _____

NOTE

- The following step may be repeated as necessary.
- Annunciator H-32, QUENCH TANK LEVEL HIGH/LOW alarms at 70% (HIGH) and 60% (LOW).

6. IF Quench Tank pressure lowers to less than 1 psig, THEN **PERFORM** the following:

   A. **CLOSE** V1401, Quench Tank Drain. RTGB-203 _____

   B. IF necessary to maintain Quench Tank pressure, THEN **EQUALIZE** pressure between the Quench Tank and Reactor Drain Tank as follows:

      (1) **OPEN** V1400, QUENCH TANK VENT. RTGB-203 _____

      (2) **OPEN** V6300, RDT VENT VALVE. RTGB-205 _____

   C. WHEN Quench Tank pressure returns to between 2 and 4 psig, THEN **OPEN** V1401, Quench Tank Drain. RTGB-203 _____

7. IF Quench Tank initial level was greater than 70%, THEN **VERIFY** Annunciator H-32, QUENCH TANK LEVEL HIGH / LOW, CLEAR when level is less than 70%. _____

8. WHEN Quench Tank level is between 60% and 70%, THEN **CLOSE** V1401, QUENCH TANK DRAIN. RTGB-203 _____

9. IF Quench Tank pressure is less than 2 psig, THEN **ENSURE** V1400, QUENCH TANK VENT, is CLOSED. RTGB-203 _____

4.4 Lowering Quench Tank Level (continued)

10. WHEN Quench Tank pressure is between 2 psig and 4 psig, THEN **PERFORM** the following:

A. **ENSURE** V1400, QUENCH TANK VENT, is CLOSED. _____

B. **ENSURE** V6300, VENT VALVE, is CLOSED. _____

C. **CLOSE** V6741, NITROGEN HEADER.
(Section 7.1.3, Management Directive 1) _____

Performed By: _____ _____ _____
Print/Sign Initials Date

Reviewed By: _____ _____
Unit Supervisor (Print/Sign) Date

QUENCH TANK SYSTEM

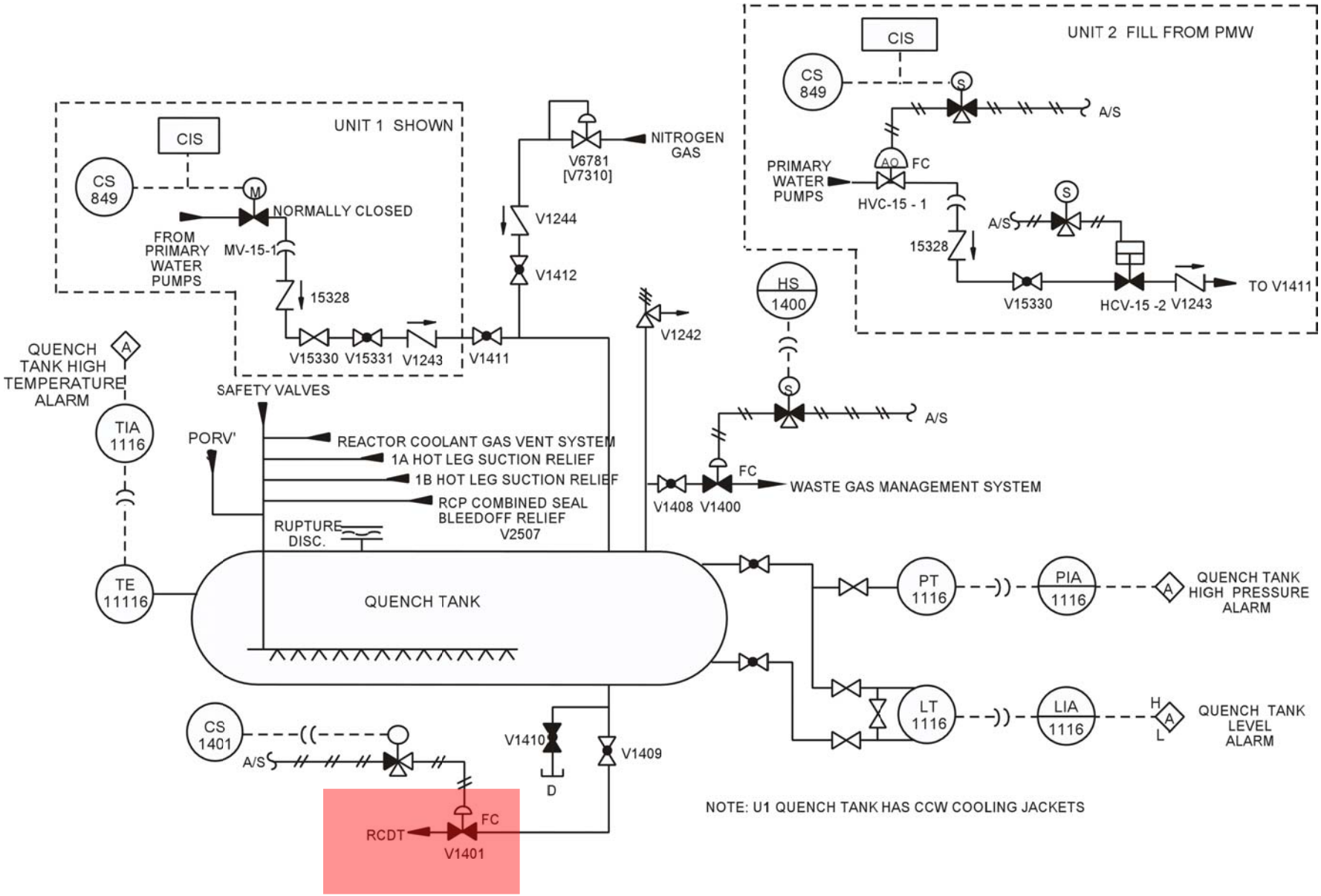


FIGURE 23

35.

008 K2.02 CCW / Knowledge of bus power supplies to the following: CCW pump, including emergency backup

Given the following conditions:

- Unit 2 is at 100% power
- The 2A and 2B Component Cooling Water (CCW) pumps are running
- “AB” Electrics are aligned to the “A” side

Subsequently:

- The 2B CCW pump was secured due to rapidly rising amps
- The crew entered 2-AOP-14.01, Component Cooling Water Abnormal Operations

Which ONE of the following completes the statements below?

In accordance with 2-AOP-14.01, when the 2C CCW pump is started, the 2AB 4.16 Kv bus will be powered from the ____(1)____ 4.16 KV bus.

If a subsequent Loss of Off-site Power(LOOP) were to occur IMMEDIATELY following pump starting, the 2C CCW pump ____(2)____ AUTOMATICALLY start when the bus is energized.

A.	(1)	2A3
	(2)	will
B.	(1)	2A3
	(2)	will NOT
C.	(1)	2B3
	(2)	will
D.	(1)	2B3
	(2)	will NOT

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect but plausible 2-AOP-14.01 step 7 Contingency 7.2 states that if the 2B3 4.16KV bus is de-energized, then verify less than 100 KW of temporary loads and start the 2C CCW pump powered from 2A3 4.16 KV bus. In this case, the pump is tripped and the 2B3 4.16 KV bus remains energized. Part 2 correct, but plausible for this condition. The applicant incorrectly believes that the mechanical alignment to the "B" train, AND the "B" CCW pump control switch in PTL, the restart permissive would be satisfied. The mechanical line up will be to the "B" train and the "B" CCW pump control switch will be in pull to lock. See additional details of analysis "C"
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 incorrect, but plausible: The applicant may have the incorrect knowledge that "All" AB busses (480 VAC and 125VDC) must be aligned to the same train for an auto restart to occur.
C.	Correct:	Part 1 correct: 2-AOP-14.01 directs the mechanical alignment from the control room to "B" train, then the electrical alignment of the 4.16 KV to the "B" train, THEN start the 2C CCW pump to restore CCW flow to the "B" train. The remainder of the electrical alignments, 480 "AB" VAC and 125 VDC "AB" busses will be realigned later. Part 2 is correct: Three conditions must be met for an auto restart of the 2C CCW following a loss of power; (1) Pump previously running, (2) 2B CCW pump control switch in Pull to Lock, and (3) "AB" 4.16 Kv bus aligned to the 2B3 4.16 Kv bus. (1) Given that the question stated the 2C CCW pump was started (2) is met by the required contingency action for placing the 2B CCW pump in Pull to Lock for plant conditions (Step 4.2.3 Contingency 1.1), (3) the "AB" 4.16 Kv bus is realigned to the 2B3 (step 4.2.3 Contingency 7.1).
D.	Incorrect:	Part 1 correct: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 35

Tier: 2 Group: 1

K/A: 008 K2.02 CCW / Knowledge of bus power supplies to the following: CCW pump, including emergency backup

Importance Rating: 3.0 3.2

10 CFR Part 55: (CFR 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required know how the C CCW pump is powered during a LOOP

Technical Reference: 2-AOP-14.01

Proposed references to be provided: None

Learning Objective: PSL OPS 0702209-8

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

CCW Surge Tank High Level Abnormal Condition

Three conditions could cause a high level in the CCW Surge Tank, radioactive leakage into the CCW system, air/gas intrusion, or failure of the demineralized makeup water system to function properly. The abnormal procedural guidance provides for:

- The CCW radiation monitors are checked for abnormal trends for high levels in the CCW surge tank. If high radiation is indicated, the abnormal procedure for CCW excessive activity is entered.

- If excessive makeup flow is indicated, the makeup supply from the demineralized water system is isolated.

- If condition is not one of the above, air/gas intrusion should be considered. Co-symptoms are CCW pump amperage fluctuations, low flow to smaller components, high temperature alarms on smaller components. The abnormal procedure will direct system venting per the AOP.

CCW Surge Tank Low Level Abnormal Condition

Two conditions could cause a low level in the CCW surge tank; a failure of the makeup system to supply demineralized water or a rupture in one of the CCW headers. The abnormal procedural guidance provides for:

- Ensuring the makeup system is working properly
- Looking for and isolating leaks

CCW PUMPS

There are three centrifugal, horizontal split, double suction pumps rated at 8500 gpm at 177 (~77 psig) feet of discharge head located on the CCW platform east of the RAB [CCW platform in the CCW building]. In accident conditions the 'A' pump supplies the 'A' header and the 'B' pump supplies the 'B' header. The 'C' pump is normally aligned to the 'B' ['A'] header with its motor-operated suction and discharge valves and power supplies aligned to that side. Train separation is always met such that before aligning the 'C' pump to the other train, it is first isolated from the current train. (See Figures 1,2 and 4.) When the 'C' CCW pump is being used to satisfy the requirements of either the 'A' or 'B' CCW pump, the alignment of the suction and discharge valves MV-14-1,

14-2, 14-3, and 14-4, respectively, shall be consistent with the same side power supply.

The CCW pump motors are powered from the safety-related 4160 volt AC buses which are loaded onto the Emergency Diesel Generators upon a loss of off-site power (LOOP). If a LOOP occurs, the normally running(red flagged) CCW pumps 'A' and 'B' would restart immediately (the A and B CCW breakers does not open on undervoltage].

Power supplies to the CCW pumps are:

Pump	Power supply
1A	1A3 4160 volt AC bus
1B	1B3 4160 volt AC bus
1C	1AB 4160 volt bus (normally aligned to the 1B3 4160 volt AC bus)
2A	2A3 4160 volt AC bus
2B	2B3 4160 volt AC bus
2C	2AB 4160 volt bus (normally aligned to the 2A3 4160 volt AC bus)

The CCW pumps can be operated from two locations:

- **NORMAL** operation by the respective control switch at the RTGB 106 [206] in the control room. The circuit NORMAL/ISOLATE switch, located at the 4160 VAC switchgear, is in the NORMAL position. Each pump control switch has five positions:

  - **START** which starts the pump
  - **STOP** which stops the pump
  - **PULL TO LOCK**

    The **standby** CCW pump control switch (normally 'C'), at RTGB 106 [206], is maintained in **the PULL TO LOCK** position. **This configuration prevents the standby pump from AUTO starting for a SIAS and/or LOOP condition, thereby ensuring that only one CCW pump would be loaded to one EDG and preventing an overload condition.** The time that a standby pump is not in PULL TO LOCK is minimized to the time just prior to starting it. The standby pump would be taken from PULL TO LOCK to AUTO GREEN FLAG for a very short time prior to starting the standby pump. Once the running pump is stopped, its control switch would be taken to PULL TO LOCK.

The Pull to Lock position for the A or B CCW Pump is part of the auto start circuit for the C CCW pump. For the C CCW pump to auto start, the pump which has the same electrical supply as the AB 4160 V AC bus must be in Pull-to-Lock. Additionally, in Unit 1only, the relay that indicates the pump is in Pull-to-Lock must have power, MA instrument bus for the A CCW pump in Pull-to-Lock and MB for the B CCW pump in Pull-to-Lock.

- **Green Flag after STOP**
  This position enables the control circuit to enable certain AUTO start conditions. For example, if the 'A' CCW pump was stopped and a SIAS were to occur, the 'A' pump would AUTO START.

- **Red Flag after START**
  This position enables the control circuit to enable certain AUTO start conditions. For example, if the 'A' pump was in Pull-to-Lock and the 'C' pump was running (red flagged or Auto start from SIAS) with the AB 4160 V AC bus aligned to the A3 4160 V AC bus, then when a LOOP and/or a LOOP/SIAS occurred, the 'C' pump breaker would trip and then would reclose once voltage was back on the bus (providing MA power was available to the relay needed on Unit 1).

  The 'A' and 'B' CCW pump breakers don't get an undervoltage trip signal, so if bus voltage goes away, the breaker doesn't trip. If the pump breaker was closed (red flagged or an Auto start from SIAS), the pump will restart whenever voltage is restored to the bus because the breaker never opened.

- **LOCAL** operation at the pump breaker would occur for control room inaccessibility conditions when the NORMAL/ISOLATE switches are taken to the ISOLATE position for the 'A' and 'B' pump controls, with the exception being the 'C' pump, which has a three position switch:

  - NORMAL-AUTO, which is the normal position of the switch
  - NORMAL-MAN [NORMAL-MANUAL], which is not used
  - ISOLATE, which is used during control room inaccessibility conditions

Alarms associated with the CCW pumps:

- (ICW)/CCW THIRD PUMP INTLK FAILURE alarm occurs in Unit 1 only when the relay which is necessary for the C CCW (and ICW) pump to "see" that the A or B CCW pump is in Pull –to-Lock has lost power. If the relay that has lost power is the relay for the pump that is in Pull-to-Lock, then this indicates that the C CCW pump will not auto start on a SIAS or not restart on a LOOP or LOOP/SIAS. Since the C CCW pump breaker trips on undervoltage, this indicates that it is inoperable. However, it can be manually started. The MA instrument bus powers the relay for the A CCW pump in Pull-to-Lock, so if the MA bus was lost but the C CCW pump was substituting for the B CCW pump, there would be no effect on the C CCW Pump.

- CCW low header pressure alarm occurs at 60 psig

- 'C' CCW Pump Valves MISALIGNED alarm occurs when the electrical 4160 V AC source for the 'C' pump is not the same as the header to which the suction and/or discharge valves are aligned (See Figure 5)

- CCW PUMP OVERLOAD/TRIP alarm occurs on an overcurrent or trip condition.

- Emergency 125 V DC/4.16 KV/480V AB BUSES MISALIGNED alarm occurs when or of the AB buses is aligned to one source (A or B) and another AB bus is aligned to the opposite source (B or A).

- CCW PUMP MOTOR HIGH TEMPERATURE alarm occurs at 185^{o}F. The Senior Nuclear Plant Operator would be dispatched to read the local temperature indication on the CCW platform for the affected pump, and to check the oil levels. In the event of a valid high temperature, the standby pump would be started on the affected header.

- CCW PUMP BKR FAILURE alarm could occur as a result of a failure of the closing spring charging motor, SF_6 gas pressure on breaker is low or closing power has been lost.

- SS ISOL alarm occurs when the NORMAL/ISOLATE switch is taken to ISOLATE.

The maximum allowable single pump flow is procedurally limited to 10,800 gpm. CCW

pump performance is tested in accordance with the plant Pump and Valve test program. Header flows and pressures are monitored at RTGB 106 [206]. Following major system work or pump overhaul, procedural guidance is given on filling and venting the system. It is important to do filling and venting slowly to minimize sudden drops in surge tank level [with automatic 'N' header isolation]. Pump casings are vented upon starting to prevent cavitation.

Loss of a CCW Pump

The loss of either the normally running 'A' or 'B' CCW pump would require the prompt alignment of the 'C' pump to the affected side. For example, if the 1A CCW pump failed, and the 1C CCW pump were to be aligned to the 'A' side, the 1C CCW pump would have its suction and discharge valves closed to the 'B' side, thereby ensuring train separation. The 1C CCW pump's suction and discharge valves to the 'A' side would then be opened, the 4.16 KV AB electrical bus would be aligned to the A3 bus and the pump started on the 'A' side. The 'AB' 125 VDC, and 480 VAC buses would have to be realigned to the 'A' side

If, in the event of only one CCW pump is available and running, non-essential loads are isolated to ensure that the lone pump flow is below 10,800 gpm. Examples of non-essential loads isolated include CCW to the Fuel Pool Heat Exchanger.

CCW HEAT EXCHANGERS

The CCW system contains two horizontal, counter flow Component Cooling Water heat exchangers (CCW HX) located on the CCW platform [CCW platform in the CCW building] east of the RAB. CCW is pumped through the shell side and Intake Cooling Water (ICW) is pumped through the tube side. The system is designed such that one CCW HX and one CCW pump has the heat removal capacity equipment required for safe shutdown or design basis events. (See Figure 6)

TIC-14-4A and TIC-14-4B control ICW flow through the CCW HXs. These temperature controllers sense the CCW outlet temperature of the CCW HXs and positions TCV-14-4A and TCV-14-4B, respectively, to control the ICW flow to maintain the desired temperature. The normal setpoint for these controllers is 100^{o}F. TCV-14-4A and TCV-14-4B are fail open, air-operated butterfly valves.

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2.3 Loss of CCW Pump 2B (continued)

☐ **4.** **VERIFY** CCW Pump 2C is stopped.

4.1 IF CCW Pump 2A is on standby, THEN **PERFORM** the following:

A. **START** CCW Pump 2A.

B. **STOP** CCW Pump 2C.

NOTE

Annunciator S-26, 2C CCW PUMP HDR VALVES / AB BUS MISALIGNMENT, is expected while re-aligning CCW Pump 2C to CCW Header B if electrically aligned on Train A.

☐ **5.** **VERIFY** the following CLOSED:

- MV-14-1, PUMP 2C DISCH TO HEADER A
- MV-14-3, HEADER A TO PUMP 2C

5.1 **CLOSE** the following:

- MV-14-1, PUMP 2C DISCH TO HEADER A
- MV-14-3, HEADER A TO PUMP 2C

☐ **6.** **VERIFY** the following OPEN:

- MV-14-2, PUMP 2C DISCH TO HEADER B
- MV-14-4, HEADER B TO PUMP 2C

6.1 **OPEN** the following:

- MV-14-2, PUMP 2C DISCH TO HEADER B
- MV-14-4, HEADER B TO PUMP 2C

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.3 Loss of CCW Pump 2B (continued)

NOTE

If 2AB AC and DC Buses are **NOT** all powered from the B side, then Tech Specs credit can **NOT** be taken for CCW Pump 2C until alignment is complete.

☐ **7.** **VERIFY** both the following conditions are met:

- CCW Pump 2C electrically aligned to B Side.
- 4160V Bus 2B3 ENERGIZED.

7.1 IF in MODES 1 to 4 AND 4160V Bus 2B3 ENERGIZED, THEN **PERFORM** Attachment 2, Aligning 4160V Bus 2AB to B Side, prior to starting CCW Pump 2C on Header B.

NOTE

Operation of two CCW pumps electrically aligned to the same electrical bus for emergency conditions while in MODES 1 through 4, should be limited to 12 hours. (Section 6.1.3, Management Directive 2)

7.2 IF 4160V Bus 2B3 is **NOT** ENERGIZED, THEN **PERFORM** the following:

- **VERIFY** less than 100 kW of temporary loads are being supplied, or will be upon a turbine trip, from the 2A Start-Up Transformer. (Section 6.1.3, Managemen t Directive 2)
- **ENSURE** 4160V Bus 2AB aligned to A Side per Attachment 1, Aligning 4160V Bus 2AB to A Side, prior to starting CCW Pump 2C on CCW Header B.

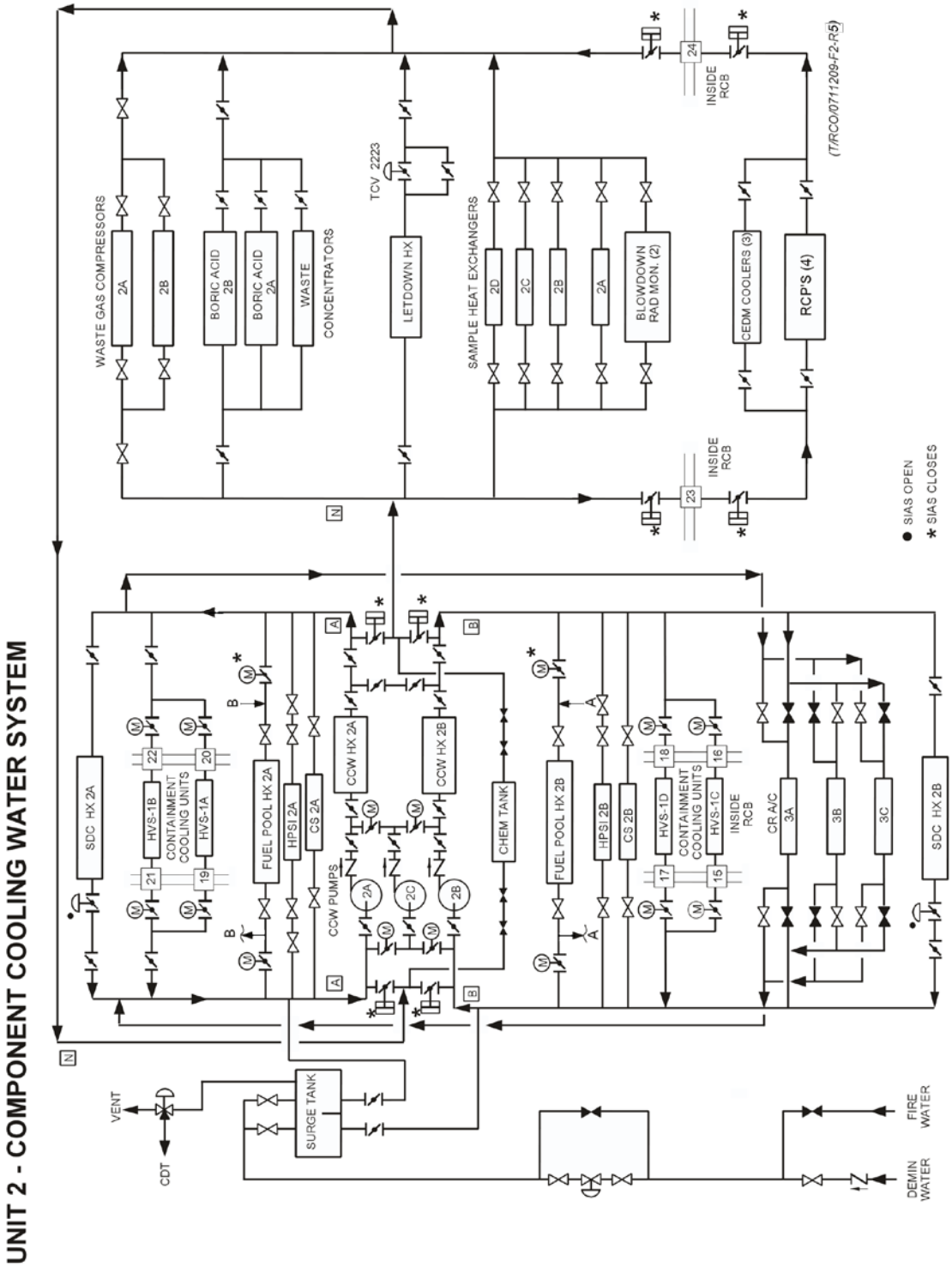

UNIT 2 - COMPONENT COOLING WATER SYSTEM
WASTE GAS COMPRESSORS
2A
2B
BORIC ACID 2B
BORIC ACID 2A
WASTE CONCENTRATORS
TCV 2223
LETDOWN HX
SAMPLE HEAT EXCHANGERS
2D
2C
2B
2A
BLOWDOWN RAD MON. (2)
CEDM COOLERS (3)
RCP'S (4)
INSIDE RCB
24
23
(T/RCO/0711209-F2-R5)
● SIAS OPEN
✱ SIAS CLOSES
SDC HX 2A
HVS-1B
HVS-1A
CONTAINMENT COOLING UNITS
22
20
21
19
FUEL POOL HX 2A
HPSI 2A
CS 2A
CCW HX 2A
CCW HX 2B
CCW PUMPS
2A
2C
2B
CHEM TANK
FUEL POOL HX 2B
HPSI 2B
CS 2B
HVS-1D
HVS-1C
18
16
17
15
CR A/C
3A
3B
3C
SDC HX 2B
SURGE TANK
VENT
CDT
FIRE WATER
DEMIN WATER
N
A
B

FIGURE 2

CCW PUMP PIPING ARRANGEMENT

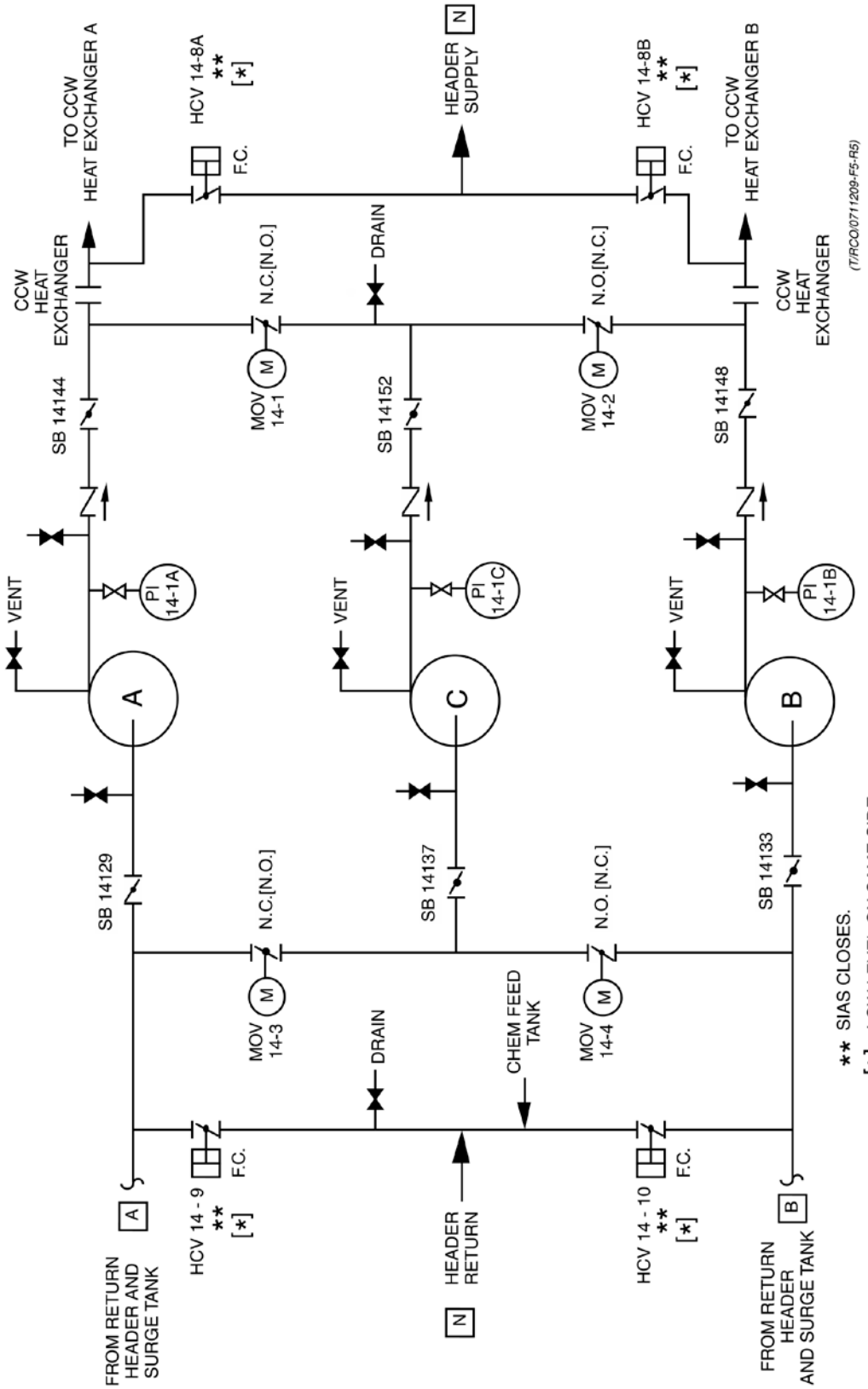


FIGURE 4

36. 008 K4.02 CCW / Knowledge of CCWS design feature(s) and/or interlock(s) which provide for the following: Operation of the surge tank, including the associated valves and controls.

Given the following conditions:

- Unit 2 is at 100% power

Subsequently:

- Annunciator LA-10, CCW Surge Tank Compartment **"A"** Level Low ALARMS
- LG-14-2A, CCW Surge Tank Level indicates 29 inches and SLOWLY LOWERING
- LG-14-2B, CCW Surge Tank Level indicates 30 inches and STABLE
- The Crew enters 2-AOP-14.01, Component Cooling Water Abnormal Operations

Which ONE of the following completes the statements below?

_____(1)_____ "N" Header Isolation Valves have AUTOMATICALLY CLOSED.

The CLOSED "N" Header Isolation Valves ____(2)____ be overridden OPEN.

A.	(1)	TWO
	(2)	can
B.	(1)	TWO
	(2)	can NOT
C.	(1)	FOUR
	(2)	can
D.	(1)	FOUR
	(2)	can NOT

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: Only the TWO “A” header “N” header isolation valves will close on the low level. Part 2 incorrect: But plausible, SIAS can be overridden but the low level cannot.
B.	Correct:	Part 1 correct: Only the TWO “A” header “N” header isolation valves will close on the low level. Part 2 correct: SIAS can be overridden but the low level cannot.
C.	Incorrect:	Part 1 incorrect: It is plausible to think that ALL 4 N header isolation valves go closed since this is what happens on a SIAS and is also the required action on Unit 1 on the Low level. On Unit 2 Only the TWO “A” header “N” header isolation valves will close on the low level. Part 2 incorrect: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 correct: See analysis B.

Question Number: 36

Tier: 2 Group: 1

K/A: 008 K4.02 CCW / Knowledge of CCWS design feature(s) and/or interlock(s) which provide for the following: Operation of the surge tank, including the associated valves and controls.

Importance Rating: 2.9 2.7

10 CFR Part 55: (CFR 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the design features/interlocks of the CCW valves

Technical Reference: 2-AOP-14.01, Component Cooling Water Abnormal Operations

Proposed references to be provided: None

Learning Objective: PSL OPS 0702209-4B

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

CAUSES: Alarm may be caused by a faulty automatic makeup valve, gas intrusion, or CCW system leak. (Management Directive, Ref # 3)

CCW SURGE TANK COMPARTMENT A LEVEL LOW

LA-10

DEVICE: LS-14-1A/211

SETPOINT: 2 feet 5 inches above tank bottom

LOCATION: RAB/64/S-RA1/W-RAI

ALARM CONFIRMATION

1. LG-14-2A, CCW Surge Tank Level (local indication).

OPERATOR ACTIONS

CAUTION

HCV-14-8A and HCV-14-9 automatically CLOSE when level decreases to low level setpoint. CCW flow will be lost to ALL of the following components which may cause equipment damage:

- Boric Acid Concentrators
- 2A and 2B Waste Gas Compressors
- RCPs
- Letdown HX
- Fuel Pool HX
- Sample Hxs
- CEDM Coolers

1. Locally **PERFORM** the following:
   A. **ENSURE** the following valves are OPEN:
      - V14482, Root Valve for LG-14-2A Upper On CCW Surge Tank. (RAB/77/S-RA1/W-RAI)
      - V14483, Root Valve for LG-14-2A Lower On CCW Surge Tank. (RAB/73/S-RA1/W-RAI)

   B. **CHECK** LG-14-2A, CCW Surge Tank Level.

NOTE

LCV-14-1, Demin Water to CCW Surge Tank, receives an OPEN signal at 36 inches above tank bottom and a CLOSE signal at 48 inches above tank bottom. (Management Directive, Ref # 3)

   C. **VERIFY** LCV-14-1, Demin Water to CCW Surge Tank, is operating properly to maintain surge tank level 36 to 48 inches above tank bottom. (RAB/64/S-RA1/E-RAJ)

   D. IF LCV-14-1 is **NOT** operating to maintain surge tank level, THEN **PERFORM** the following:
      (1) **THROTTLE** OPEN V14103, LCV-14-1 Bypass, as required to restore CCW surge tank level above low level alarm setpoint.
      (2) **CLOSE** V14102, LCV-14-1 Upstrm Isol.
      (3) **OPERATE** V14103 as required to maintain CCW surge tank level 36 to 48 inches above tank bottom. (Management Directive, Ref # 3)
      (4) **REQUEST** System Engineering or Maintenance assistance in troubleshooting LCV-14-1 malfunction. (Management Directive, Ref # 3)

   E. WHEN local level indication is no longer required, THEN **CLOSE** the following valves:
      - V14482, Root Valve for LG-14-2A Upper On CCW Surge Tank.
      - V14483, Root Valve for LG-14-2A Lower On CCW Surge Tank.

2. IF any of the following conditions exist:
   - CCW system leak is indicated (continuous makeup required to maintain CCW surge tank level or surge tank level lowering).
   - Abnormal CCW Surge Tank Level (Management Directive, Ref # 3)
   - Signs of gas intrusion by CCW Surge Tank Level rise

   THEN **GO TO** 2-AOP-14.01, Component Cooling Water Abnormal Operations

3. IF CCW Surge Tank Level is greater than 54 inches above tank bottom and needs to be lowered, THEN **GO TO** precautions of 2-NOP-14.02, Component Cooling Water System Operation, prior to draining. (Management Directive, Ref # 3)
4. **REQUEST** System Engineering support in determining cause of this annunciator.

REFERENCES:

1. CWD 2998-B-327 SH 211
2. P&ID 2998-G-083 SH 1
3. CAPR CR 403656 Assignment 25, Air Intrusion Into CCW System, (Management Directive, Cause, Step 1.C note, Step 1.D.(3), Step 1.D.(4), Step 2 2nd bullet, Step 3, Step 4)

DETAILED DESCRIPTION

CCW SURGE TANK

The CCW surge tank is connected to the suction of the CCW pumps and is designed to accommodate volumetric thermal changes in the system and to maintain NPSH at each pump suction. The tank is normally vented to atmosphere to prevent damage to the tank from both over-pressure and vacuum conditions. The cylindrical tank is horizontally mounted and has a volume of 2000 gallons. The surge tank is located east of the control room and north of the control room A/C units. Although both essential headers share the surge tank, a 30” high baffle divides the lower portion of the tank into two separate compartments; each associated with one of the essential headers. Each essential header is supplied from one compartment through separate surge lines.

Demineralized makeup water is added to the surge tank through an automatic level control system by the demineralized water system. A backup water supply is also available from the fire water system. (Refer to Figure 3 and Table1

- Air-operated valve LCV-14-1 is used to control makeup flow. Automatic makeup water is:
  - **added** when the surge tank level falls below **36"** as sensed by LS-14-3 (This setpoint is based on the requirement that the surge tank level be maintained for fluid contraction and expansion and to ensure that the pumps have the required NPSH)
  - **stopped** when surge tank level increases to **48"** as sensed by LS-14-4. (This setpoint is based on the requirement to maintain level below the top of the tank which is 66” from the tank bottom)
- Alarms associated with CCW surge tank levels are actuated at:
  - **High at 54"** as sensed by LS-14-5 (CCW SURGE TANK LEVEL HIGH) This setpoint is set to alert the operator of a potential leakage of radioactive water into the CCW system, air intrusion, OR a failure of the makeup system to terminate makeup flow.
  - **Low at 29"** as sensed by LS-14-1A (COMPARTMENT A LEVEL LOW)
  - **Low at 29"** as sensed by LS-14-1B (COMPARTMENT B LEVEL LOW). This

The 'N' non-essential header serves components used for normal plant operations that are not Seismic Class I equipment and is normally supplied by the 'A' and 'B' headers. The 'N' header is automatically isolated from the 'A' and 'B' headers upon receipt of a **SIAS** [and/or CCW Surge Tank low level].

Header flow and pressure indications are read on RTGB 106 [206]. In addition, CCW flow from the Fuel Pool Heat Exchangers, Shutdown Cooling Heat Exchangers, Letdown Heat Exchangers [and combined CCW from RCPs and CEDM coolers] are available on RTGB 106 [206].

Rupture of Essential Header

On Unit 1, the affected header ties to the 'N' header are closed and the affected side CCW pump is secured. On Unit 2, all four 'N' header valves will automatically close, and then Surge Tank level will increase for the non-faulted side, at which time that side 'N' header valves should be re-opened and the affected side CCW pump secured

N' Header Valves

As shown on Figure 7, air-operated, fail-close 'N' header valves HCV-14-8A, HCV-14-8B, HCV-14-9, and HCV-14-10 are used to line up the 'N' header to both the 'A' and 'B' headers for normal operation. The safety function of these valves is to isolate the non-essential header from the essential headers on a SIAS.

The air supply solenoid valves for 'A' side supply HCV-14-8A and return HCV-14-9 are powered from 'A' 125 VDC. The air supply solenoid valves for 'B' side supply HCV-14-8B and return HCV-14-10 are powered from 'B' 125 VDC.

These valves are controlled by CLOSE/AUTO/OPEN [CLOSE/OPEN/ OVERRIDE] switches located on RTGB 106[206]. Valve position indication is also provided on RTGB 106. A **SIAS** [SIAS and/or CCW Surge Tank low level] will automatically close the valves.

On Unit 1, placing the Control Switch in OPEN will override the SIAS Signal. When SIAS is reset the switches should be returned to AUTO.

On Unit 2, during a SIAS the 'N' header valves can be re-opened by going to CLOSE and then the OVERRIDE position. When the SIAS is reset, the switches must be returned to CLOSE and then the OPEN position. If the switch is left in the OVERRIDE position with no SIAS signal present, the valves will automatically close. For normal valve operation, it is not necessary to take both valves to CLOSE and then to OPEN, as the 8A(B) valve is in the other's control circuit. Taking both the control switches to CLOSE doesn't have adverse effects. Only the HCV-14-8A(B) switch would have to be taken to override if HCV-14-9(10) is in OPEN because it follows the 8A(8B) valve when in OPEN, but procedurally we do both switches.

Unit 2 'N' header valves will automatically close on a low Surge Tank level. These valves CANNOT be OVERRIDDEN on a low Surge Tank condition.

- LS-14-6A causes HCV-14-8A and HCV-14-9 to go closed.
- LS-14-6B controls HCV-14-8B and HCV-14-10 to go closed.

Rupture of the 'N' Header

On Unit 1, the operator will close all four 'N' header valves for a rupture of the 'N' header. [On Unit 2, the 'N' header valves will automatically close on low Surge Tank level.] The Reactor and Turbine are tripped and Standard Post Trip Actions will be carried out.

'N' Header Containment Penetrations

The 'N' header supplies several components located inside containment. 'N' header flow to containment is controlled by four air-operated, fail close valves. These valves are designed to fail close upon a loss of instrument air or control power to ensure containment isolation in the event of a DBA.

The 'N' header enters the containment through penetration 23, which has two air-operated valves; and leaves through penetration 24, which also has two air-operated valves, as shown on Figure 8. The two supply valves are HCV-14-1 and HCV-14-7. The two return valves are HCV-14-6 and HCV-14-2. On Unit 1, all four valves are outside containment in the pipe penetration room. On Unit 2, one supply and return are inside containment and one supply and return are outside containment in the pipe penetration room.

The 'N' header to containment valves are operated by three position individual control switches (OPEN-AUTO-CLOSE [OPEN RESET-AUTO-CLOSE]) at RTGB 106[206]. A SIAS will automatically close these valves. The operator has the ability to restore CCW to the RCPs and other containment CCW loads in a SIAS configuration by placing each control switch for HCV-14-1, HCV-14-2, HCV-14-6, and HCV-14-7 to OPEN [OPEN RESET], which will "override" SIAS and open the valves. An alarm, RCP CCW ISOL HCV-14-1/2/6/7 SIAS OVRD, informs the operator that SIAS has been overridden. In addition, in order to restore CCW flow to the RCPs following a SIAS the 'N' header valves HCV-14-8A, HCV-14-8B, HCV-14-9, and HCV-14-10 will have to be overridden as described previously in the 'N' header section of this text. [On Unit 2, the instrument air to containment air-operated valves, HCV-18-1, will also have to be taken to OVERRIDE to restore CCW to the RCPs.]

A backup to the instrument air system is provided by nitrogen to operate the supply and return valves on Unit 1 during abnormal conditions. RCP abnormal operational procedural guidance nitrogen can be used for two scenarios:

If the loss of CCW is due to an air supply failure, local restoration of CCW to the RCPs is accomplished by:

- Closing the instrument air supply valve to the affected HCV(s),
- Attaching the nitrogen flex hose to the male quick disconnect fitting in the air supply to each affected HCV,
- Verifying that the HCV has opened.

If the loss of CCW is due to an air supply SOLENOID failure, local restoration of CCW to the RCPs is accomplished by:

- Closing the solenoid vent ball valve for the affected HCV,
- Attaching the HCV solenoid vent line male flex hose to the female quick disconnect fitting downstream of the air supply regulator,
- Verifying that the HCV has opened.

'C' CCW Pump Suction and Discharge Valves

The 'C' CCW pump can be aligned to take suction from, and discharge to, one essential header at a time. The other set of suction and discharge valves being closed ensures separation between the 'A' and 'B' essential headers. Normally, the 'C' pump is aligned to the 'B' ['A'] header, which is consistent with the power supplies for the AB

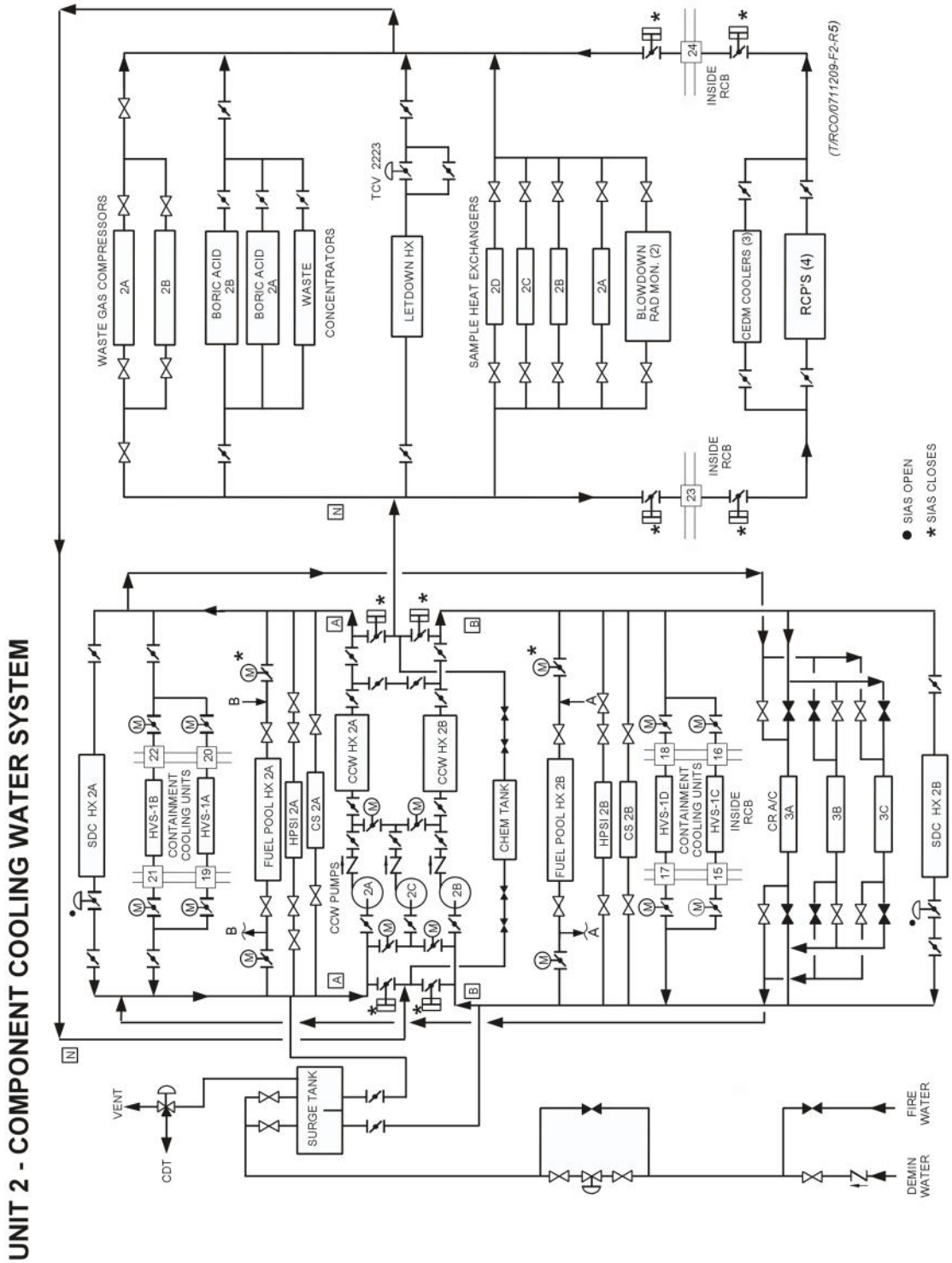

UNIT 2 - COMPONENT COOLING WATER SYSTEM
WASTE GAS COMPRESSORS
2A
2B
BORIC ACID 2B
BORIC ACID 2A
WASTE CONCENTRATORS
TCV 2223
LETDOWN HX
SAMPLE HEAT EXCHANGERS
2D
2C
2B
2A
BLOWDOWN RAD MON. (2)
CEDM COOLERS (3)
RCP'S (4)
INSIDE RCB
24
23
(T/RCO/0711209-F2-R5)
● SIAS OPEN
✱ SIAS CLOSES
SDC HX 2A
HVS-1B
HVS-1A
CONTAINMENT COOLING UNITS
FUEL POOL HX 2A
HPSI 2A
CS 2A
CCW HX 2A
CCW HX 2B
CCW PUMPS
CHEM TANK
FUEL POOL HX 2B
HPSI 2B
CS 2B
HVS-1D
HVS-1C
CR A/C 3A
3B
3C
SDC HX 2B
SURGE TANK
VENT
CDT
FIRE WATER
DEMIN WATER

FIGURE 2

37.

010 K6.03 / Pressurizer Pressure Control / Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: PZR sprays and heaters

Given the following conditions:

- Unit 1 is at 100% power

Subsequently:

- TIA-1103, SPRAY LINE1B1 (Water Temperature), indicates 530 °F
- TIA-1104, SPRAYLINE 1B2 (Water Temperature), indicates 548 °F
- RCS pressure is 2190 psia
- The crew has entered 1-AOP-01.01, Pressurizer Pressure and Level

Which ONE of the following completes the statements below?

In accordance with 1-AOP-01.10, the crew is required place the Pressurizer Spray Valve selector switch to ____(1)____ .

IF RCS Pressure continues to LOWER, the crew is required to secure the ____(2)____.

A.	(1)	1100E, Spray Valve 1B2
	(2)	1B1 RCP
B.	(1)	1100E, Spray Valve 1B2
	(2)	1B2 RCP
C.	(1)	1100F, Spray Valve 1B1
	(2)	1B1 RCP
D.	(1)	1100F, Spray Valve 1B1
	(2)	1B2 RCP

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is incorrect but plausible, the applicant must know which spray valve is associated with which loop. If the applicant applies the normal sequence of E before F, they would associate PCV-1100E with the indicated temperature on the 1B1 RCS cold leg. The sequencing of the PCVs is reversed with the numbering of the RCS loops. Part 2 incorrect but plausible. The applicant must know which temperature is indicative of the spray valve which I leaking by and the action to mitigate the transient.
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 correct: See analysis D.
C.	Incorrect:	Part 1 correct: See analysis D. Part 2 incorrect: See analysis A.
D.	Correct:	Part 1 correct: PCV-1100F Pressurizer spray valve comes off of the 1B1 RCS cold leg. The indications provided in the stem indicates that the PCV-1100E is open. The applicant must know which spray valve comes off of which loop to determine failure. By selecting spray valve selector in 1100F, as directed by 1-AOP-01.10, this will be the only spray valve receiving a pressure control signal and having PCV-1100E go closed. The spray line with the indicated temperature approaching the cold leg temperature is indicative of the failed spray valve. Part 2 correct: In accordance with 1-AOP-01.10, if selecting the operable spray valve does not mitigate the lowering of RCS pressure, the procedure dictates the securing of the 1B2 RCP.

Question Number: 37

Tier: 2 Group: 1

K/A: 010 K6.03 / Pressurizer Pressure Control / Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: PZR sprays and heaters

Importance Rating: 3.2 3.6

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how a malfunction of the PZR Sprays will have on the PZR PCS.

Technical Reference: PSL OPS 0711206

Proposed references to be provided: None

Learning Objective: PSL OPS 0702206 – 5.

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: Bank question for the 2019 NRC Exam

Comments: Bank question from Waterford 3 2015 NRC Exam

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.4 Pressurizer Spray or Auxiliary Spray Valves OPEN or Leaking

NOTE

Divergence of spray line temperatures between 1B1 and 1B2 spray lines may indicate a stuck open spray valve. The stuck open spray valve would have the spray line with the higher temperature approaching cold leg temperature.

☐ **1.** IF either of the following conditions are met:

- Pressurizer pressure is less than 2275 psia
- Pressurizer pressure is lowering uncontrollably

THEN **VERIFY** spray valves CLOSED:

- PCV-1100E, SPRAY VALVE 1B2, status lights
- PCV-1100F, SPRAY VALVE 1B1, status lights
- TIA-1103, SPRAY LINE 1B1 (Water Temperature), and TIA-1104, SPRAY LINE 1B2 (Water Temperature), indicate approximately equal temperatures.

1.1 IF PCV-1100E, SPRAY VALVE 1B2, is OPEN,
THEN **PLACE** Pressurizer spray valve selector switch in 1100F.

1.2 IF PCV-1100F, SPRAY VALVE 1B1, is OPEN,
THEN **PLACE** Pressurizer spray valve selector switch in 1100E.

1.3 IF spray valve is still failed OPEN AND Pressurizer pressure approaches TM/LP setpoints,
THEN **PERFORM** the following:

A. **TRIP** reactor.

B. **IMPLEMENT** 1-EOP-01, Standard Post Trip Actions.

C. IF PCV-1100E, SPRAY VALVE 1B2, is **NOT** CLOSED,
THEN **STOP** 1B2 RCP.

D. IF PCV-1100F, SPRAY VALVE 1B1, is **NOT** CLOSED,
THEN **STOP** 1B1 RCP.

Unit 1 proportional heaters have a NORMAL/ISOLATE switch at the heater bus breaker.

- **NORMAL** - allows RTGB breaker operation, along with interlock protection.
- **ISOLATE - blocks RTGB control, along with the LO-LO level.**
  - In ISOLATE, heater bank now manually operated from the HSCP ON/OFF switch. When closed, PPCS auto signal to the SCR still functions to vary heater output.
  - ISOLATE triggers the RTGB-103 loss of control power annunciator.
  - ISOLATE de-energizes the affected breaker position indication on RTGB 103.

Backup Heaters

Backup Heaters Bank B1, B2, B3, B4, B5 and B6 are normally controlled from RTGB 103 [203]. Refer to Figure 11.

Each of the six (6) backup heater banks has three switches for heater control:

- A maintained contact three position switch, OFF-RESET/AUTO/ON, on RTGB-103 [203]
- A maintained contact, two position, NORMAL/ISOLATE switch at the breaker.
- An ON/OFF switch at the HSCP
- If the NORMAL/ISOLATE switch for backup heaters is in NORMAL with Pressurizer level **≥ 28 [27]%**, backup heaters are energized when the control switch is selected to ON.
- [Unit 2 B/U heaters will de-energize if pressure **≥ 2340 psia** and must be reset when pressure reduces to < 2340 psia.]
- If Pressurizer level is **≥ 28 [27]%** and AUTO is selected, the backup heaters will cycle:
  - **OFF at 2220 psia** increasing and **ON at 2200 psia decreasing**, or
  - **ON if Pressurizer level exceeds setpoint by 3.6%**.
    - The heaters cycle on when an insurge is indicated due to anticipation of a pressure decrease from the colder water and a subsequent outsurge.
    - [If pressure is ≥ 2275 psia, the backup heaters that are in 'Auto' will not energize.]

Analog Pressure Control

Pressurizer pressure controllers, PIC-1100X & Y, are proportional controllers, located on RTGB-103 [203], which provide a 4 to 20 mA DC current output signal. The controller develops an analog output signal to control the proportional heaters and the spray valves. Refer to Figure 30. (This discussion assumes the associated NORMAL/ISOLATE selector switches at the isolation panels are in NORMAL.)

- The pressure setpoint is manually adjustable by means of a RAISE/LOWER pushbutton on the controller, normally set at **2250 psia**.

- The analog output control signal of PIC-1100X & Y, in percent of maximum, is determined by pressure deviation from setpoint.

- When actual pressure is at setpoint, the output signal of PIC-1100X(Y) is **16.6%**.
  - With 16.6% control signal applied to the SCRs, the heaters produce ~50% of their maximum thermal output.

- Controller output is indicated by a horizontal output [bar graph] meter on the controller.

- Actual pressure and pressure setpoint are displayed on the vertical portion of the controller.

By design, approximately 150 kW thermal input is required to offset Pressurizer heat losses to ambient and the Pressurizer cooldown caused by continuous bypass spray. For normal steady state operations, sufficient backup heater banks will be energized to maintain proportional heaters at ~50% output.

Since the pressure setpoint is normally 2250 psia, analog control points are frequently given in psia. Refer to Figure 30.

As actual pressure deviates from setpoint, controller output (and heater thermal output) vary in a linear fashion: (Refer to Figures 31 and 32.)

- At -25 psi from setpoint, controller output is 0% and proportional heater output is maximum.

- At +25 psi from setpoint, controller output is 33.3% and proportional heater thermal output reaches zero.

- There is a 25 psi dead band of no heater or spray operation from +25 psi to +50 psi. [Unit 2 does not have this dead band.]

PRESSURIZER HEATER AND SPRAY PROPORTIONAL CONTROL

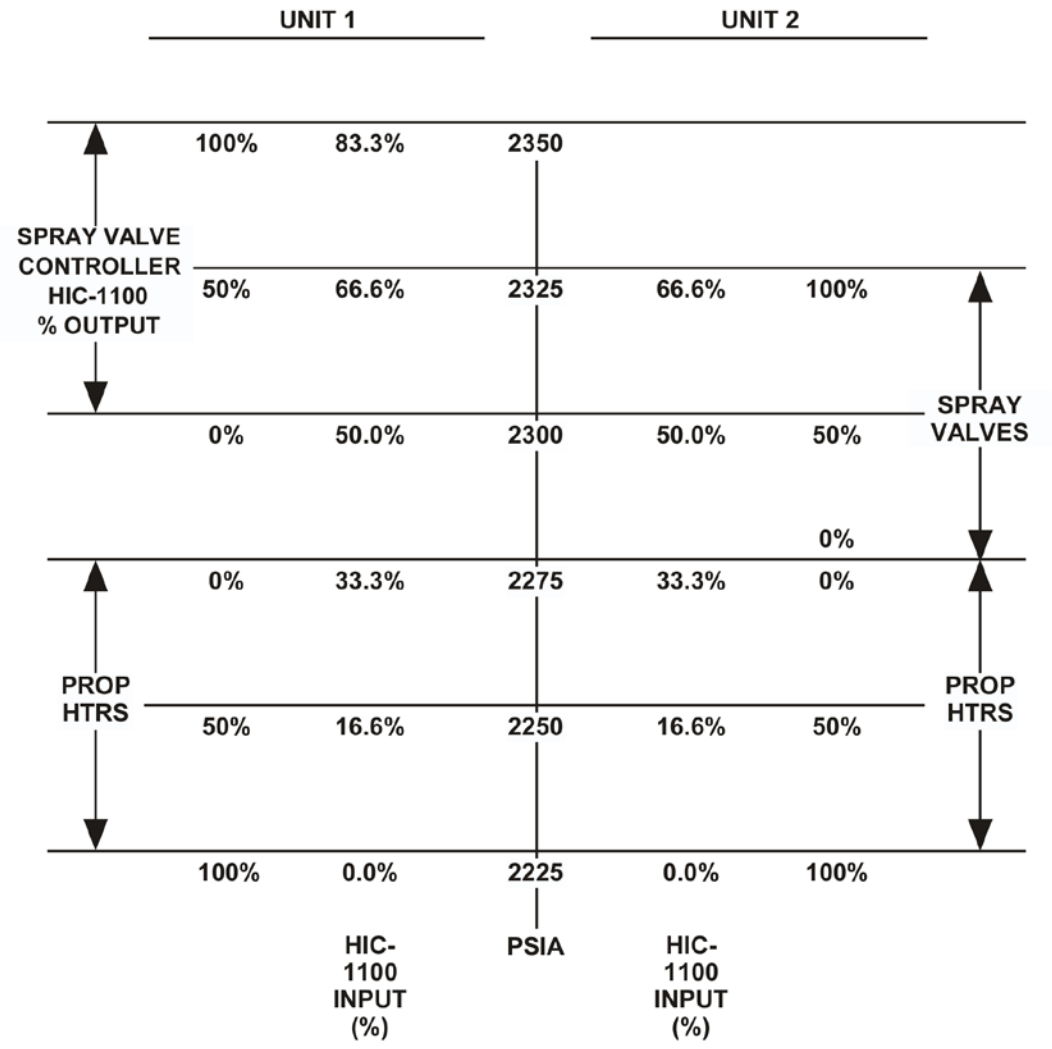


FIGURE 31

38.

010 K6.02 / PPCS / Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: PZR

Given the following conditions:

- Unit 1 is at 100% power
- Channel X Pressurizer Pressure Controller is selected
- Proportional Heater Bank output is 50%
- Pressurizer Backup Heaters B2 and B5 are ON
- ALL other Pressurizer Backup Heaters are in AUTO

Subsequently:

- A Small Leak develops on the top of the Pressurizer

Which ONE of the following equipment responses will occur?

PIC-1110X, Pressurizer Pressure controller OUTPUT will ____(1)____.

The remaining Backup Heaters will automatically energize at ____(2)____.

A.	(1)	lower to 0%
	(2)	2200 psia
B.	(1)	lower to 0%
	(2)	2225 psia
C.	(1)	rise to 100%
	(2)	2200 psia
D.	(1)	rise to 100%
	(2)	2225 psia

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: As pressure lowers the output of PIC-1110X will lower until 0% Part 2 correct: The setpoint for the remaining BU HTRS to energize is 2200 psia.
B.	Incorrect:	Part 1 correct: See analysis A Part 2 incorrect: The setpoint for the remaining BU HTRS to energize is 2200 psia. It is plausible that the applicant believe that 2225 psia is correct due to this being the pressure at which the proportional heaters are at maximum output, therefore the applicant may think the BU HTRS will de-energize on rising pressure. This is also the DNB Margin Limit.
C.	Incorrect:	Part 1 incorrect: As pressure lowers the output of PIC-1110X will lower until 0%. It is plausible that the applicant believe that the control will rise to 100% to raise pressure. Part 2 correct: See analysis A
D.	Incorrect:	Part 1 incorrect: See analysis C Part 2 incorrect: See analysis B

Question Number: 38

Tier: 2 Group: 1

K/A: 010 K6.04 / PPCS / Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: PZR

Importance Rating: 3.2 3.5

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how a malfunction of the PZR will affect the PZR PCS

Technical Reference: 2-AOP-01.10

Proposed references to be provided: None

Learning Objective: PSL OPS 0711206-18

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

Analog Pressure Control

Pressurizer pressure controllers, PIC-1100X & Y, are proportional controllers, located on RTGB-103 [203], which provide a 4 to 20 mA DC current output signal. The controller develops an analog output signal to control the proportional heaters and the spray valves. Refer to Figure 30. (This discussion assumes the associated NORMAL/ISOLATE selector switches at the isolation panels are in NORMAL.)

- The pressure setpoint is manually adjustable by means of a RAISE/LOWER pushbutton on the controller, normally set at **2250 psia**.

- The analog output control signal of PIC-1100X & Y, in percent of maximum, is determined by pressure deviation from setpoint.

- When actual pressure is at setpoint, the output signal of PIC-1100X(Y) is **16.6%**.
  - With 16.6% control signal applied to the SCRs, the heaters produce ~50% of their maximum thermal output.

- Controller output is indicated by a horizontal output [bar graph] meter on the controller.

- Actual pressure and pressure setpoint are displayed on the vertical portion of the controller.

By design, approximately 150 kW thermal input is required to offset Pressurizer heat losses to ambient and the Pressurizer cooldown caused by continuous bypass spray. For normal steady state operations, sufficient backup heater banks will be energized to maintain proportional heaters at ~50% output.

> Since the pressure setpoint is normally 2250 psia, analog control points are frequently given in psia. Refer to Figure 30.

As actual pressure deviates from setpoint, controller output (and heater thermal output) vary in a linear fashion: (Refer to Figures 31 and 32.)

- At -25 psi from setpoint, controller output is 0% and proportional heater output is maximum.

- At +25 psi from setpoint, controller output is 33.3% and proportional heater thermal output reaches zero.

- There is a 25 psi dead band of no heater or spray operation from +25 psi to +50 psi. [Unit 2 does not have this dead band.]

ATTACHMENT 2
Automatic Responses to Pressurizer Pressure Deviations
(Page 1 of 1)

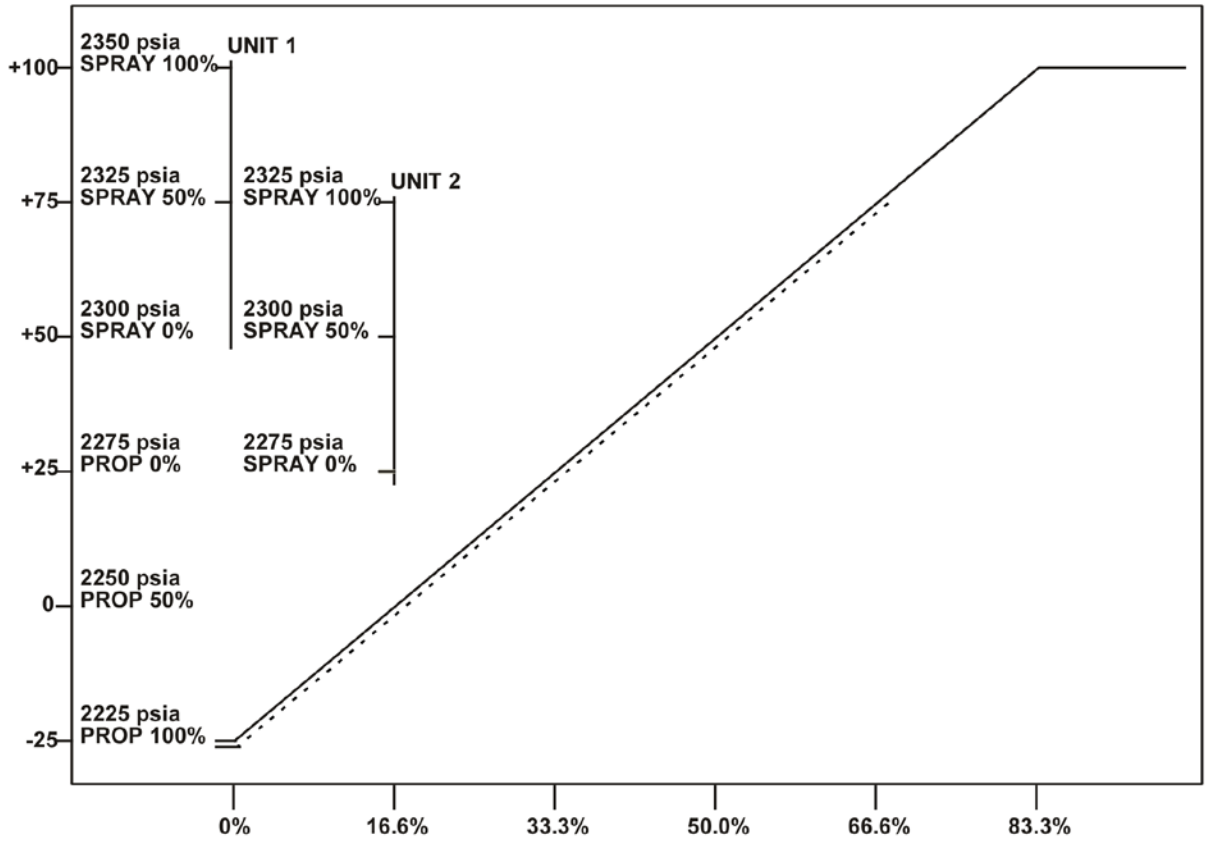
PRESSURIZER PRESSURE SETPOINTS	
Pressurizer Pressure (psia)	**Automatic Responses**
2500	Pressurizer safety valves OPEN
2437	ATWS diverse scram system initiates reactor trip
2370	High pressure reactor trip and PORVs OPEN
2340	High pressure alarm Backup signal to deenergize all Pressurizer heaters
2325	Spray valves fully OPEN *
2275	Proportional heaters at minimum output * Spray valves fully CLOSED *
2250	**NORMAL PRESSURIZER PRESSURE OPERATING SETPOINT**
2225	Proportional heaters at maximum output *
2220	Backup heaters deenergize (rising pressure)
2200	Backup heaters energize
2100	Low pressure alarm
1900	TM/LP reactor trip minimum pressure
1736	SIAS initiation
* Assumes Pressurizer pressure setpoint is at 2250 psia.	

UNIT 1 SUMMARY OF PRESSURIZER PRESSURE CONTROL ACTIONS

PZR	PRESSURE (PSIA)	AUTOMATIC ACTIONS
2575		PZR SAFETY VALVES FULL OPEN (INCREASING)
2500		PZR SAFETY VALVES OPEN (INCREASING)
2437		ATWS TRIP (INCREASING)
2400		• HIGH PRESSURE RX TRIP • PORVs OPEN • PZR SAFETY VALVES CLOSE (DECREASING)
2350	(setpoint +100)	• PZR SPRAY VALVES FULL OPEN (INCREASING) • PRE TRIP ALARM
2340		HIGH PRESSURE ALARM (INCREASING)
2300	(setpoint +50)	SPRAY VALVES FULL CLOSED (DECREASING)
2275		PROPORTIONAL HEATERS AT MINIMUM OUTPUT (INCREASING)
2250	(typical setpoint)	NORMAL PRESSURIZER PRESSURE OPERATING SETPOINT
2225	(setpoint –25)	PROPORTIONAL HEATERS AT MAXIMUM OUTPUT (DECREASING)
2220		BACKUP HEATERS OFF (INCREASING)
2200		BACKUP HEATERS ON (DECREASING)
2100		LOW PRESSURE ALARM (DECREASING)
1887		TM/LP REACTOR TRIP MINIMUM SETPOINT (DECREASING)
1600		SIAS ON LOW PRESSURIZER PRESSURE (DECREASING)
	> 310°F	INSTRUCTIVE ALARM "SELECT NORMAL RANGE" (INCREASING)
	< 307°F	INSTRUCTIVE ALARM "SELECT LOW RANGE" (DECREASING)
530	(Upper LTOP setpoint)	LOW RANGE SELECTED, PORV OPEN (INCREASING)
510		LOW RANGE SELECTED, ANTICIPATORY ALARM (INCREASING)
350		OPEN SIT OUTLET VALVES (INCREASING)
350	(Lower LTOP setpoint)	LOW RANGE SELECTED, PORV OPEN (INCREASING)
330		LOW RANGE SELECTED, ANTICIPATORY ALARM (INCREASING)
267		OPEN PERMISSIVE TO SDC SUCTION VALVES

PORV LTOP ACTUATION 1/1 LOGIC
PIC-1103 OPENS PORV 1402, AND SIT OUTLETS, V3624 AND V3644
PIC-1104 OPENS PORV 1404, AND SIT OUTLETS, V3614 AND V3634

ANALOG PRESSURE CONTROL



PIC-1100 X(Y)
PRESSURIZER PRESSURE CONTROLLER OUTPUT
MILLIAMPS DC

FIGURE 30

PRESSURIZER HEATER AND SPRAY PROPORTIONAL CONTROL

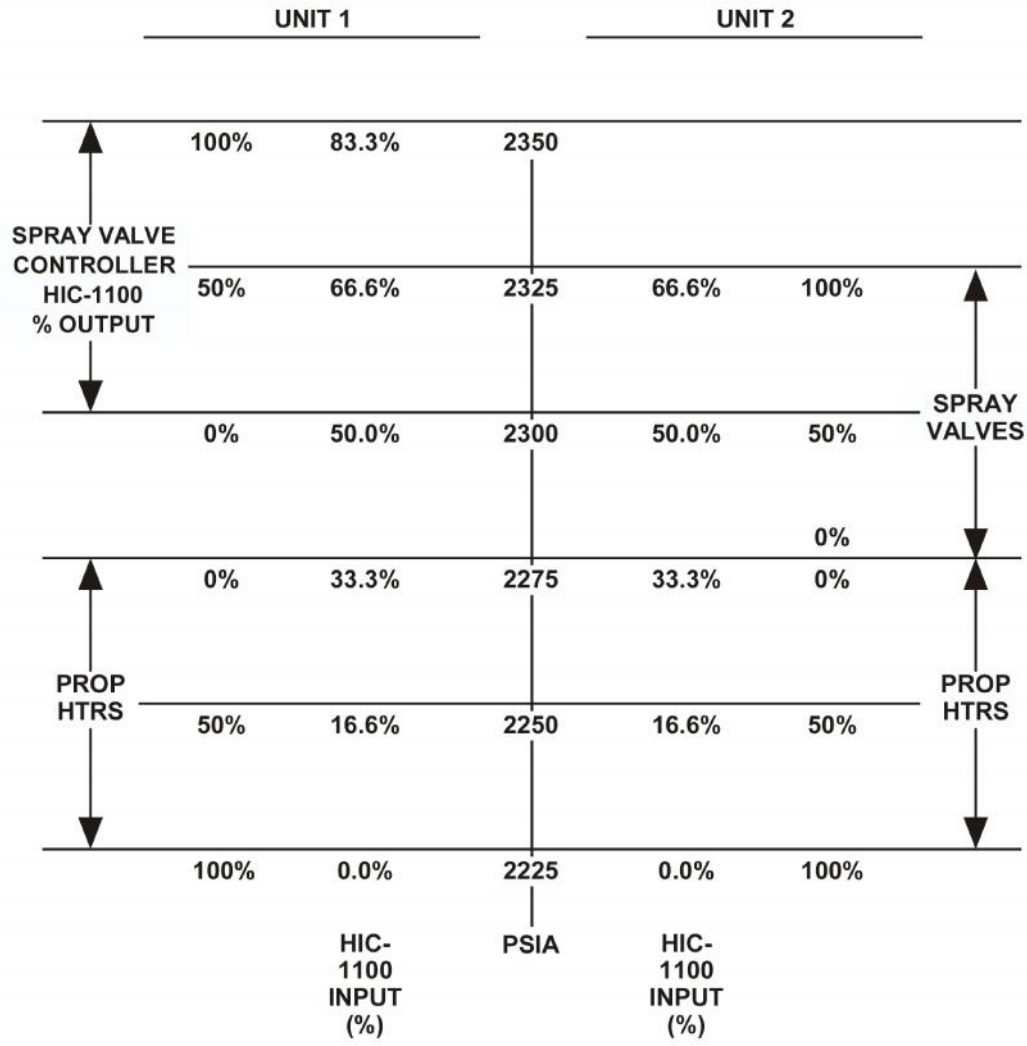


FIGURE 31

HEATER AND SPRAY PROPORTIONAL CONTROL

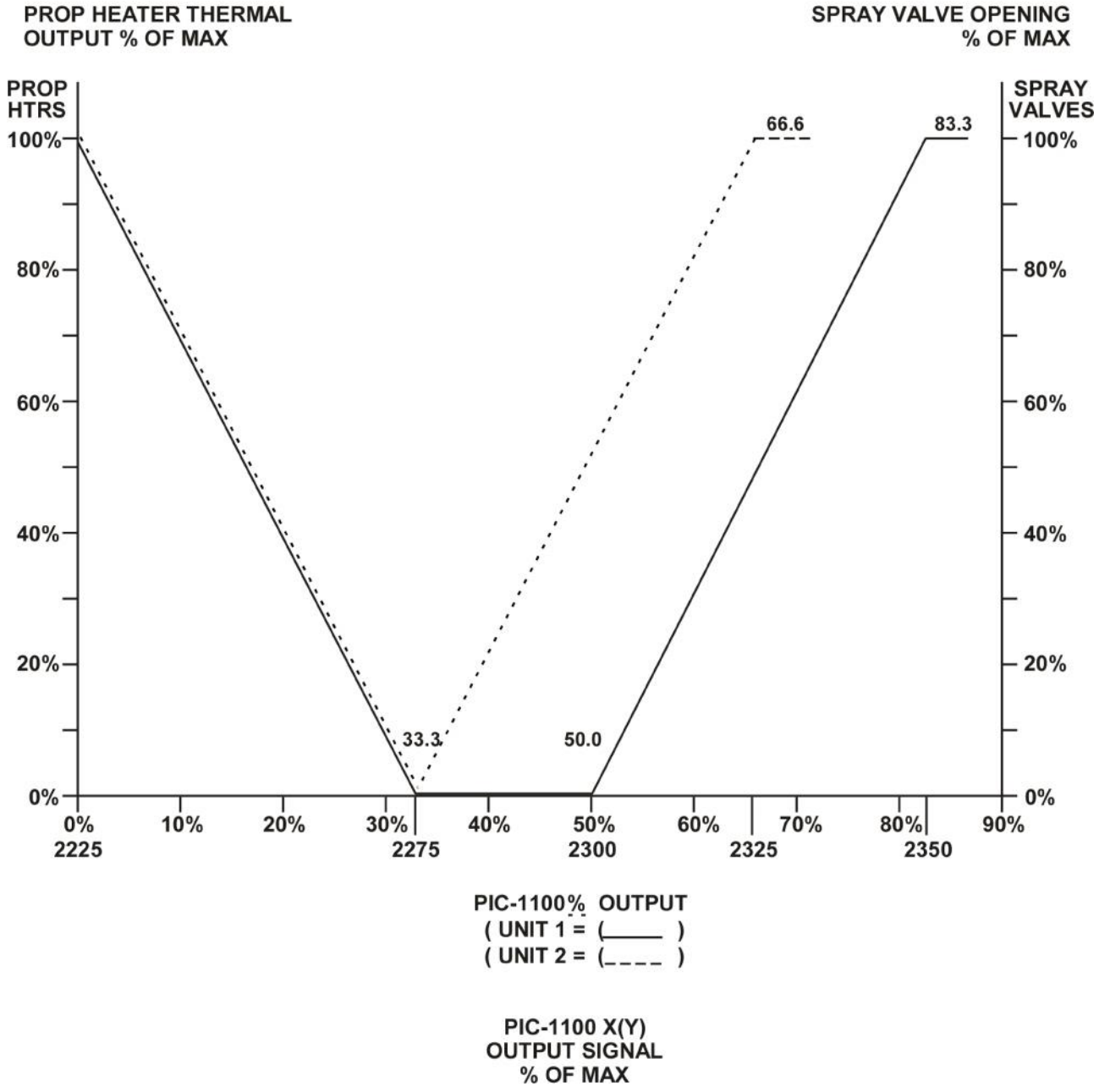


FIGURE 32

Table 3.2-1

DNB MARGIN LIMITS

PARAMETER	FOUR REACTOR COOLANT PUMPS OPERATING
Cold Leg Temperature	≤ 551°F
Pressurizer Pressure*	≥ 2225 psia
AXIAL SHAPE INDEX	COLR Figure 3.2-4

* Limit not applicable during either a THERMAL POWER ramp increase in excess of 5% per minute of RATED THERMAL POWER or a THERMAL POWER step increase of greater than 10% of RATED THERMAL POWER.

39.

012 A1.01 / Reactor Protection / Ability to predict and/or monitor Changes in parameters (to prevent exceeding design limits) associated with operating the RPS controls including :Trip Setpoint Adjustment

Given the following conditions:

- Unit 2 is at 50% power performing an up power per 2-GOP-201, Reactor Plant Startup - Mode 2 To Mode 1
- The Variable High Power Trip (VHPT) Reset 1 Light has just illuminated on RTGB-204
- The US directs resetting the VHPT

Which ONE of the following completes the statements below?

To prevent a Reactor Trip the VHPT Reset Pushbutton must be pressed prior to power reaching ____(1)____.

The VHPT Reset can be performed at ____(2)____.

A.	(1)	52%
	(2)	RPS Cabinet calibration and indication panel ONLY
B.	(1)	52%
	(2)	RTGB-204 or the RPS Cabinet calibration and indication panel
C.	(1)	54%
	(2)	RPS Cabinet calibration and indication panel ONLY
D.	(1)	54%
	(2)	RTGB-204 or the RPS Cabinet calibration and indication panel

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect, see analysis "B" Part 2 incorrect, see analysis "C"
B.	Incorrect:	Part 1 incorrect, but plausible. The VHPT pre-trip setpoint is 2% below the actual trip setpoint. At 52%, a VHPT pre-trip would come in. If the applicant has the misconception that this is the actual setpoint, this would make this choice plausible. Part 2 correct: See analysis "C"
C.	Incorrect:	Part 1 correct: See analysis "D" Part 2 incorrect, but plausible. The applicant may have the misconception that the VHPT reset (VHPT setpoint adjust) can be performed only at RPS Cabinet calibration and indication panel.
D.	Correct:	Part 1 correct: The Variable High Power Trip reset light illuminates when reactor power is within 4% of the VHPT setpoint. When the VHPT Reset pushbutton is depressed, the RPS setpoint will be change the Reactor Protection System VHPT setpoint by 9.61% from the current power level. The question states the light illuminates at 50%, therefore the RPS VHPT setpoint is within 4% of tripping (ie, VHPT setpoint of 54%). Part 2 correct: The VHPT setpoint adjust can be performed at either RTGB-204 OR on the affected RPS cabinet.

Question Number: 39

Tier: 2 Group: 1

K/A: 012 A1.01 / Reactor Protection / Ability to predict and/or monitor Changes in parameters (to prevent exceeding design limits) associated with operating the RPS controls including :Trip Setpoint Adjustment

Importance Rating: 2.9 3.4

10 CFR Part 55: (CFR: 41.5 / 45.5)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the setpoint adjustments required for RPS

Technical Reference: 2-GOP-201

Proposed references to be provided: None

Learning Objective: PSL OPS 0702404-6

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

DETAILED DESCRIPTION

The RPS includes the following: (Refer to Figures 1 & 3)

- NSSS Parameter Measurement Channels
- Trip Units
- Coincidence Logic Matrices
- CEDM Power Trip Paths
- RPS Testing System

RPS TRIP UNIT INPUTS

NOTE: The setpoint values found throughout this text are nominal values generally found in design documentation. Calibration values will typically not be exactly the same. Occasionally, the calibrated value will be substantially different, introducing additional conservatism.

Hi Power Level

- A reactor trip on variable high power level is provided to trip the reactor in the event of reactivity excursions that might be too rapid for the high Pzr pressure reactor trip or a TM/LP trip. This trip is utilized to prevent exceeding the DNBR.
- Also provides backup protection for steam line break accidents.

The bistable trip unit (BTU) receives a signal (Q) that is the higher of nuclear power (ϕ) (from the linear power range safety channel) or thermal ΔT (β) power which is determined in the CPC-1. This signal (Q) is then compared in the trip unit to a variable high power trip limit signal (Q_{TR}) which is computed in CPC-2. Refer to Figures 4 & 5. A channel trip occurs if Q rises above the Q_{TR} value. If Q decreases, Q_{TR} follows, remaining above Q by a fixed bias, Q_b ($\leq$ **~ 9.61%**). If a power (Q) increase is required, the setpoint Q_{TR} remains at the minimum value of Q + Q_b last achieved, until reset by the operator. This reset is accomplished by four lighted pushbuttons, one for each channel, located on RTGB 104 [204], or locally on the RPS cabinet Calibration and Indication Panel (Figure 22).

- When the pushbutton is lit, power has changed by an increase of ~ 4% and should be reset. All four pushbuttons must be depressed.

Once the pushbutton is depressed, Q_{TR} is reset to the current value of Q + Q_b. The system is capable of holding the setpoint Q_{TR} at the previous minimum indefinitely. A pretrip occurs when Q rises to within **2%** of Q_{TR}.

- The Q_{TR} signal has lower and upper limits of **15%** and **107%** respectively.

A similar circuit generates a pretrip limit for the BTU, as well as an annunciator to warn the operator that Q_{TR} may have to be reset to avoid a trip. The pretrip output provides annunciation in addition to CEA withdrawal prohibit (CWP) signals.

Hi Rate of Change of Power

- The high rate (SUR) trip is provided to protect the core during startup operations, and serves as a backup to the administrative startup rate limits. This trip is not credited in any design basis accident; however, this trip is considered in the safety analysis in that it precludes the need for specific analyses of other events initiated from subcritical conditions.

- A high SUR trip is initiated at **2.49 decades per minute (DPM)**, as sensed on 2-out-of-4 wide-range logarithmic channels, over the range of 10^{-4}% to 15% power.

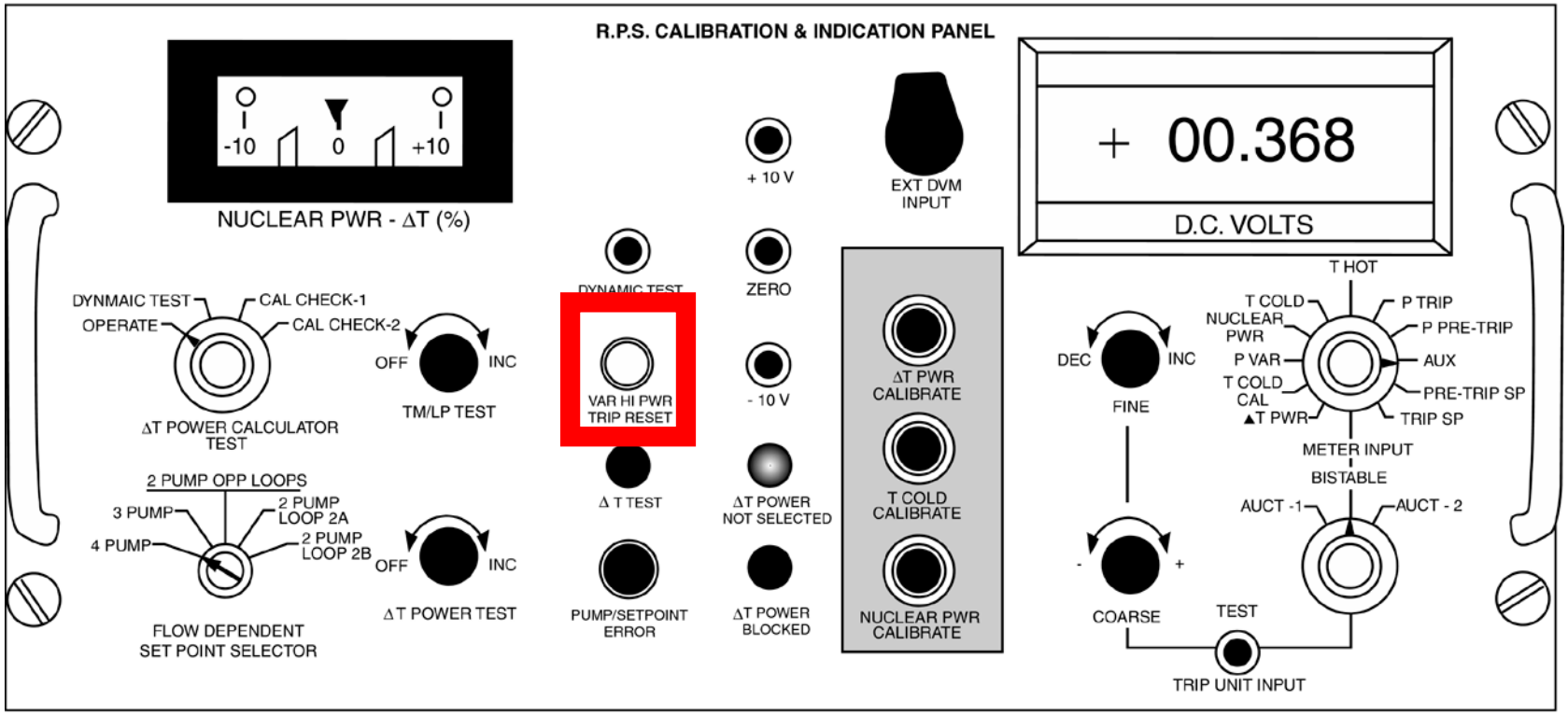
- The SUR signal is automatically grounded below **10^{-4}%** and bypassed above **15%** power. Refer to Figure 6. Annunciation alerts the operator when the SUR trip is enabled.

- A common pretrip alarm is generated by any one of the four channels when its trip unit senses a SUR in excess of **1.3 DPM** over the range of 10^{-4}% to full power. In conjunction with the pretrip alarm, a CWP signal is also generated (2-out-of-4 coincidence logic) which prevents further withdrawal of regulating group CEAs, but does not affect insertion capability. The SUR input for a CWP is auto bypassed when < 10^{-4}%.

Low Reactor Coolant Flow

- The reactor coolant low flow trip provides core protection against Departure from Nucleate Boiling (DNB) in the event of a sudden significant decrease in RCS flow.

UNIT 2
REACTOR PROTECTIVE SYSTEM
CALIBRATION AND INDICATION PANEL
(UNIT 1 SIMILAR)



(T/RCO/0711404-F25-R9)

VARIABLE HIGH POWER TRIP OPERATION

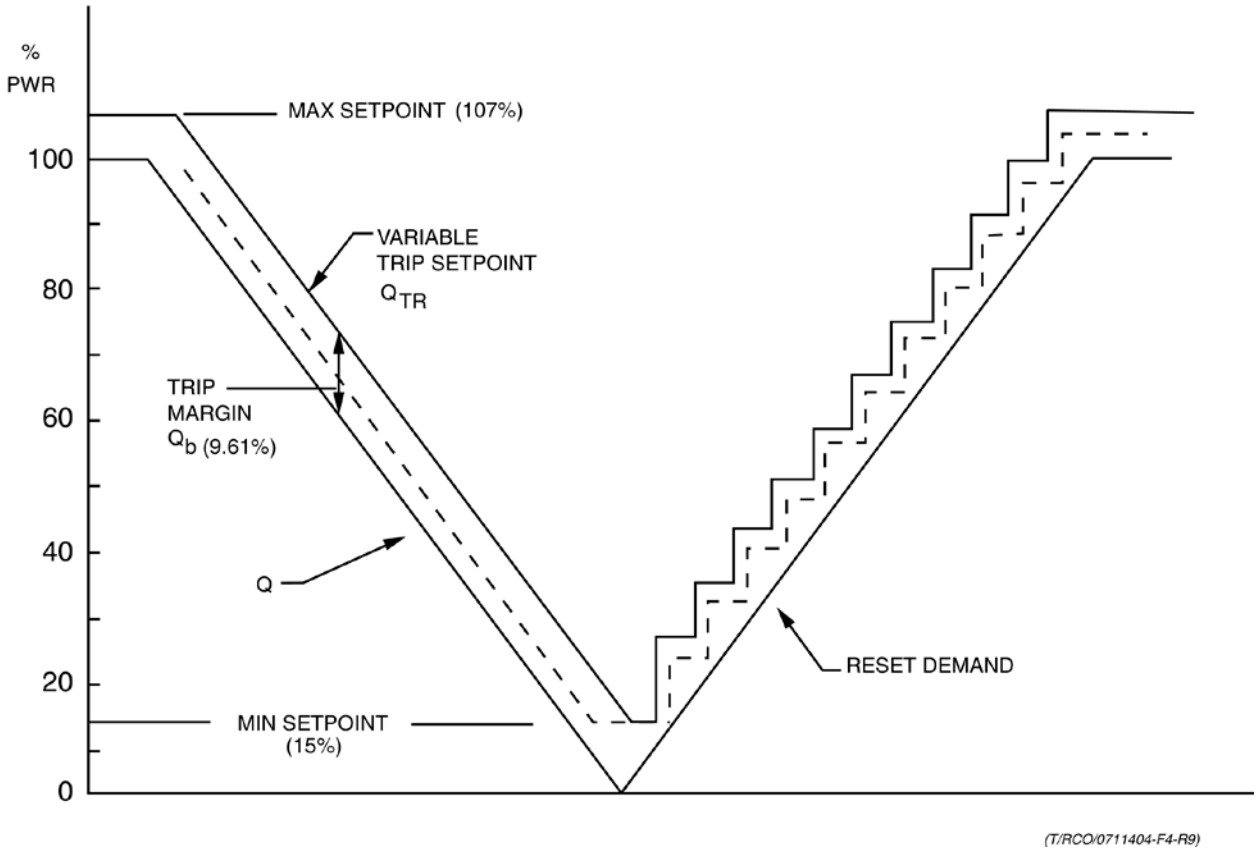
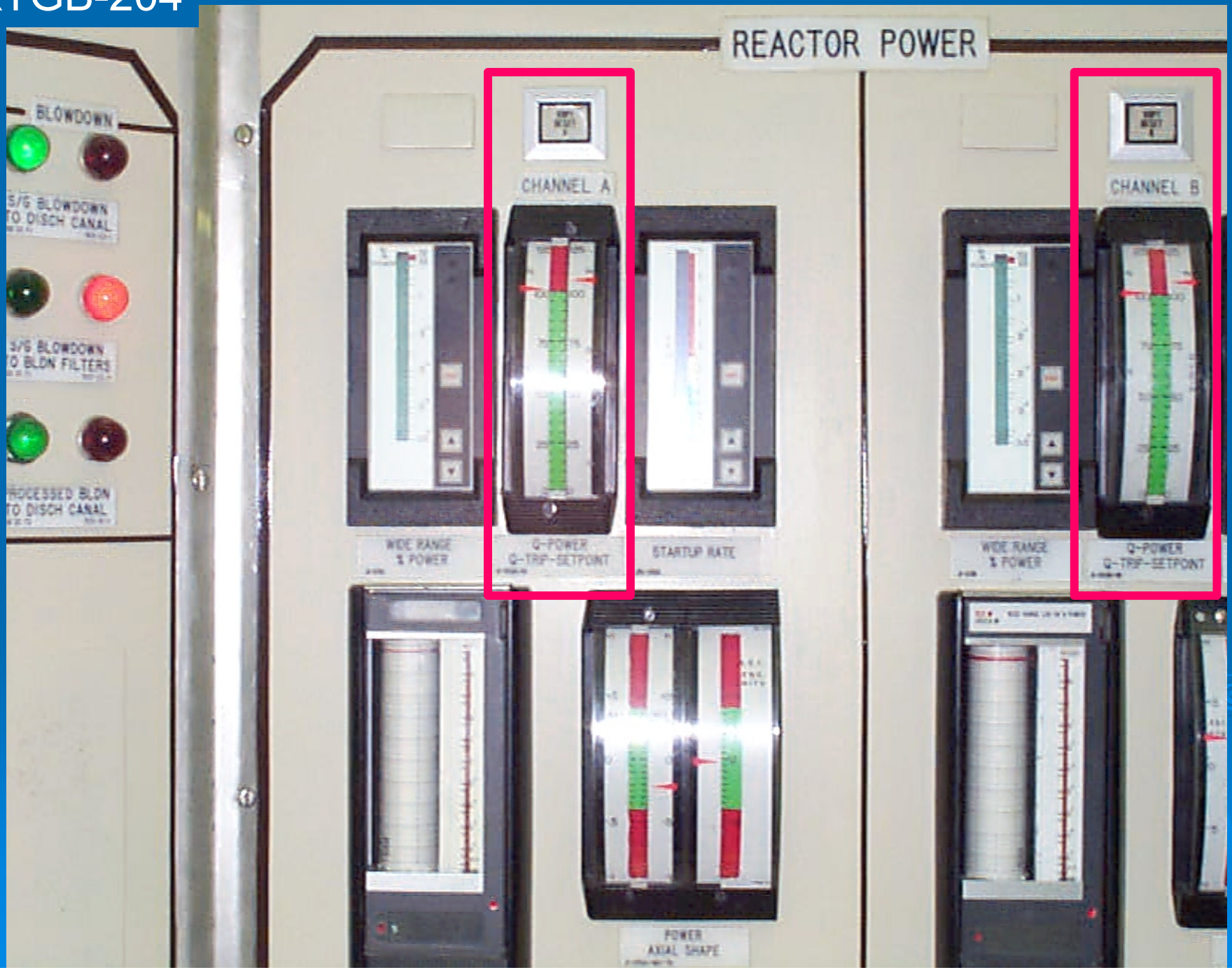


FIGURE 4

RTGB-204

EO 4a



40.

013 K5.01 / ESFAS / Knowledge of the operational implications of the following concepts as they apply to the ESFAS: Definitions of safety train and ESF channel

Which ONE of the following completes the statement below?

On Unit 2, manual initiation of AFAS-2 at RTGB-202 requires ____(1)____ of the four channels to actuate ____(2)____ **TRAIN**(s) of Auxiliary Feedwater flow.

A.	(1)	any two
	(2)	one
B.	(1)	any two
	(2)	two
C.	(1)	two specific
	(2)	one
D.	(1)	two specific
	(2)	two

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect but plausible. The applicant may misapply the concept of any two of four channels will actuate the AFW system. Any 2 of 4 low S/Gs level channels will actuate AFAS, but these switch positions are NOT the same as S/Gs level channel which require a specific 2 of four. See Analysis "C". Part 2 correct – see analysis "C"
B.	Incorrect:	Part 1 incorrect – see analysis "A" Part 2 incorrect but plausible. Two of four switches of AFAS-2 will only actuate AFAS-2 components. The applicant may have the misconception that actuating 2/4 switches will initiate AFAS for both trains. This is similar to other ESFAS components where 2/4 will initiate both trains. For this instance ONLY (AFAS), there are 4 switches for AFAS-1, and 4 switches for AFAS-2. This is train specific and unique to AFAS AND Unit 2.
C.	Correct:	Part 1 correct: The remote MANUAL INITIATION switches for a channel on RTGB-202 (Figure 26) function differently than the MANUAL ACTUATION switches on the AFAS control panel. When the MANUAL position is selected on a single channel on RTGB-202, the INITIATION RELAYS for that channel de-energize (Figures 22 and 26) causing one contact on one side of the AFAS ACTUATION CIRCUIT to open (Figures 22 and 27). The contacts from the other side's two channels remain closed keeping the ACTUATION RELAYS energized, therefore no components actuate. An odd (1 or 3) and even (2 or 4) switch both in initiate would cause an actuation on Unit 2. Part 2 correct. Initiating AFAS-2 will only actuate "B" Train AFW – The 2B AFW pump would start and feed the 2B S/G and the 2C AFW pump would start and feed the 2B S/G
D.	Incorrect:	Part 1 is correct – see analysis "C" Part 2 is incorrect – see analysis "B"

Question Number: 40

Tier: 2 Group: 1

K/A: 013 K5.01 / ESFAS / Knowledge of the operational implications of the following concepts as they apply to the ESFAS: Definitions of safety train and ESF channel

Importance Rating: 2.8 3.2

10 CFR Part 55: (CFR: 41.5 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to what constitutes an AFW train and channel.

Technical Reference: PSL OPS 0711412

Proposed references to be provided: None

Learning Objective: PSL OPS 0702412 - 4

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	X
Bank	

Question History: Modified Bank question for the 2019 NRC Exam

Comments: Modified from Waterford #3 2015 NRC Exam

It takes both Bistable Relays in the Logic Matrix to de-energize in order to illuminate the BISTABLE RELAY STATUS lights. These lights (6) can be seen on Figure 28 below the Bistable 'PT/T' indicators and are labeled according to the Matrix they input into.

For example, if a low S/G level causes the Channel A AFAS-1(2) Bistable Relay to trip (de-energize), contacts actuate in one leg of the three corresponding 2/4 Coincidence Logic Matrix Circuits, i.e., the AFAS-1 Bistable Relays in Channel A operate contacts in the AFAS-1 AB, AC, and AD Coincidence Logic Matrices.

Coincidence Logic Matrices

Refer to Figure 25. There are six Coincidence Logic Matrices for AFAS-1 and six for AFAS-2. Each logic matrix corresponds to one of the six combinations of 2/4 logic (i.e., AB, AC, AD, BC, BD, CD). A Logic Matrix consists of two legs operated by the associated AFAS Bistable relays, four Matrix Relays, two power supplies and the interconnecting wiring.

For example, if two channels sense a low level for the same steam generator (i.e., Ch. A and Ch. B), the four AFAS-1(2) Matrix Relays (AB Matrix) de-energize. Power is removed from the four (4) normally lit AFAS-1(2) (AB) MATRIX RELAY STATUS LIGHTS (Figure 28) and each Matrix Relay opens a contact in its corresponding AFAS-1(2) Initiation Circuit. For example, the AB Matrix Relays will open the Initiation Circuit in Channel A, B, C, and D as will the AC, AD, BC, BD, or CD Matrix Relays.

Initiation Circuits

Refer to Figure 26. There are four Initiation Circuits associated with AFAS-1 and four associated with AFAS-2. Each Initiation Circuit consists of six relay contacts (one from each of the six Matrices) connected in series to a time delay device, four Initiation Relays and indicating lights on the control panel. [Unit-2 also has remote manual initiation switches on RTGB-202]. When an AFAS-1 or AFAS-2 is called for, the output contacts from the Matrix Relays open interrupting continuity in the "ladder" and causing the time

delay device to start timing. This also causes the AFAS-1(2) SYSTEM STATUS "INT" light to extinguish.

If ladder continuity is not restored (i.e., 3/4 Channels do not sense level recovered above the Low Level Bistable reset point of 29%), or, the rupture ID circuit detects a fault before the timer times out (235 [210] seconds), the Time Delay Relay will cause the four Initiation Relays to de-energize. Each of the AFAS-1(2) Initiation Relays will open a contact in one of the four AFAS-1(2) Actuation Circuits. [Positioning the AFAS-1(2) switches on RTGB-202 to "MANUAL" will immediately de-energize the Initiation Relays.]

When the delay time has expired, continuity through the Series Matrix Ladder - which is needed to reset the timer - will not be restored until 3/4 Channels sense S/G Level recovered to approximately 29% NR. If ladder continuity is subsequently re-interrupted, the TD Relay will not trip until the timer again counts the preset delay time.

Actuation Circuits

Refer to Figure 27. There are four Actuation Circuits associated with AFAS-1 and four associated with AFAS-2. Each Actuation Circuit consists of two auctioneered power supplies, four Initiation Relay contacts (one from each of Channels A, B, C, and D), two Interposing Relays, a Manual Actuation switch, an Actuation Reset switch, two Lockout Relays, Actuation Relays and indicating lights. The power supplies are powered from independent 120 VAC Instrument buses such that the failure of one power supply or loss of an Instrument bus would not result in the actuation of AFW components.
The four Initiation Relay contacts are arranged in a series-parallel manner with two Interposing Relays. Contacts from Channels A and C are connected in series with one Interposing Relay in one leg and Channels B and D in series with its Interposing Relay form the parallel leg. The legs are identified as the "1-3" (A and C) and "2-4" (B and D).

The Interposing (interface) Relays are used to provide a set of contacts with better current handling capability than the Initiation Relays have. Deenergization of the Interposing Relays in turn causes the interruption of power to the Lockout Relays, Actuation Relays and the SYSTEM STATUS 1-3 and 2-4 "leg" lights. The Interposing Relays reenergize

when their associated Initiation Relays reenergize. The Lockout Relays have three contacts; one which lights the normally off AFAS-1(2) LOCKOUT RELAY STATUS 1-3 or 2-4 light, one that extinguishes the normally on "ACT" light, and the other to lockout ("latch") some of the Actuation Relays in their de-energized position. Note that when the contact closes to operate the LOCKOUT RELAY STATUS light, the light (LED) has no power and remains OFF until the associated Interposing Relay reenergizes with the Lockout Relay still tripped. The Lockout Relays can only be reset by manual operation of the ACTUATION RESET Switch at the AFAS cabinet.

The Actuation Relays are sub-divided into the "Cycling" and "Latching" relays. Those relays connected ahead of the Lockout Relay contacts are the Cycling Actuation Relays. These relays de-energize on an AFAS signal and reenergize when the signal clears (resets). The Latching Relays as their name implies de-energize on an AFAS signal and stay de-energized until manually reset using the ACTUATION RESET Switch.

The “Latching” relays, when de-energized, cause the ‘C’ AFW pump steam admission valves to open, MV-08-3 to open (Unit 1 only), and the ‘A’ and ‘B’ AFW pumps to start. These components do not reposition themselves until manually controlled by the operator.

The “Cycling” relays, when de-energized, cause the AFW motor operated header flow control valves to open [solenoid valves also open]. When SG level is restored to >29% NR, the cycling relays re-energize and the flow control valves close [solenoid valves also close]. This cycle continues as AFAS initiates at 19% NR (after time delay) and resets at 29% NR until interrupted by the operator. [On Unit 2, the Main Feedwater Isolation Valves (MFIVs) close on AFAS. Even though these valves do not ‘cycle’ back open on reset, they are controlled by the cycling relays.]

Note that the power to the Actuation Relays is cross-tied at three points to prevent inadvertent operation of the Actuation Relays. The first, mentioned previously is at the power supplies and protects against the loss of one power supply. The second is immediately downstream of the MANUAL ACTUATION switch and protects against a failure of one of the Interposing Relays. The third point is at the upstream side of the Lockout Relays. This provides an alternate power path to the Latching Relays should a Lockout Relay fail.

There are two MANUAL ACTUATION switches per channel - one each for AFAS-1(2). The MANUAL ACTUATION switch is a two position rotary switch. Positioning it to the "ACT" position will cause the associated Actuation Relays and the Lockout Relays to de-energize, thus the AFAS-1(2) components controlled by that channel will actuate. To get a full AFAS-1(2) actuation all four channels' MANUAL ACTUATION switches must be positioned to "ACT". It should be noted that **both** the Rupture ID **and** Automatic level control features are **defeated** by Manual Actuation since the power path to all the actuation relays remains interrupted as long as the switch is in the ACT position.

Note: the remote MANUAL INITIATION switches for a channel on RTGB-202 (Figure 26) function differently than the MANUAL ACTUATION switches on the AFAS control panel. When the MANUAL position is selected on a single channel on RTGB-202, the INITIATION RELAYS for that channel de-energize (Figures 22 and 26) causing one contact on one side of the AFAS ACTUATION CIRCUIT to open (Figures 22 and 27). The contacts from the other side's two channels remain closed keeping the ACTUATION RELAYS energized, therefore no components actuate. An odd (1 or 3) and even (2 or 4) switch both in initiate would cause an actuation on Unit 2.

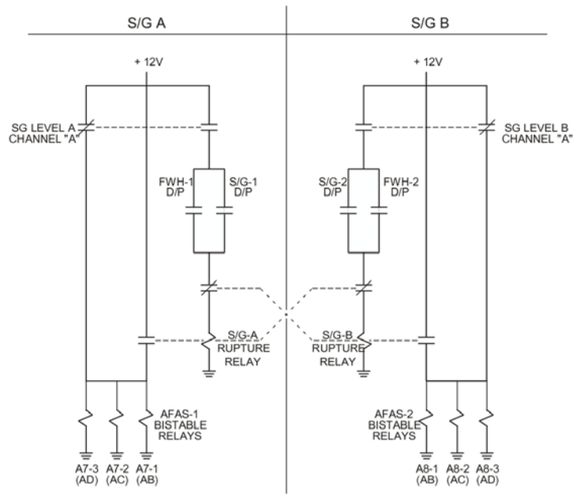
This design feature requires turning all four channel switches [or at least an odd and even Manual Initiate switch], to actuate [or initiate], to ensure a complete manual AFAS. This method of manual initiation is outlined in Operations Policies and specifies that all four remote manual actuation [or initiation] switches for a side must be repositioned to ensure ACTUATION [INITIATION].

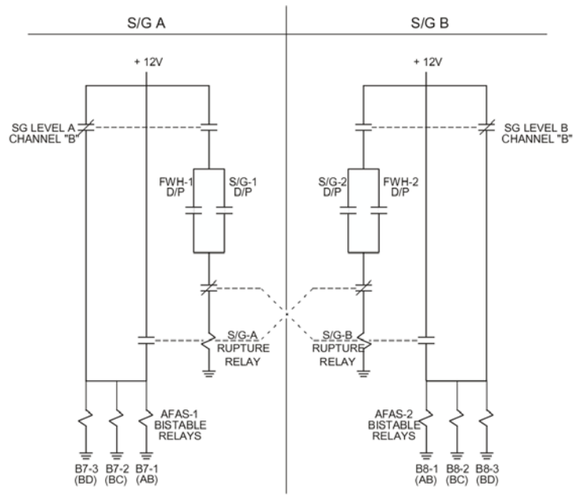
The ACTUATION RESET pushbutton on the control panel front is depressed to reenergize the Latching and Lockout Relays when the AFAS signal has cleared and the MANUAL ACTUATION [or INITIATION] switches are in "NORM" ["AUTO"]. Depressing it prior to the AFAS signal clearing would have no effect since the Initiation Relay contacts are open.

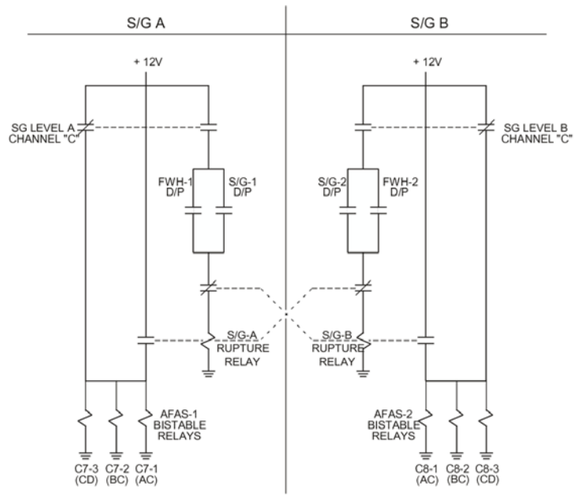
Components

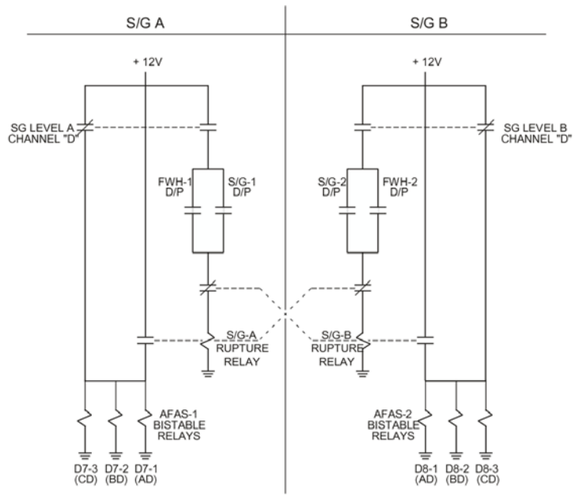
Refer to the System Data section for a listing of the components actuated by each channel and whether they are latching or cycling components.

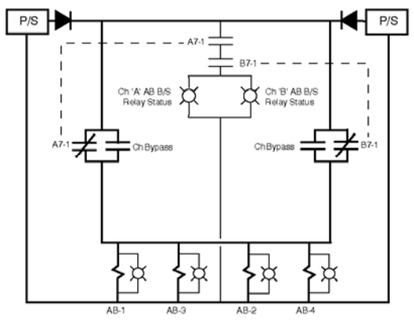
AFAS-1 (SG "A") IN STANDBY (NOT ACTUATED)

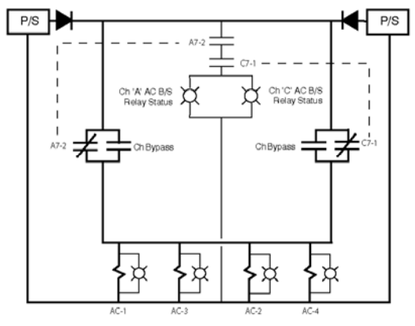


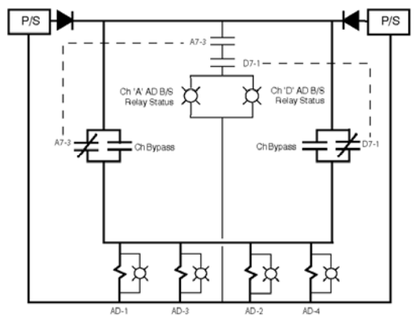


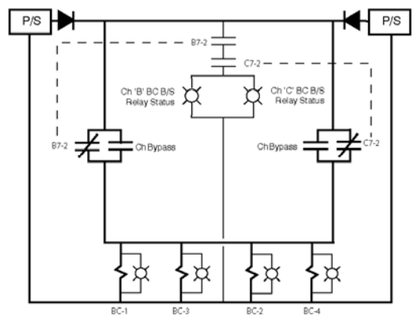


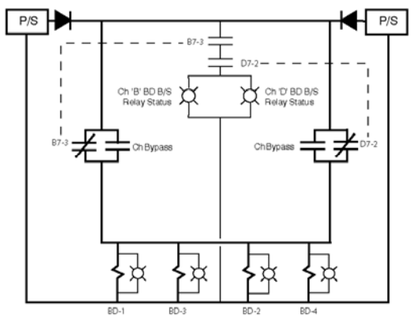


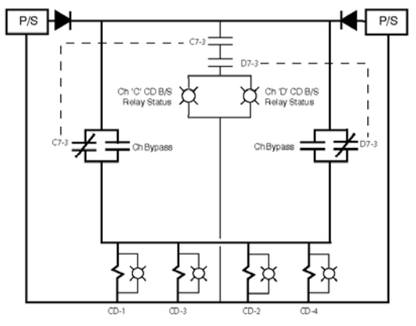












INPUTS &
LOGIC MATRICES

(T/RCO/0711412-F60-R1)

SIMPLIFIED AFAS INITIATION CIRCUIT - CHANNEL A (1 of 4) (STANDBY - NOT ACTUATED)

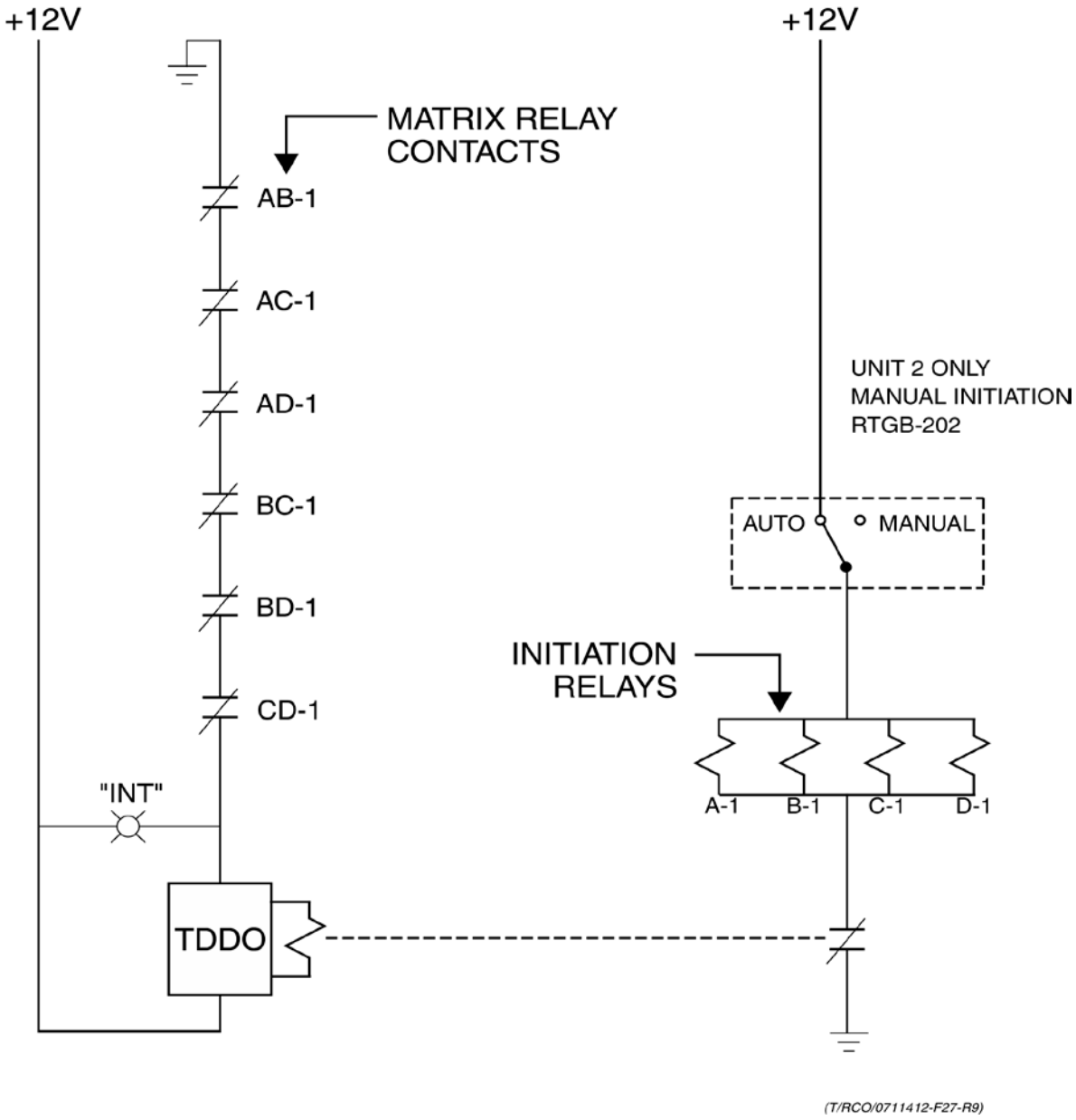


FIGURE 26

TYPICAL AFAS ACTUATION CIRCUIT (1 of 4) (STANDBY - NOT ACTUATED)

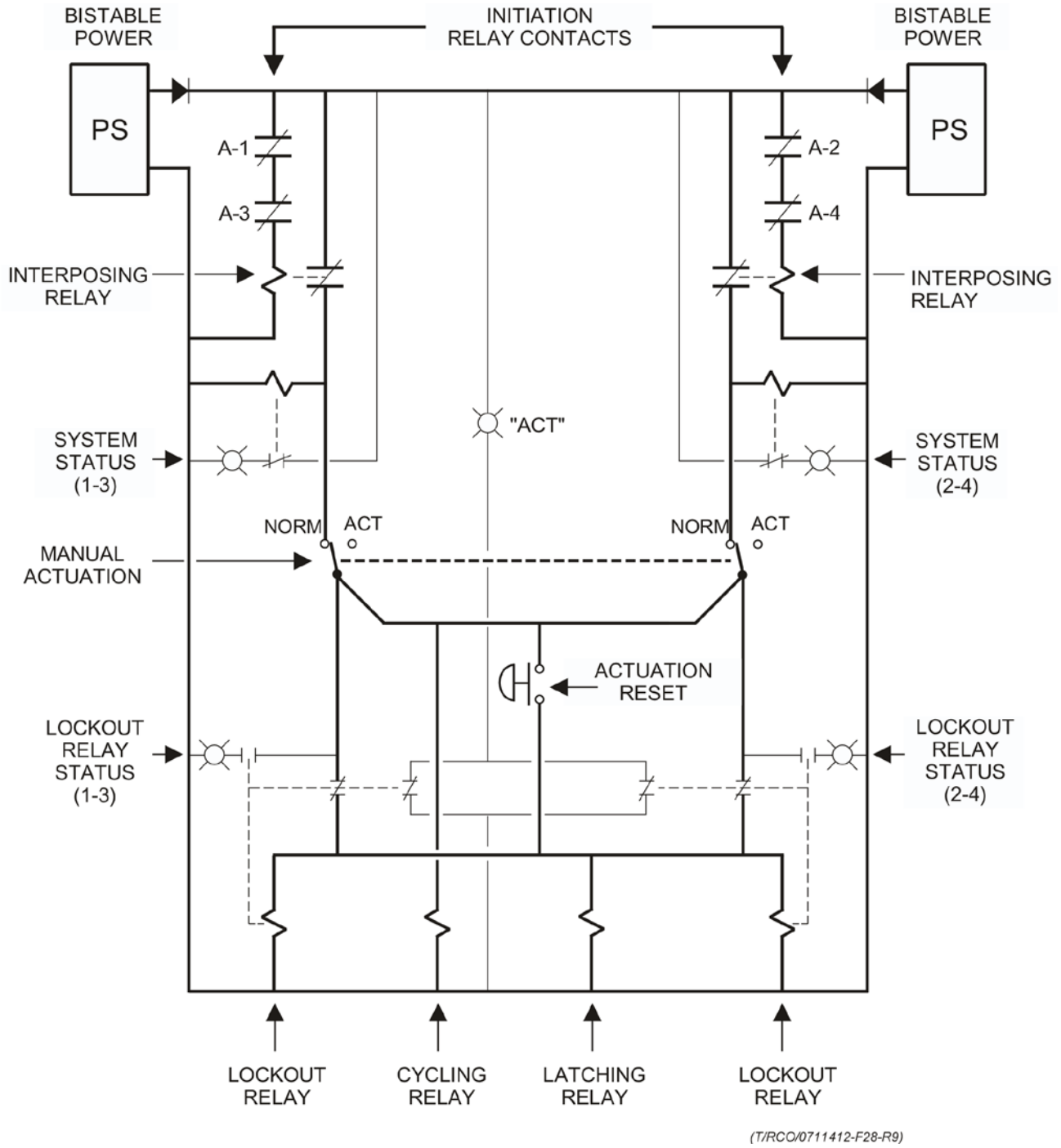
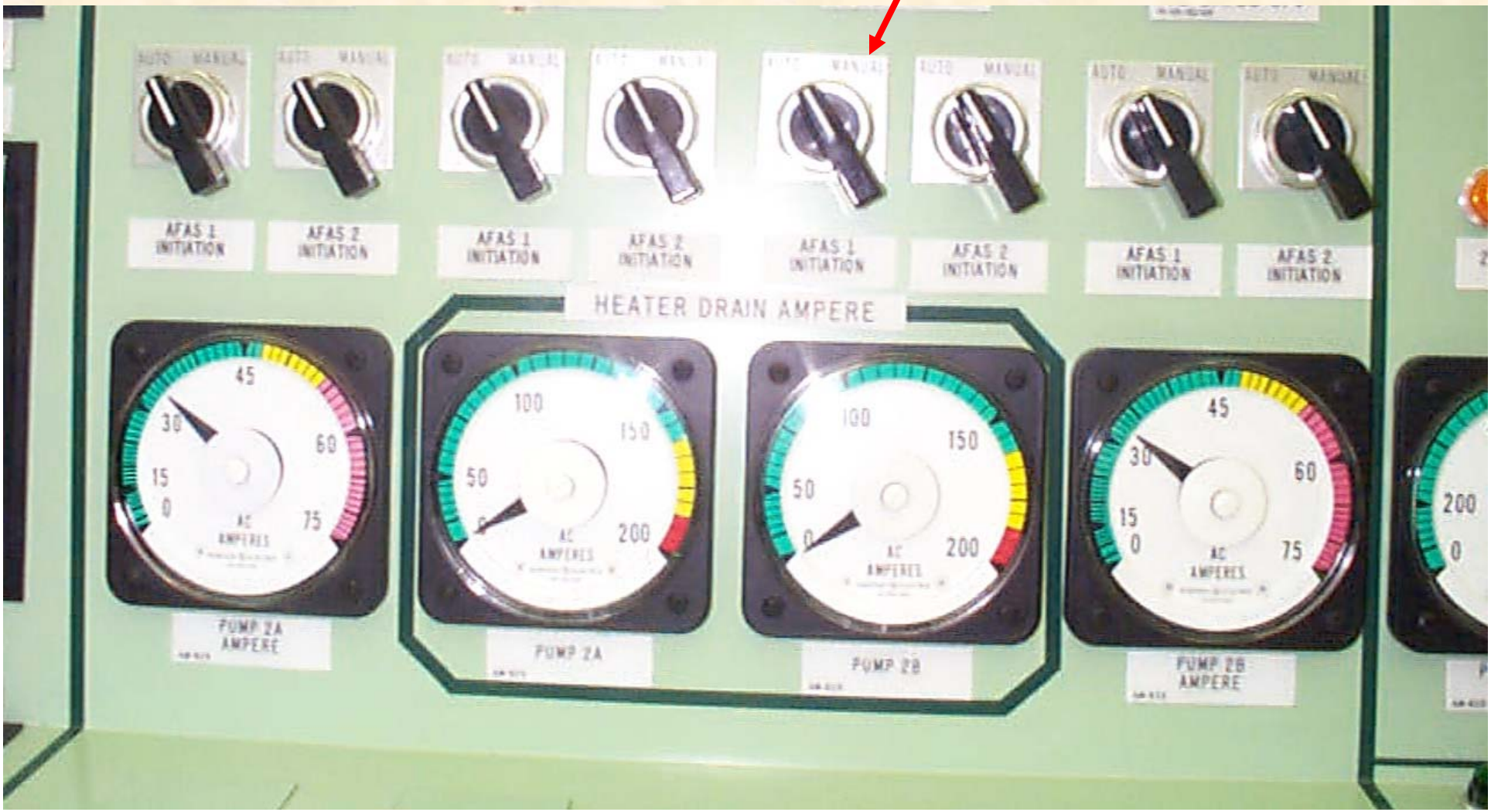


FIGURE 27

RTGB 202

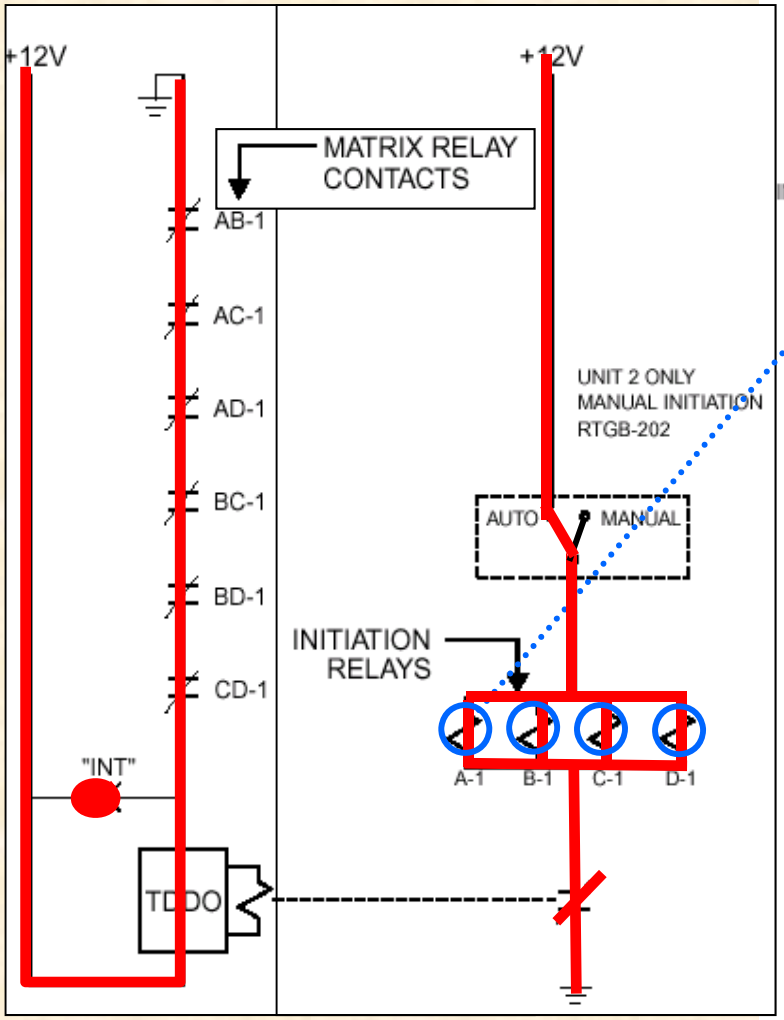
Need at least an odd and an even switch to get actuation!! Why??

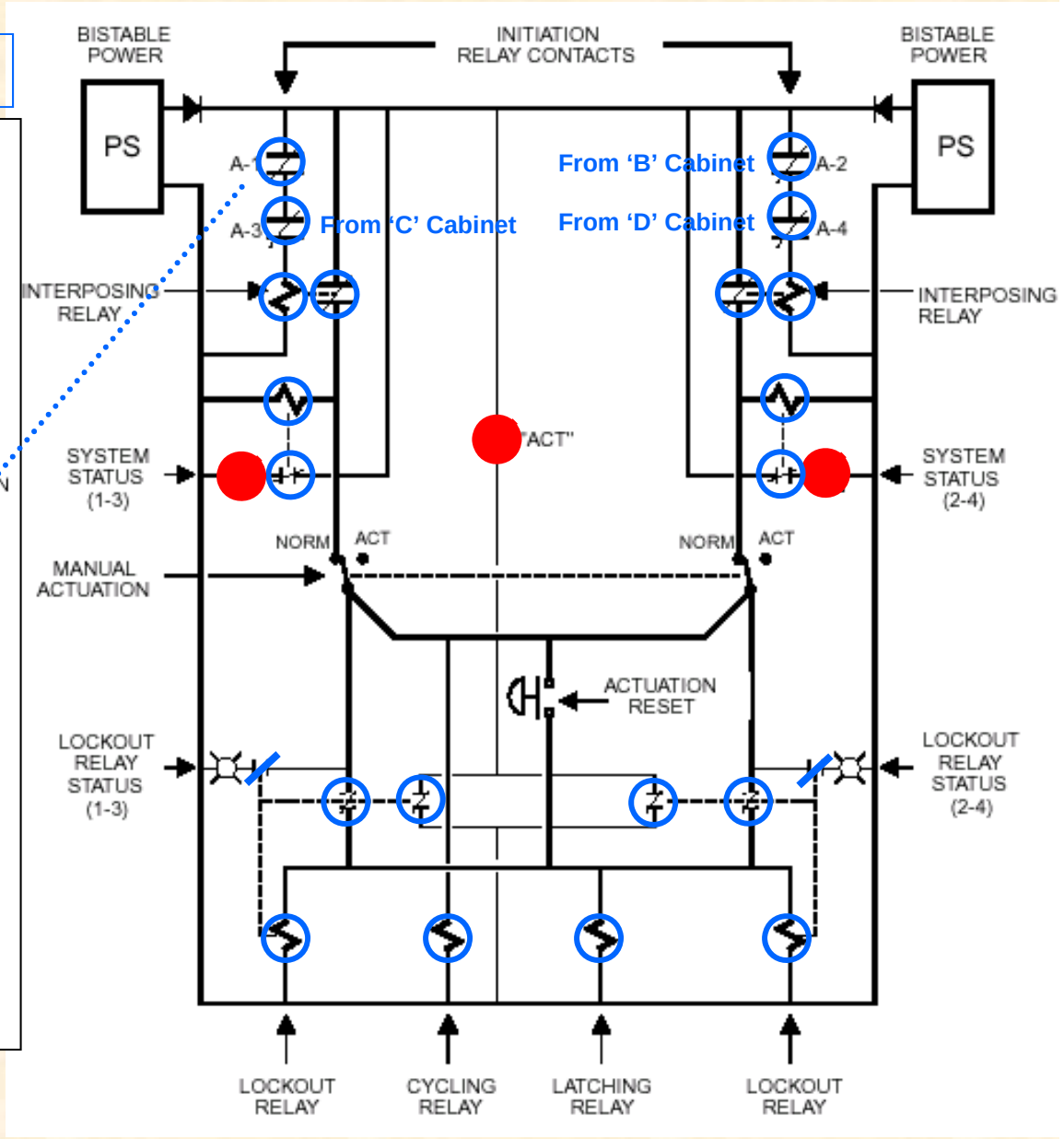
U2 can manually initiate here



Channel ‘A’ Actuation Circuit

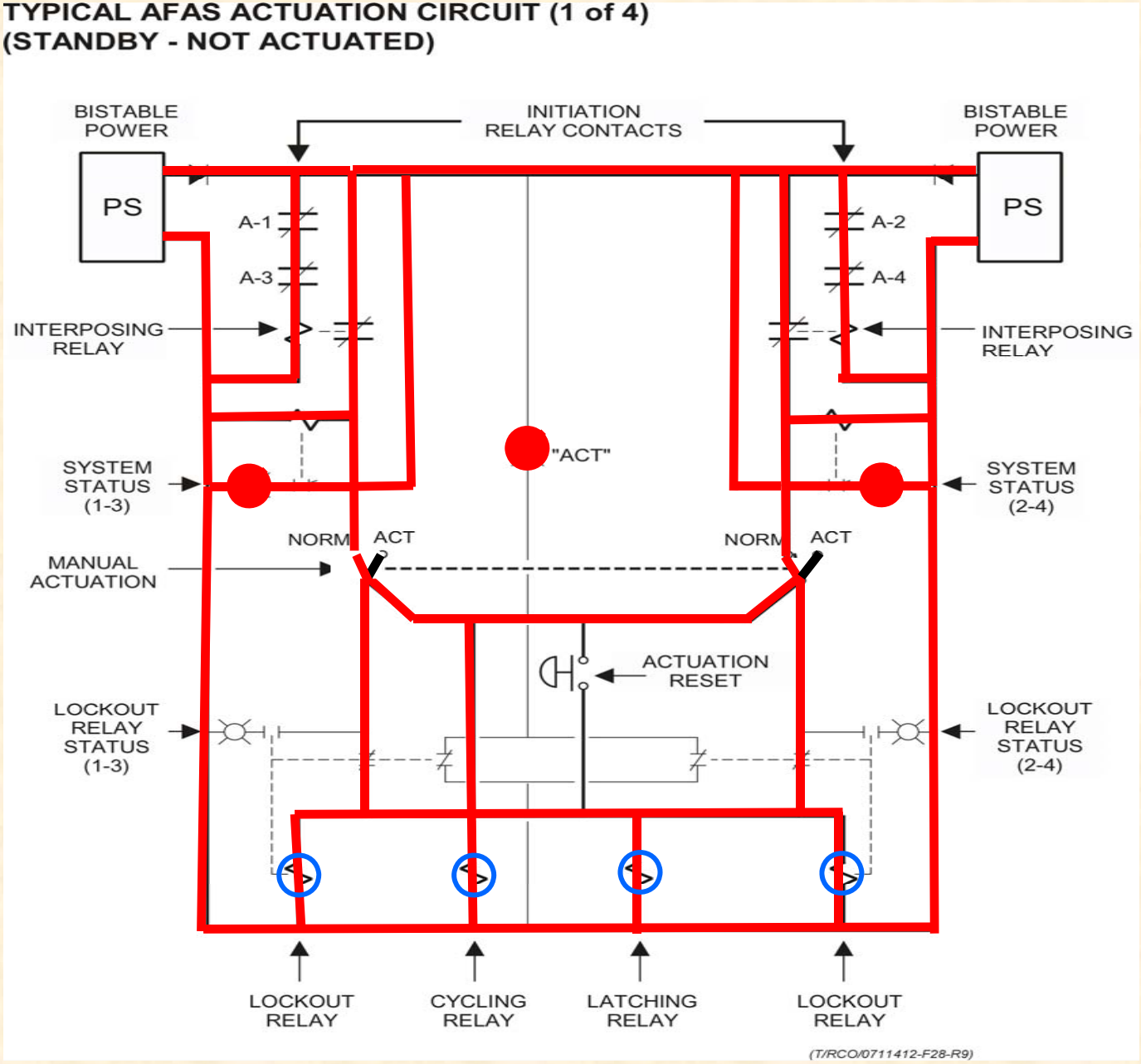
Manual Initiation – Unit 2 Only





Channel ‘A’ Actuation Circuit

Manual Actuation – Unit 1 or 2



WATERFORD ORIG QUESTION

Facility:

Vendor CE

Exam Date:

Exam Type:

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		
	Group #		
	Topic & KA #		
	Importance Rating:		

KA Statement

Proposed Question:

Manual actuation of a Containment Spray Actuation Signal (CSAS) from the Control Room requires _____(1) two of the four ESFAS channels and will start _____(2) train(s) of Containment Spray.

A. a specific one

B. a specific both

C. any one

D. any both

Proposed Answer: B

Explanation (Optional):

A. Incorrect: First part is correct. Meeting the trip logic will start both trains of Containment Spray.

B. CORRECT: ESFAS logic is designed with a selective 2 out of 4 trip strategy. The correct 2 out of 4 channels must be actuated to meet the trip logic. Once the trip logic is met, both trains of Containment Spray will start.

C. Incorrect: The correct 2 out of 4 channels must be actuated to meet the trip logic not just any two. Once the trip logic is met, both trains of Containment Spray will start.

D. Incorrect: The correct 2 out of 4 channels must be actuated to meet the trip logic not just any two. Second part is correct.

Techical Reference(s): SD-PPS pg. 43 & Fig. 40 (rev16) (Attach if not previously provided)

Proposed Reference to be provided to applicants during examination: N

Learning Objective: WLP-OPS-PPS00 obj. 5,6 (As available)

Question Source: Bank 26041
Modified Bank (Note changes or attach parent)
New

Question History: Last NRC Exam: 2015 Waterford 3

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

41.

022 K2.01 / Containment Cooling / Knowledge of power supplies to the following: Containment cooling fans

Given the following conditions:

- Unit 2 has experienced a LOCA
- On the trip, feeder breakers to MCC 2B9 tripped
- RCS pressure is 1580 psia and the crew has entered 2-EOP-03, LOCA

Which ONE of the following describes the RUNNING Containment Fan Coolers?

The _____ Containment Fan Coolers are RUNNING.

A.	“1A” and “1B”
B.	“1A” and “1C”
C.	“1B” and 1D”
D.	“1C” and “1D”

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	MCC 2B9 supplies Containment fans coolers 1C and 1D
B.	Incorrect:	Plausible, as the ‘B’ 120V DC bus supplies ‘B’ and ‘D’ instrument inverters
C.	Incorrect:	Plausible, as the ‘B’ 120V DC bus supplies ‘B’ and ‘D’ instrument inverters
D.	Incorrect:	MCC 2B9 supplies Containment fans coolers 1C and 1D

Question Number: 41

Tier: 2 Group: 1

K/A: 022 K2.01 / Containment Cooling / Knowledge of power supplies to the following: Containment cooling fans

Importance Rating: 3.0 3.1

10 CFR Part 55: (CFR: 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the power supply to the Containment Cooling Fans

Technical Reference: PSL OPS 0711502

Proposed references to be provided: None

Learning Objective: PSL OPS 0702210 Obj. 7b, 14a

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: Bank question from the PSL 2011 NRC Exam # 41

HVS-1A, 1B, 1C and 1D, which are cooled by CCW. All four units are connected to a ring shaped duct. Each fan cooler unit consists of a cooling coil assembly, dampers and a fan.

Containment Cooling Fans

Unit 1:

Fans are centrifugal and direct-drive with backward curved airfoil blades that provide a non-overloading characteristic. The fan motors are single speed, water cooled AC induction motors powered from 480 V load center 1A2 for fans HVS-1A and 1B, and load center 1B2 for fans HVS-1C and 1D. Control power is supplied from 125 VDC batteries A and B.

Cooling water for the motors is supplied from CCW at a rate of 50 gpm. Each fan has a control switch on RTGB 106. During normal operation the four fan-cooler units operate to supply the containment building with 60,000 cfm air flow each. Upon receipt of an SIAS, all four fan-cooler units will automatically start and supply post-accident heat removal air at an expected flow rate of 58,000 cfm each. The fans are in the three second load block.

Unit 2:

Use vane axial flow fans that consist of a multi-bladed rotor assembly mounted directly to the motor shaft. The fan-rotor is of the adjustable pitch type so air flow can be mechanically adjusted. The two-speed fan motors are not cooled by CCW. The fan motors are cooled by air that has been through the cooling coils.

Each fan has a **STOP/AUTO/START/TEST** control switch and off/fast/slow indication lights on HVAC control board. The fan motors are powered from 480 VAC buses; fans 2HVS-1A/1B from MCC 2A9 and 2HVS-1C/1D from MCC 2B9. Control power is supplied from the 480V fan breaker through a step down transformer. There is a **FAST/REMOTE/SLOW** local control switch on each MCC for maintenance. During normal operation, three of the four fan-cooler units operate in fast speed to supply the

containment with an air flow of 60,000 cfm each.

Upon receipt of an SIAS, all four fan-cooler units start in slow speed to supply approximately 39,600 cfm air flow each for post-accident heat removal system. Following a loss of power to the MCC or cycling of an individual fan breaker, the respective fan will start in fast if the control switch is in Auto. There is a 3 second time delay before auto starting. This places these fans in the three second load block following a loop.

The fan can be placed in slow speed by taking the control switch to TEST. To return the fan to fast, the control switch is first taken to STOP, and then placed in START. Time should be allowed for the fan to coast down before restarting.

Fan problems are indicated by any of these annunciators:

- CONTAINMENT FAN CLR HVS-1A (B, C, D) OVRLD/TRIP
- CONTAINMENT FAN CLR HVS-1A (B, C, D) FLOW LOW/VIBRATION HIGH
- CONTAINMENT FAN CLV HVS-1A (B, C, D) SIAS OVRD/SS ISOL

The vibration alarm can be reset by depressing the reset button on the vertical section of RTGB-106 [HVCB]. Refer to the System Data Section of this text for more information on these and other annunciators.

Containment Cooling Coils

Each fan cooling unit contains two banks of cooling coils for normal and post-accident operation. The coils are mechanically and uniformly expanded into finned collars. Each fan cooler is in an enclosure designed to withstand any seismic loads and pressure differentials that could be encountered. The fan coolers are provided with a gravity damper to limit reverse flow while the fan is idle. The fan coolers are located in different quadrants within containment as illustrated in Figures 9 and 10. Three fan coolers are on 43’ floor elevation, and the fourth is on the 62' operating floor.

42. 026 K3.02 / Containment Spray / Knowledge of the effect that a loss or malfunction of the CSS will have on the following: Recirculation spray system

Given the following conditions:

- Unit 2 is experiencing a large break LOCA
- 2-EOP-03, LOCA is in progress
- The 2A Containment Spray pump is out of service
- The 2A HPSI pump is out of service
- Containment Pressure is 9 psig
- RAS has occurred
- The 2B Containment Spray pump tripped and cannot be restarted
- ALL Containment Fan Coolers are running

Which ONE of the following describes the status of Core cooling AND Containment cooling Safety Functions?

Core cooling ____(1)____ be maintained.

Containment cooling ____(2)____ be maintained.

A.	(1)	will
	(2)	will
B.	(1)	will
	(2)	will NOT
C.	(1)	will NOT
	(2)	will
D.	(1)	will NOT
	(2)	will NOT

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: Alignment of Cooled Containment Spray to the suction of the HPSI pumps is not required for core cooling. Part 2 correct: On Unit 2, four Containment Coolers are 100% Containment heat removal capacity.
B.	Incorrect:	Part 1 correct: See analysis A. Part 2 incorrect: It is plausible that the applicant have the misconception that containment cooling cannot be maintained without CS pumps operating since this part of NPSH requirements for Unit 1.
C.	Incorrect:	Part 1 incorrect: It is plausible that the applicant have the misconception that core cooling cannot be maintained a HPSI pump out of service during a Large Break LOCA. Part 2 correct: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 42

Tier: 2 Group: 1

K/A: 026 K3.02 / Containment Spray / Knowledge of the effect that a loss or malfunction of the CSS will have on the following: Recirculation spray system

Importance Rating: 4.2 4.3

10 CFR Part 55: (CFR: 41.7 / 45.6)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required know the effect that a loss of RAS will have on the CSS.

Technical Reference: UFSAR 6.3.2.2.3, Lesson Text 0711207

Proposed references to be provided: None

Learning Objective: PSL OPS 0702207 - 3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: Bank question for the 2019 NRC Exam

Comments: #43 on PSL 2010 NRC Exam

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 8 of 11)

7. CONTAINMENT ISOLATION

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
Either Section A or Section B will satisfy this safety function		
A. Secondary Plant Activity	Less than alarm value AND stable or lowering trends on Condenser Air Ejector, Blowdown and Main Steamline Radiation Monitors	☐☐☐☐☐☐
	OR	
	Surveys indicate normal levels AND stable or lowering trends	☐☐☐☐☐☐
	AND	
Containment Pressure	Less than 3.5 psig	☐☐☐☐☐☐
	AND	
CIS Radiation Monitors	Less than alarm value AND stable or lowering trends	☐☐☐☐☐☐
OR		

(continued on next page)

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 11 of 11)

8. CONTAINMENT TEMPERATURE AND PRESSURE (continued)

	SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
C.	FOUR Containment Fan Coolers	RUNNING	
			AND
	Containment pressure	Less than 42 psig	
			AND
	Hydrogen Concentration	Less than 3.0%	
		OR	
D.	TWO Containment Fan Coolers	RUNNING	
			AND
	ONE Containment Spray Header	Flow in the header is at least 2700 gpm	
			OR
	Containment Spray Pumps	Stopped as allowed by procedure	
			AND
	Containment Pressure	Less than 42 psig	
			AND
	Hydrogen Concentration	Less than 3.0%	

END OF SAFETY FUNCTION 8

INITIALS RO / SRO / STA

ultimate subcooling of the core coolant independent of break location. For small pipe breaks, the HPSI pumps continue injecting into the Reactor Coolant System to provide makeup for spillage out the break while a normal cooldown is implemented.

The St. Lucie 2 HPSI pumps are manufactured by Bingham-Willamette Company. These pumps are similar in design to conventional boiler feed pumps where continuous service over a broad range of temperature is required. Specific long-term testing of the HPSI pumps was not required because of the vendors experience with the design.

Operational testing is considered as part of the functional requirements of the pump. For the purpose of pump specification and design, the long-term LOCA requirement is defined as continuous operation for up to one year at runout conditions. The operational experience of the pump vendor on similar equipment is defined below.

The pumps for Units 1 and 2 have virtually identical performance curves, running clearances, and materials of construction.

St. Lucie Unit 2 pumps are designed to operate at a nominal 3600 rpm. The St. Lucie motors are 400 HP two-pole machines directly coupled to the pumps. For St. Lucie, anti-friction bearings of proven design are used.

Other Bingham-Willamette pumps of comparable size which have and are compiling significant operating hours include North Anna (Auxiliary Feedwater); Oyster Creek (Emergency Feedwater); Prairie Island (HPSI) and Point Beach (HPSI).

During normal operation the high-pressure safety injection pumps are isolated from the Reactor Coolant System by motor operated valves. During the injection mode, the HPSI pumps deliver water from the refueling water tank to the Reactor Coolant System via the cold leg safety injection nozzles when RCS pressure falls below the high pressure safety injection pump shutoff head. During the recirculation mode of operation, the high pressure safety injection pumps take suction from the containment sump.

The high pressure safety injection pumps are sized such that one HPSI pump (after consideration of spillage directly out the break) supplies adequate water to the core to match decay heat boiloff rates soon enough to minimize core uncovery and allow such small break LOCAs to meet the performance criteria of 10 CFR 50.46. The high-pressure safety injection pump characteristic curves are shown on Figures 6.3-4a and 4b.

The NPSH calculations for the HPSI pumps utilize the recommendations of Regulatory Guide 1.1, "Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal System Pumps," November 1970 (R0), as outlined in Subsection 6.2.2.3. The NPSH available to the HPSI pumps during recirculation (refer to Table 6.3-18) has been calculated based on "issued for construction" piping drawings and the following:

a. Crane Company Technical Paper No. 410, "Flow of Fluids Through Valves, Fittings, and Pipe," 1976.

b. System runout flow of one suction header of 5050 gpm, consisting of 4350 gpm for one containment spray pump and 700 gpm for one HPSI pump.

c. Containment pressure is equal to the saturation pressure of the containment sump water, as discussed in Subsection 6.2.2.

Normal Operation

Containment Spray System

Normally the CS System is lined up for automatic initiation on a CSAS along with the related IRS. Like the HPSI and LPSI Systems, CS relies on Instrument Air, electrical power and CCW for operation.

Containment Cooling System

The Containment Cooling System has four [three] fans operating [in fast speed and a fourth in standby] with the system normal alignment. System operation requires that CCW be supplied to each cooler between **1350 and 1450 gpm** along with power available to fans and motor operated valves. Refer to Containment Cooling System normal operating procedure.

Each unit is sized to remove one-third of the total normal heat load or one-fourth of the accident heat load. [Unit 2 fans have two speeds; fast, 60,000 cfm and slow, 39,600 cfm, while Unit 1 fans operate at 60,000 cfm. Three Unit 2 fans are normally run at fast speed and shifted to four fans operating at slow speed upon a receipt of an SIAS.]

Plant Shutdown/Cooldown

When RCS pressure is less than 1750 psia, the CS System is removed from service by closing MV-07-3A and MV-07-3B [MV-07-3 and MV-07-4]. Refer to the Reactor Plant Cooldown procedure. In addition, operators are directed to perform an appendix to disable and isolate the CS and NaOH [Hydrazine] Systems.

CONTAINMENT COOLING FANS

4 per unit	
Air flow, each, normal, cfm	60,000
Air flow, each, post-accident, cfm	58,000 [39,600]
Cooling water flow, each, gpm	1200 {includes 50 gpm for motor} [1200]
Accident Heat Removal Capacity, 2 trains	100% [50% each train]

SITS

4 per unit	
Total Volume, each tank, ft^3	1980 [1855]
Liquid volume, ft^3	1090 to 1170 [1420 to 1556]
Design Pressure, psig	280 [650]
Design Temperature, °F	200

MOTOR-OPERATED VALVES

LPSI HEADER ISOLATION VALVES

VALVE	DESIGNATION	POWER SUPPLY
HCV 3615	LPSI TO LOOP A2	MCC 1A5 [2A5]
HCV 3625	LPSI TO LOOP A1	MCC 1B6 [2A6]
HCV 3635	LPSI TO LOOP B1	MCC 1A6 [2B6]
HCV 3645	LPSI TO LOOP B2	MCC 1B5 [2B5]

HPSI HEADER ISOLATION VALVES

VALVE	DESIGNATION	POWER SUPPLY
HCV 3616	HP HPSI [B HPSI] HDR TO LOOP A2 VALVE	MCC 1B5 [2B5]
HCV 3626	HP HPSI [B HPSI] HDR TO LOOP A1 VALVE	MCC 1B6 [2B6]
HCV 3636	HP HPSI [B HPSI] HDR TO LOOP B1 VALVE	MCC 1B6 [2B6]
HCV 3646	HP HPSI [B HPSI] HDR TO LOOP B2 VALVE	MCC 1B5 [2B5]
HCV-3617	AUX HP HPSI [A HPSI] HDR TO LOOP A2 VALVE	MCC 1A5 [2A5]
HCV-3627	AUX HP HPSI [A HPSI] HDR TO LOOP A1 VALVE	MCC 1A6 [2A6]
HCV-3637	AUX HP HPSI [A HPSI] HDR TO LOOP B1 VALVE	MCC 1A6 [2A6]
HCV-3647	AUX HP HPSI [A HPSI] HDR TO LOOP B2 VALVE	MCC 1A5 [2A5]

EOP DEVIATIONS AND JUSTIFICATIONS

EOP Title: Loss of Coolant Accident

EOP Procedure No.: 1 - EOP - 03 **Revision No.** 41

Corresponding EPG Title: Loss of Coolant Accident Recovery

EPG Revision No.: 6.0

EOP Step/Attachment No.: Instruction Step 36

*In preparation for RAS, WHEN the RWT level is between 8 and 6 feet, THEN PERFORM the following:

A. ALIGN CS to HPSI pump suction.

- OPEN V3663, SD HX A to HPSI A
- OPEN V3662, SD HX B to HPSI B/C

B. REMOVE power inhibit from SI Recirc valves by placing the following keyswitches to ON:

- V3659, SI PUMP MINIFLOW ISOL LOCKOUT key switch (Key 56)
- V3660, SI PUMP MINIFLOW ISOL LOCKOUT key switch (Key 57)

Corresponding EPG Step/Attachment No.: None

EOP Deviations from EPG:

1. This is a plant specific instructional step.

EOP DEVIATIONS AND JUSTIFICATIONS

EOP Title: Loss of Coolant Accident

EOP Procedure No.: 1 - EOP - 03 **Revision No.** 41

Corresponding EPG Title: Loss of Coolant Accident Recovery

EPG Revision No.: 6.0

Technical Justifications for Deviations:

1. This is a plant specific step to align the Containment Spray system to the suction of the HPSI pumps. This is performed in accordance with FSAR Section 6.3.2.1.2. As stated in the FSAR, "The RAS also acts to shutdown the low pressure safety injection pumps and closes the isolation valves in the pump recirculation line (V-3659 and V-3660). Recirculation flow is normally provided by at least one high pressure safety injection pump. Plant procedures require that, just prior to RAS, a portion of the cooled water from the containment spray system be directed to the high pressure pump suction. This is not necessary to meet core cooling requirements. Therefore, the step is needed to help ensure operability and maintainability of the HPSI pumps. The guidance and justification for this alignment is provided for in PSL-1FSM-98-001. The 6-8 feet is an administrative level which allows time for restoration of power to the minimum flow recirculation valves. These valves must close on a RAS to prevent pumping the water from the containment sump to the RWT. The valve numbers were given for human factor considerations.

Amplifying Bases Information:

FSAR Section 6.3.2.1.2, System Operation in Recirculation Mode

FSAR Section 6.3.2.2.4, High Pressure Safety Injection Pumps

PSL-1FSM-98-001, LPSI, Containment Spray Pumps NPSH from the Containment Sump

Heat Exchangers for heat removal. The cooled water is then directed to the CNTMT spray rings. The CS cools the containment atmosphere as it flow back to the CNTMT sump where the cycle is repeated.

On Unit 1, a portion of this water, downstream of the SDC Heat Exchangers, is aligned to provide the suction to the HPSI pumps for enhanced NPSH while on RAS. Refer to Figure 1.

- 1[2]-EOP-99 also provides guidance for aligning SITs to the VCT for RCS makeup.

Testing

The HPSI and LPSI pumps are run and all MOVs stroked quarterly in accordance with the HPSI/LPSI periodic test procedure to ensure Tech. Spec. surveillance requirements are met.

The SI Loop isolation check valves are required to be checked after each opening and/or every 18 months to verify their operability. These check valves and their leakage limits are listed in Tech Specs under RCS leakage limits.

[On Unit 2, every time a SIT is filled by the operator, Data Sheet 25, "Verification of ECCS RCS Pressure Valve Integrity," must be performed. This is due to the extra SI header check valve installed upstream of each SIT (V-3260, 3261, 3258 and 3259).]

The SIT discharge check valves are verified operable each refueling outage by utilizing the SIT discharge and SI loop check valves stroke testing procedure. This procedure allows the SITs to discharge into the RCS while monitoring the level of the refueling cavity.

All pump runs and surveillances shall be performed under the appropriate procedural guidance. Particular care shall be given to use of the CORRECT procedure, with all “Cautions” and “Precautions” carefully observed. Of specific concern is the need to assure sufficient venting of pumps, piping, seals, and seal coolers, as referenced in applicable procedures.

RWT/CNTMT sump.

On Unit-1, there are additional suction lines from the containment spray system down stream the SDC Heat Exchangers. The HPSI pumps suction is manually aligned to CS prior to RAS, if CS is available. This provides additional assurance that NPSH will be maintained after RAS actuates.

On an SIAS, the A & B HPSI pumps automatically start, and discharge into two headers; the auxiliary HP [A] header and the HP [B] header, respectively. Each header splits into four separate headers which connect into the four SI headers via normally closed motor operated header isolation valves. Each of the four SITs connects with its respective SI header just prior to connecting to the four RCS cold legs. Refer to Figures 1 and 2.

The HPSI header isolation valves open automatically on an SIAS. The HP [B] header isolation valves are powered from MCC B5 and B6. The Auxiliary HP [A] header isolation valves are powered from MCC A5 and A6. This arrangement ensures HPSI flow is available with a loss of offsite power and failure of one emergency diesel generator. Isolation valves HCV-3616, 3626 3636 and 3646, are controlled from individual three-position **CLOSE/AUTO/OPEN** (spring return to AUTO) switches in the control room on RTGB 106 [206], or locally, by OPEN/CLOSE pushbuttons located in the corridor outside the room for LPSI pump A. Isolation valves HCV-3617, 3627, 3637 and 3647 are controlled from individual three-position **CLOSE/AUTO/OPEN** (spring return to AUTO) switches in the control room on RTGB 106 [206], or locally, by OPEN/CLOSE pushbuttons located in the corridor outside the room for the shutdown cooling heat exchanger “A.” These valves travel in the associated direction (open or close) only as long as the switches are held in that position. This allows operators to throttle the positions for flow control.

Refer to the System Data Section of this text for the individual valve power supplies.

The HPSI pumps are multi-stage centrifugal type pumps, with a runout flow of **640 [685] gpm** and shutoff head of approximately **1250 psig**. The pumps are designed to operate at a temperature of 350°F with a rated flow of 345 gpm, including 30 gpm bypass (recirc) flow, and a rated head of 2500' (1084 psi).

Design Bases

Containment Heat Removal System

The Containment Heat Removal System is designed to:

- Prevent the containment pressure from exceeding its design value following a LOCA, assuming a single active or passive failure.
- Withstand the design basis earthquake loads without loss of function.
- Withstand post-accident environmental conditions without a loss of function.
- Permit inspection and testing at appropriate intervals to ensure system integrity and functional capability.

The CS System consists of two independent and redundant subsystems. The Containment Cooling System consists of four fan-cooling units, a ducted air distribution system, and associated instrumentation and controls. The heat removal capacity of either of the two spray subsystems or all four fan coolers (one spray train and two fan coolers) is adequate to keep containment pressure and temperature below design values. The heat removal capacity of either combination will bring containment pressure below **10 psig [less than half its peak value]** within 24 hours after any size break in the reactor coolant piping up to and including a double-ended break of the largest reactor pipe, assuming unobstructed discharge from both ends.

Any of the following combinations of equipment will provide the minimum heat removal capability necessary to limit and reduce the post-accident containment pressure and temperature:

- All four containment fan coolers (100% capacity: Unit 1 only).
- Both CS subsystems (100% capacity: Unit 1 only).
- One CS subsystem in conjunction with two containment fan coolers (100% capacity: Unit 1 & Unit 2).

43.

039 A4.04 / Main and Reheat Steam / Ability to manually operate and/or monitor in the control room: Emergency Feedwater Pump Turbines

Which ONE of the following describes the indications of a MECHANICAL overspeed trip on the 2C AFW Pump?

When Annunciator G-46, 2C AFW Pump Turbine Failure/Trip/SS Isol, alarm is acknowledged and RESET, the Alarm window will ____(1)____ and the indication for MV-08-3, Trip and Throttle valve will show ____(2)____.

A.	(1)	CLEAR
	(2)	GREEN light ONLY
B.	(1)	CLEAR
	(2)	BOTH RED and GREEN lights
C.	(1)	remain LOCKED IN
	(2)	GREEN light ONLY
D.	(1)	remain LOCKED IN
	(2)	BOTH RED and GREEN lights

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: If the alarm resets it is indication of electrical overspeed which directly impacts how the CR will recover the AFW pump. Remain locked in is the indication of a mechanical overspeed trip. Part 2 correct: See analysis C
B.	Incorrect:	Part 2 incorrect: See analysis A Part 2 incorrect: Dual indication is would be correct on Unit 1
C.	Correct:	Part 1 is correct: If the alarm remains locked in it indicates a mechanical trip and requires field actions to recover. Part 2 is correct: Unit 2: An electrical and mechanical overspeed results in a closed** position indication for MV-08-3 **Unit Overspeed Indication Differences:** - Unit 1: An electrical overspeed trip results in dual* position indication of MV-08-3 and alarm reset on Ann. G-46 - Unit 1: A mechanical overspeed trip results in dual* position indication for MV-08-3 and alarm Ann. G-46 locked in. *The dual position indication is a result of both position switches (valve and motor) feeding the indication in the control room. A trip of MV-08-3 results in the valve being closed and the motor still in the open position until it is driven in the close direction to relatch the electrical overspeed lever. - Unit 2: An electrical and mechanical overspeed results in a closed** position indication for MV-08-3. Like Unit 1 the alarm Ann. G-46 is locked in only on a mechanical overspeed trip. **Only the valve position limit switch feeds the control room indication. At the local panel, the motor position indicator would still indicate open until the motor is driven in the close direction to relatch the electrical overspeed lever.
D.	Incorrect:	Part 2 correct: See analysis C Part 2 incorrect: Dual indication is would be correct on Unit 1

Question Number: 43

Tier: 2 Group: 1

K/A: 039 A4.04 / Main and Reheat Steam / Ability to manually operate and/or monitor in the control room: :Emergency Feedwater Pump Turbines

Importance Rating: 3.8 3.9

10 CFR Part 55: (CFR: 41.7 / 45.5 to 45.8)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the CR indications for AFW pump turbines.

Technical Reference: 2-AOP-09.02, Auxiliary Feedwater
2-ARP-01-G46, Annunciator Response Procedure

Proposed references to be provided: None

Learning Objective: PSL OPS 0702412-4,6,10,19

Cognitive Level:

Higher	
Lower	x

Question Source:

New	
Modified Bank	X
Bank	

Question History: MODIFIED BANK question for the 2019 NRC Exam

Comments: MODIFIED Bank question from 2017 PSL NRC Exam #46

2C AFW PUMP TURBINE FAILURE/TRIP/ OVRLD/SS ISOL

G-46

CAUSES: Any of the following:

- NORMAL/ISOLATE in ISOL
- Loss of control power
- Mechanical or electrical overspeed trip
- MV-08-3 thermal overload actuated.

Other considerations:

- Actuation of Thermal Overload will cause alarm only, control power and light indication will remain functional

DEVICE:	SETPOINT:	LOCATION:
SS/632	ISOLATE	CNTL XFR PNL 2AB
CR2	De-energized	TRSL/20/N-T3/W-TA
CR1	mech trip 4690 rpm	TRSL/20/N-T3/W-TA
CON-1	elec trip 4315 rpm	TRSL/20/N-T3/W-TA

ALARM CONFIRMATION

1. NORM/ISOL Switch in ISOL
2. MV-08-3, 2C AFW Pump Trip and Throttle valve, red and green indicating lights OFF
3. 2C AFW Pump Turbine Control Panel, Power on, WHITE light OFF
4. MV-08-3, Trip and Throttle Valve indicates closed, green light ON

OPERATOR ACTIONS

1. **DISPATCH** an operator and perform the following:
   A. **ENSURE** the NORM/ISOL switches are in the NORMAL position.
   B. **CHECK** if the Power On, WHITE light is ON.
   C. IF the WHITE light is OFF, THEN **PERFORM** the following:
      (1) **ENSURE** 125V DC BUS 2AB Ckt-20 is ON.
      (2) **NOTIFY** EM Department to troubleshoot and repair MV-08-3 Thermal Overloads.
2. IF 2C AFW Pump TRIPPED, THEN **GO TO** 2-AOP-09.02 Auxiliary Feedwater.

REFERENCES:

1. CWD 2998-B-327 SH 631, 632
2. Schematic 2998-B-326 SH 631
3. VTM 2998-12474

CAUSES: Any of the following:

- NORM/ISOL switches in ISOL
- Loss of power
- Mechanical or electrical overspeed trip has occurred
- MV-08-3 Thermal Overload actuated.

1C AFW PUMP TURBINE FAILURE/TRIP/ SS ISOL

G-46

DEVICE:	SETPOINT:	LOCATION:
SS/631	ISOL	Isolation Panel 1AB
SS/632	ISOL	Isolation Panel 1AB
SS/652	ISOL	Norm/ Isol Panel 480V MCC 1AB
SS/653	ISOL	Norm/ Isol Panel 480V MCC 1AB
74/631	De-energized	1C AFW Pump Control Panel
49/632	Thermal Overload	Local Starter
LS3	MECH TRIP 4500 RPM	TRSL/19/S-T2/W-TA
72/631	Energized	1C AFW Pump Trip and Throttle Valve
OS	ELEC TRIP 4140 RPM	1C AFW PUMP CNTL PNL

ALARM CONFIRMATION

1. MV-08-3, 1C AFW PUMP TRIP AND THROTTLE VALVE, red and green status lights OFF
2. MV-08-13, 1A S/G STEAM TO 1C AFW PUMP, red and green status lights OFF
3. MV-08-14, 1B S/G STEAM TO 1C AFW PUMP, red and green status lights OFF
4. MV-08-3, 1C AFW PUMP TRIP AND THROTTLE VALVE, red and green status lights OFF
5. NORM/ISOL switches in ISOL

NOTE

AFAS signal is bypassed when in ISOL.

OPERATOR ACTIONS

1. **DISPATCH** operator to perform the following:
   A. **CHECK** position of Normal/Isolate Switches:
      - SS/631 (Isolation Panel 1AB)
      - SS/632 (Isolation Panel 1AB)
      - SS/652 (Norm/ Isol Panel 480V MCC 1AB)
      - SS/653 (Norm/ Isol Panel 480V MCC 1AB)
2. IF one or more switches are in ISOL AND there is **NO** valid reason for switches to be in ISOL, THEN **PERFORM** the following:
   A. **ENSURE** NORM/ISOL switches in NORM position.
   B. **ENSURE** 125V DC BUS 1AB-1, Ckt-8 is ON.
   C. **ENSURE** 125V DC BUS 1AB-1, Ckt-10 is ON.
3. IF 1C AFW Pump tripped, THEN **GO TO** 1-AOP-09.02, Auxiliary Feedwater.
4. IF the Annunciator remains IN ALARM, THEN **NOTIFY** EM to troubleshoot and repair.

REFERENCES:

1. CWD 8770-B-327 SH 631, 632, 638, 651, 652, 653
2. Schematic 8770-B-326 SH 631
3. VTM 8770-6702

mechanism catch. The linkage rod does not interfere with the trip hook or electrical overspeed action.

Refer to Figures 15 and 16. Following a TRIP actuation, the TTV cannot be reopened either by motor or manual handwheel action until the trip hook is returned to its normal "latched" position. Relatch of the TTV occurs by manually returning the spring loaded trip linkage rod to its "reset" position (moving it "toward" the TTV) resetting the trip mechanism linkage rod catch and manual "TRIP" lever. The lever should return to the horizontal position when the mechanism resets, with the linkage rod moved to position the trip hook for latching the stem collar.

Electrical Overspeed Trip

Electrical overspeed trip actuation causes the TTV to close by unlatching the trip hook from the valve stem collar. The trip solenoid (THR) unlatches the trip hook on the electrical trip. The unlatch action is by the same solenoid linkage assembly that causes the electrical TTV closure and actuates when the overspeed setpoint (115%) is reached. Unlatching the trip hook allows the TTV to close by spring pressure. This action is independent and different from the mechanical overspeed actuation in that it does not require any local operator actions to enable valve relatching.

The trip hook will automatically return (by spring pressure) to its "engaged" position as soon as the overspeed or electrical trip condition clears. The valve stem collar must be motor or handwheel driven upwards to latch the trip hook. This normally occurs with TTV motor operator actuation in the "STOP/RESET" ["CLOSE"] direction, and is normally performed from the RTGB.

Unit Overspeed Indication Differences:

- Unit 1: An electrical overspeed trip results in dual* position indication of MV-08-3 and alarm reset on Ann. G-46
- Unit 1: A mechanical overspeed trip results in dual* position indication for MV-08-3 and alarm Ann. G-46 locked in.

*The dual position indication is a result of both position switches (valve and motor) feeding the indication in the control room. A trip of MV-08-3 results in the valve

being closed and the motor still in the open position until it is driven in the close direction to relatch the electrical overspeed lever.

- Unit 2: An electrical and mechanical overspeed results in a closed** position indication for MV-08-3. Like Unit 1 the alarm Ann. G-46 is locked in only on a mechanical overspeed trip.
  **Only the valve position limit switch feeds the control room indication. At the local panel, the motor position indicator would still indicate open until the motor is driven in the close direction to relatch the electrical overspeed lever.


U2 RTGB-202 list the deltas
PUMP 2A DISCH TO SG 2A VALVE
CLOSE AUTO OPEN
2A PUMP DISCH TO 2A S/G VLV (KEY 83)
AUTO OPEN
PUMP 2A
AUTO STOP START
PUMP 2C TO SG 2A
CLOSE AUTO OPEN
2C PUMP DISCH TO 2A S/G VLV (KEY 85)
AUTO OPEN
SG 2A STM TO AFW PP 2C
AUTO CLOSE OPEN
2C PUMP KEY 78
CLOSE OPEN
HEATER DRAIN PUMP
PUMP 2C TO SG 2B
CLOSE AUTO OPEN
2C PUMP DISCH TO 2B S/G VLV (KEY 86)
AUTO OPEN
SG 2B STM TO AFW PP 2C
AUTO CLOSE OPEN
PUMP 2B DISCH TO SG 2B VALVE
CLOSE AUTO OPEN
2B PUMP DISCH TO 2B S/G VLV (KEY 84)
AUTO OPEN
PUMP 2B
AUTO STOP START

ORIGINAL QUESTION FROM 2017 NRC

46. 061 K6.02 Auxiliary/Emergency Feedwater / Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: Pumps

Which ONE of the following describes the indications of an ELECTRICAL overspeed trip on the 2C AFW Pump?

When Annunciator G-46, 2C AFW Pump Turbine Failure/Trip/SS Isol, alarm is acknowledged and RESET, the Alarm window will ____(1)____ and the indication for MV-08-3, Trip and Throttle valve will show ____(2)____.

A.	(1)	CLEAR
	(2)	GREEN light ONLY
B.	(1)	CLEAR
	(2)	BOTH RED and GREEN lights
C.	(1)	remain LOCKED IN
	(2)	GREEN light ONLY
D.	(1)	remain LOCKED IN
	(2)	BOTH RED and GREEN lights

ORIGINAL QUESTION FROM 2017 NRC

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	If the alarm resets it is indication of electrical overspeed which directly impacts how the CR will recover the AFW pump. If the alarm remains locked in it indicates a mechanical trip and requires field actions to recover. **Unit Overspeed Indication Differences:** - Unit 1: An electrical overspeed trip results in dual* position indication of MV-08-3 and alarm reset on Ann. G-46 - Unit 1: A mechanical overspeed trip results in dual* position indication for MV-08-3 and alarm Ann. G-46 locked in. *The dual position indication is a result of both position switches (valve and motor) feeding the indication in the control room. A trip of MV-08-3 results in the valve being closed and the motor still in the open position until it is driven in the close direction to relatch the electrical overspeed lever. - Unit 2: An electrical and mechanical overspeed results in a closed** position indication for MV-08-3. Like Unit 1 the alarm Ann. G-46 is locked in only on a mechanical overspeed trip. **Only the valve position limit switch feeds the control room indication. At the local panel, the motor position indicator would still indicate open until the motor is driven in the close direction to relatch the electrical overspeed lever.
B.	Incorrect:	Clear is correct, dual indication is incorrect. See explanation above.
C.	Incorrect:	Remain locked in is the indication of a mechanical overspeed trip. Closed indication is correct.
D.	Incorrect:	Remain locked in is the indication of a mechanical overspeed trip. dual indication is incorrect.

ORIGINAL QUESTION FROM 2017 NRC

Question Number: 46

Tier: 2 Group: 1

K/A: 061 K6.02 Auxiliary/Emergency Feedwater / Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: Pumps

Importance Rating: 2.6 2.7

10 CFR Part 55: (CFR 41.5)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how a loss of malfunction of the AFW pumps will have on the AFW system.

Technical Reference: 2-ARP-G46, 2C AFW Pump Turbine Failure/Trip/SS Isol,

Proposed references to be provided: None

Learning Objective: PSL OPS 0702412-04

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	
Bank	X

Question History: PSL LOIT Bank question for the 2017 NRC RO Exam

Comments:

44. 059 K1.03 / Main Feedwater / Knowledge of the physical connections and/or cause effect relationships between the MFW and the following systems: S/GS

Given the following conditions:

- Unit 2 is at 75% power
- The 'B' Main Feedwater Regulating valve (MFRV) is out of service (isolated)
- 2B S/G level is being controlled with the 100% Bypass Valve throttled open and the Low Power Feed Regulating valve (15% Bypass) is in automatic

Subsequently:

- S/G level control fails resulting in the 2B S/G level RISING to a MAXIMUM level of 79% Narrow Range

Which ONE of the following describes the response of the Feedwater system?

(Assume NO operator action)

At the current level of 79 % Narrow Range, the 2B 100% Bypass valve ____(1)____ and BOTH Main Feedwater Pumps ____(2)____.

A.	(1)	CLOSES
	(2)	trip
B.	(1)	CLOSES
	(2)	continue operating
C.	(1)	remains AS-IS
	(2)	trip
D.	(1)	remains AS-IS
	(2)	continue operating

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: This would be true on Unit 1. Part 2 correct: Hi Level > 81 % will result in the MFPs trip.
B.	Incorrect:	Part 1 incorrect: This would be true on Unit 1. Part 2 correct: Hi Level > 81 % will result in the MFPs trip.
C.	Incorrect:	Part 1 correct: On Unit 2 the 100% bypass valve does NOT receive a close signal on HI Level > 77% only the MFRVs do. Part 2 incorrect: Hi Level > 81 % will result in the MFPs trip.
D.	Correct:	Part 1 correct: On Unit 2 the 100% bypass valve does NOT receive a close signal on HI Level > 77% only the MFRVs do. Part 2 correct: Hi Level > 81 % will result in the MFPs trip.

Question Number: 44

Tier: 2 Group: 1

K/A: 059 K1.03 / Main Feedwater / Knowledge of the physical connections and/or cause effect relationships between the MFW and the following systems: S/GS

Importance Rating: 3.1 3.3

10 CFR Part 55: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the cause effect relationship between FW and S/Gs

Technical Reference: PSL OPS 0711408

Proposed references to be provided: None

Learning Objective: PSL OPS 0702408-06

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: PSL Bank question for the 2019 NRC Exam

Comments: PSL Bank #6829

Transfer to 100% Bypass Valve

Feedwater can be transferred to the 100% Bypass Valve should the Main Feed Reg Valve become inoperable. Procedural guidance in the Appendices of the Main Feedwater Off-Normal Procedure outline the steps necessary to transfer feedwater to and from the 100% Bypass Valve. If the MFRV is operating satisfactorily in Automatic, then the transfer is performed in Auto. If Automatic control is not working then the transfer may be performed in Manual but this method of transfer is a more sensitive evolution due to the potential for the effect that excessive valve feedback can have on the 15% Bypass Valve's position. For either method, a SLOW, deliberate transfer is necessary in order to maintain SG levels within their control band of 60% to 70%.

SG LEVEL AND PRESSURE PROTECTION

SG Level

As illustrated in **Figures 14, 15 and 16**, each steam generator also has four safety grade narrow range level transmitters, LT-9013 A, B, C, D ('A' SG) and LT-9023 A, B, C, D ('B' SG). They provide input signals to their respective level indicator controller (LIC) located on RTGB 102 [202], which provides indication of level span, from 0 to 100%.

These LICs also provide a level input to the feedwater High Level Override (HLO) and Hi-Hi SG Level Turbine Trip protection circuitry, to the Reactor Protection System (RPS) for low SG level trip, and to the Auxiliary Feedwater Actuation System (AFAS) for AFW initiation.

Both the Hi and Hi-Hi Level signals can be defeated via level channel key switches located inside RTGB 102 and behind RTGB 202 so that the MFRVs (and a FW pump) can be used to fill the SGs for wet layup during plant shutdown conditions.

High level override (HLO) occurs when 2/4 NR safety level channels for a particular SG exceed 82% [77%] regardless of High Power M/A Station control mode (Manual or Auto). High level override closes the affected main feed regulating valve (and the Unit 1 100% Bypass valve for 35 seconds) and places the High Power M/A Station in Manual. There are two HLO Override Cancel pushbuttons (one per Train) located behind RTGB 102 [202] which when depressed will Manually override the HLO signal. The HLO will automatically clear when level drops below the reset setpoint of 77% [72%]. For either case, the MFRV must be operated in Manual to control SG level once the HLO signal has been removed.

Placing the High Power M/A Station back in Automatic should only be performed after the cause of the high level condition has been identified and Auto control of the MFRV is deemed safe.

A high level override cancel pushbutton, located at the high level override channel, allows overriding the high level override signal and restores control of the main feed regulating valve to the MFWCS. This button has no effect on the turbine trip signal to the main feed regulating valve (and the Unit 1 100% bypass).

The high SG level turbine trip provides protection against possible water slugging of the turbine due to excessive water level transients. The inputs feed a 2/4 coincidence logic matrix, one for each steam generator. At a Hi-Hi level of 90% [81%] in 2/4 indicators in either SG, the turbine is tripped, and both FW pumps are tripped.

As illustrated in **Figure 15**, on a turbine trip, the feedwater control system sends a Close signal to the MFRV. The MFRV is driven closed by the digital valve positioner via the DCS by sending out a 'Maximum Valve Demand Open' signal of '0', effectively closing the MFRVs. This same (Turbine Trip) signal places the High Power M/A Station in Manual which further ensures the valve(s) stay closed. A Turbine Trip (and/or a High Level Override) signal also sends a 'Close' signal to the Unit 1 100% bypass valve (in case it might be open) which is again to limit overfeeding of the SGs following a trip. This (Turbine Trip) signal also causes the FW pump recirculation valve to open for any running FW pump, which provides sufficient minimum flow to prevent the FW pump from overheating/cavitating and from tripping on low flow.

At the same time, the Turbine Trip signal initiates another DCS signal that positions the 15% Bypass valves to their 5% (total) flow position. This position (which is ~ 20 % open) provides enough flow to make up for inventory loss due to decay heat while also minimizing the possibility of overfeeding the SGs. The Low Power M/A Stations (which control the 15% Bypass valves) 'Valve Demand Output' is 'clamped' at the 5% Flow Open position from a Turbine Trip signal that inputs the DCS. Similar to the way the MFRV is closed by the DCS, this clamping signal sends out a 'Maximum Open' signal of ~ 20 % and a 'Maximum Close' signal of ~20 % to achieve the desired position.
Note: the 5% Flow position for LCV-9005 on Unit 2 is 19% Open due to a minor difference in valve design.

S/G Level Protection

- Turbine Trip (or HLO) also closes the Unit 1 100% bypass valve for 35 seconds. [No effect on Unit 2 100% bypass valve.]

- Turbine Trip also actuates TTOHLO2 and TTOHLO3 to initiate a 5% flow bias signal to the 15% bypass valve (valve still in AUTO)
  - Overridden by associated Turbine Trip reset button.
  - Annunciation is now provided when the 15% Bypass valves have been automatically positioned as a result of a turbine trip.

- CAUTION: TTOHLO1, TTOHLO2, and TTOHLO3 are energized on ANY turbine trip: Automatic, Manual, or Local. Must relatch the turbine to restore Man/Auto control of MFRV.
  - To get control of the 15% Bypass FCV. Push turbine trip Reset button.

INSTRUMENTATION

Unit 1

- RGTB 102
  - SG LEVEL
    - 1A SG Safety Narrow Range level transmitters LT-9013A, B, C, D and 1B SG Safety Narrow Range level transmitters LT-9023A, B, C, D provide input to:
      - AFAS actuation **at 19.5%** (2/4 logic)
      - RPS steam generator **low level trip at 35%** (2/4 logic)
      - Main Feed Regulating Valve FCV-9011 (FCV-9021) closure **at 82%** (2/4 logic)
      - 100% Bypass valve MV-09-03 (MV-09-04) closure **at 82%** (2/4 logic)
      - Main Feed Pump Trip **at 90%** (2/4 logic)
      - Main Turbine Trip **at 90%** (2/4 logic)
      - Level indication on LIC-9013A, B,C,D (1A) or LIC-9023A, B, C, D (1B)
      - SG Levels on DCS (WR level L9012, L9022; NR levels L9005, L9011, L9006, L9021)
    - NR Level indication is also provided on the following T-800 controllers:
      - FIC-9011, 1A High Power M/A Station
      - FIC-9021, 1B High Power M/A Station
      - LIC-9005, 1A Low Power M/A Station
      - LIC-9006, 1B Low Power M/A Station
  - SG PRESSURE
    - SG steam pressure indication is provided by P0801A and P0801B on the DCS FPDs.
    - PIC-08-1A and PIC-08-1B, the ADV controllers, also provide SG steam pressure indication.
  - STEAM FLOW/FEEDFLOW
    - Steam flow is provided by F0801A and F0801B on the DCS FPDs.
    - 1A SG steam flow and feedflow is indicated on F8011/9011 on the DCS FPDs.
- RTGB 103
  - LEVEL (Refer to **Figure 25** for NR vs. WR Levels)
    - Wide Range steam generator level indication
      - 1A SG: LI-9012

- HSCP 1B
  - 1B SG Level Wide Range LI-9022-1
  - 1B SG Level Narrow Range LI-9006

Unit 2

- RGTB 202
  - SG LEVEL
    - 2A SG Safety Narrow Range level transmitters LT-9013A, B, C, D and 2B SG Safety Narrow Range level transmitters LT-9023A, B, C, D provide input to:
      - 2A SG indication as read by LIC-9012A,B,C,D
      - 2B SG indication as read by LIC-9023A,B,C,D
      - AFAS actuation **at 19.5%** (2/4 logic)
      - RPS steam generator low level trip **at 35%** (2/4 logic)
      - Main Feed Regulating Valve FCV-9011 (FCV-9021) closure **at 77%** (2/4 logic)
      - Main Feed Pump trip **at 81%** (2/4 logic)
      - Main Turbine trip **at 81%** (2/4 logic)
      - SG Levels on DCS (WR level L9012, L9022; NR levels L9005, L9011, L9006, L9021)
      - Narrow Range Level is indicated on the following T-800 controllers:
        - FIC-9011, 2A High Power M/A Station
        - FIC-9021, 2B High Power M/A Station
        - LIC-9005, 2A Low Power M/A Station
        - LIC-9006, 2B Low Power M/A Station

  - SG PRESSURE
    - Steam pressure indication is provided by P0801A and P0801B on the DCS FPDs.

  - STEAM FLOW/FEEDFLOW
    - Steam flow indication is provided by F0801A and F8011 on the DCS FPDs.
    - 2A SG Steam Flow and Feedflow is provided by F8011/F9011 on the DCS FPDs.
    - 2B SG Steam Fflow and Feedflow are provided by F8021/F9021 on the DCS FPDs.

- RTGB 204
  - LEVEL
    - SPDS Displays wide range level for both the 2A and 2B SGs.

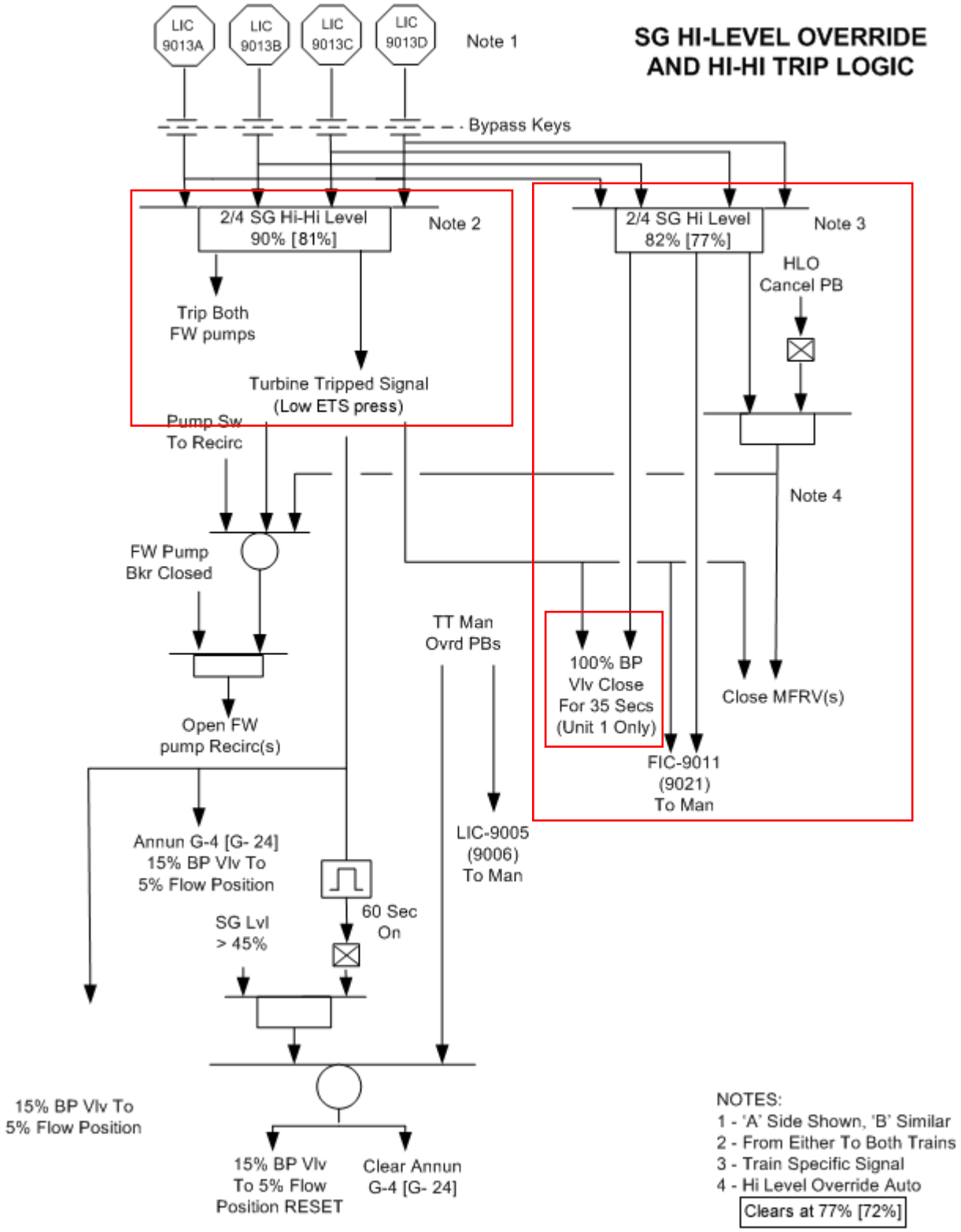

SG HI-LEVEL OVERRIDE
AND HI-HI TRIP LOGIC
LIC 9013A
LIC 9013B
LIC 9013C
LIC 9013D
Note 1
Bypass Keys
2/4 SG Hi-Hi Level
90% [81%]
Note 2
Trip Both
FW pumps
Turbine Tripped Signal
(Low ETS press)
2/4 SG Hi Level
82% [77%]
Note 3
HLO
Cancel PB
Pump Sw
To Recirc
Note 4
FW Pump
Bkr Closed
Open FW
pump Recirc(s)
TT Man
Ovrd PBs
100% BP
Vlv Close
For 35 Secs
(Unit 1 Only)
Close MFRV(s)
FIC-9011
(9021)
To Man
Annun G-4 [G- 24]
15% BP Vlv To
5% Flow Position
LIC-9005
(9006)
To Man
60 Sec
On
SG Lvl
> 45%
15% BP Vlv To
5% Flow Position
15% BP Vlv
To 5% Flow
Position RESET
Clear Annun
G-4 [G- 24]
NOTES:
1 - 'A' Side Shown, 'B' Similar
2 - From Either To Both Trains
3 - Train Specific Signal
4 - Hi Level Override Auto
Clears at 77% [72%]

FIGURE 15

45.

061 A2.01 / AFW / Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Startup of MFW pump during AFW operation

Given the following conditions:

- Unit 2 performing 2-GOP-201, Reactor Plant Startup – Mode 2 to Mode 1
- Unit 2 is at 1% power

In accordance with 2-GOP-201, Which ONE of the following completes the statements below?

Reactor Power is limited to ____(1)____ while feeding with AFW.

WHEN total feedwater flow exceeds 10,000 gpm, THEN PLACE the running Main Feedwater Pump Control Switch in ____(2)____.

A.	(1)	3%
	(2)	RECIRC
B.	(1)	3%
	(2)	AUTO RECIRC
C.	(1)	7%
	(2)	RECIRC
D.	(1)	7%
	(2)	AUTO RECIRC

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: IAW 2-GOP-201, 2.2.18, Reactor Power limit is 3% while feeding with AFW. Part 2 correct: RECIRC is plausible due to that being the required position of the valve for this condition.
B.	Correct:	Part 1 correct: IAW 2-GOP-201, 2.2.18, Reactor Power limit is 3% while feeding with AFW. Part 2 correct: IAW Step 4.7.19, WHEN total feedwater flow exceeds 10,000 gpm, THEN **PLACE** the running Main Feedwater Pump Control Switch in AUTO RECIRC.
C.	Incorrect:	Part 1 incorrect: This is plausible since this is the limit for the ADVs IAW 2-GOP-201, 2.2.1. When maintaining Rx Power with ADVs, Rx power should be maintained less than 7%. Part 2 incorrect: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 correct: See analysis B.

Question Number: 45

Tier: 2 Group: 1

K/A: 061 A2.01 / AFW / Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Startup of MFW pump during AFW operation

Importance Rating: 2.5 2.6

10 CFR Part 55: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the procedural requirements for starting MFW pumps during AFW operation

Technical Reference: 2-GOP-201

Proposed references to be provided: None

Learning Objective: PSL OPS 0702301 -17

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

2.2 Limitations (continued)

16. The high initial response exciter is designed to respond to system disturbances too rapid for operator intervention prior to the onset of major equipment damage. If any voltage excursion was limited and controlled, then the following parameters must be maintained within the following allowable limits:

- Generator amperes: Less than or equal to 31.4 kiloamps per phase
- Generator terminal voltage: 21 KV to 23 KV
- Exciter field amperes: Less than or equal to 460 amps
- 2A3 and 2B3 4.16 KV bus voltage: 3.95 KV to 4.35 KV

17. If a Nuclear Delta T Power Calibration has been performed at a power below a given plateau (30, 45 and 98%), then subsequent calibrations at the higher power plateaus shall be performed. If a calibration is performed below 30% due to Technical Specification surveillance requirements, the calibration shall be performed at 30, 45, and 98%. (Section 7.1.3, Management Directive 3)

18. Reactor power limit is 3% while feeding with auxiliary feedwater system.

4.3 Establishing Feedwater and Steam Bypass Control

NOTE

- If there is **NO** affected main feedwater pump, Section 4.3, Step 1 may be marked N/A.
- If tripping an affected main feedwater pump is **NOT** desired or can **NOT** be accomplished under present plant conditions, Section 4.3, Step 1 may be performed at a later time.

1. IF any main feedwater pump breaker maintenance or breaker control circuit maintenance has been performed since its last manual trip from the RTGB control switch, THEN **ENSURE** it is manually tripped via the RTGB control switch.

CAUTION

Do **NOT** exceed 3% Reactor power while feeding with Auxiliary Feed System.

2. **MAINTAIN** Reactor Power as follows:

- IF AFW is in service, THEN **MAINTAIN** Reactor power between 1% and 3%.
- IF MFW is in service, THEN **MAINTAIN** Reactor power between 2% and 4%.

NOTE

IF Main Feedwater is already in service to the Steam Generators, THEN Section 4.3, Step 3 thru Section 4.3, Step 5may be marked N/A.

3. **START** one main feedwater pump per 2-NOP-09.01, Main Feedwater System Operation.

4. **ENSURE** Feedwater and Condensate chemistry is acceptable for feeding steam generators with Main Feedwater.

Date / Time: _____ / _____

_____
CHEM

4.7 Raising Reactor Power to 45% (continued)

15. WHEN TCW System total flow exceeds 2,000 gpm, THEN **PERFORM** the following: (TGB/24/22/K)

A. **RECORD** TCW heat exchanger total flow: _____ NPO

- FR-13-50A, FIT-13-50A + B TOTAL FLOW

  _____ gpm

- FR-13-50B, FIT-13-50B + A TOTAL FLOW

  _____ gpm

B. IF 2A TCW Pump is aligned as the standby pump, THEN **ENSURE** CS-1/825, TCW STANDBY PUMP CONTROL SWITCH, is in the TCW PP A position. _____ NPO

C. IF 2B TCW Pump is aligned as the standby pump, THEN **ENSURE** CS-1/825, TCW STANDBY PUMP CONTROL SWITCH, is in the TCW PP B position. _____ NPO

16. WHEN Calorimetric power is greater than 30%, THEN **INITIATE** MSR warmup per Attachment 3, Section 3.0.

17. IF available, THEN **ENSURE** second main feed pump is ready to start per 2-NOP-09.01, Main Feedwater System Operation.

18. WHEN Calorimetric power is greater than 32%, THEN **INITIATE** placing MSRs in service per Attachment 3, Section 4.0.

NOTE

Total feedwater flow is the flow that the Main Feedwater Pump is producing with the recirc valve OPEN.

19. WHEN total feedwater flow exceeds 10,000 gpm, THEN **PLACE** the running Main Feedwater Pump Control Switch in AUTO RECIRC.

20. **VERIFY** the associated Disch Recirc Valve is CLOSED.

21. WHEN Reactor power reaches 45%, as indicated on highest reading instrument, THEN **STOP** power ascension.

2.1 Precautions (continued)

10. When placing the main turbine into service following a refueling outage and the magnitude of the moderator temperature coefficient of reactivity is small (in the range of +1 to -1 pcm/°F), additional rod motion may be required to maintain RCS temperature immediately following closing of the generator output breaker.

2.2 Limitations

1. Maintaining S/G levels at low power requires close monitoring. Several factors should be considered:

- When maintaining Reactor power with ADVs, Reactor power should be maintained less than 7%.
- S/G blowdown may affect the ability to maintain S/G levels.
- If controlling one ADV in automatic and one ADV in manual, attempt to maintain the manual ADV controller balanced with the automatic ADV controller.
- Main Feedwater should be placed in service when Reactor power is between 2 to 4%.

2. A 1% change in S/G wide range level is approximately equal to a 5% change in S/G narrow range level.

3. S/G wide range level indication will lead narrow range level indication by approximately 30 seconds to two minutes as feedwater flow to the steam generator changes.

- Wide range level should be used as a predictor in determining the need for changes in feedwater flow while feedwater regulating valves or bypass valves are in manual.
- If narrow range level is falling but wide range level is stable or increasing, feedwater flow to the S/G should **NOT** be raised until narrow range level has begun to rise.
- If S/G narrow range level is used as the only level trend indication, an overfeed condition could occur, and a feedwater isolation or turbine trip on high S/G level is extremely likely.

4. Operation of one TCW pump with two TCW heat exchangers in service is acceptable provided pump flow is maintained less than 6,500 gpm (total flow of both TCW heat exchanges).

46.

062 K4.03 / AC Electrical Distribution / Knowledge of ac distribution system design feature(s) and/or interlock(s) which provide for the following: Interlocks between automatic bus transfer and breakers

Given the following conditions:

- Unit 1 is at 100% power

Subsequently:

- An automatic reactor trip occurs

Which ONE of the following completes the following statements below?

The automatic bus transfer signal which transfers power from the Aux Transformers to the Startup Transformers is generated from the ____(1)____ signal.

This automatic bus transfer is considered a ____(2)____ bus transfer.

A.	(1)	Ovation Drops 2 and 52
	(2)	Live
B.	(1)	Ovation Drops 2 and 52
	(2)	Dead
C.	(1)	Generator Lockout
	(2)	Live
D.	(1)	Generator Lockout
	(2)	Dead

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: It is plausible that the applicant has a misconception that the Ovation Drops Drop 2/52: Emergency Trip System primary and backup process controllers signal is the input to the Automatic Bus Transfer due to the various Ovation signals that control numerous trip functions. Part 2 incorrect: It is plausible that the applicant has a misconception that the ABT is a live transfer since the switchyard still has voltage.
B.	Incorrect:	Part 1 incorrect: See analysis A Part 2 correct: See analysis D.
C.	Incorrect:	Part 1 correct: See analysis D Part 2 correct: See analysis A.
D.	Correct:	The Generator primary lockout is an interlock associated with the automatic bus transfer from the Aux Transformers to the Startup Transformers on a Rx/Turbine trip. The turbine trip (caused by TDM-1 &2) trips the turbine and causes a Generator Lockout. It is the generator lockout signal that directly generates the fast – dead bus transfer. The type of transfer is “DEAD BUS” transfer because on generator lockout, the Aux Transformer breakers open causing a dead bus momentarily and if the Startup Transformer breaker doesn’t close in.17 seconds, the Startup breakers are locked out and the bus remains de-energized.

Question Number: 46

Tier: 2 Group: 1

K/A: 062 K4.03 / AC Electrical Distribution / Knowledge of ac distribution system design feature(s) and/or interlock(s) which provide for the following: Interlocks between automatic bus transfer and breakers

Importance Rating: 2.8 3.1

10 CFR Part 55: (CFR: 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the interlock between ac distribution and ABT

Technical Reference: 0711307, Main Generator.
0711409, DEH

Proposed references to be provided: None

Learning Objective: PSL OPS 0702307-13.c

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

GENERATOR RELAYING PROTECTION

Generator relaying protection avoids mechanical and electrical damage to the generator by tripping the generator whenever there is evidence of a disruption in supply of power (reactor or turbine trip), load (a transmission failure), or internal trouble (short, faults, loss of cooling, etc.). The generator protection system trips the generator and associated breakers for faults that may result in abnormally high currents flowing through the windings of the generator, main transformers, auxiliary transformer or the generator breakers.

The generator trips are accomplished via the generator primary lockout relay, Figure 19 and/or the generator backup (secondary) lockout relay, refer to Figure 20. If reactor power is > 15% power when a turbine generator trip occurs, a loss-of-load reactor trip is initiated. (For more information see 0711404 Reactor Protection System.)

Actuation of the PRIMARY or BACKUP (SECONDARY) lockout relay performs the following automatic actions:

- Trips both generator MID and EAST OUTPUT breakers.
- Trips the generator exciter field breaker.
- Trips the turbine by de-energizing TDM-1 & TDM-2 (Testable Dump Manifold) solenoids
- *Trips the auxiliary transformer 4160 & 6900 VAC bus supply breakers.
- *Closes the Startup Transformer 4160 & 6900 VAC bus supply breakers.

** Note the transfer of the 4,160 & 6,900 VAC supply breakers is a fast dead bus transfer.*

GENERATOR RELAYING PROTECTION

– **Primary or Secondary Lockout Relay Automatic Actions (86GP/86GB) (EO-11i) (EO-13c, EO-13d)**

– ***Trips both generator MID and EAST OUTPUT breakers.***

– ***Trips the generator Exciter Field Breaker.***

– ***Trips the Auxiliary Transformer 4,160 & 6,900 VAC supply breakers.***

– ***Trips the turbine by de-energizing*** **TDM-1 & TDM-2 (Testable Dump Manifold) solenoids.**

- Closes the Startup Transformer 4,160 & 6,900 VAC supply breakers.

***** Note the transfer of the 4,160 & 6,900 VAC supply breakers is a fast dead bus transfer.***

Turbine Trip Status (EO-13g)

- When the turbine trips, it will also trip the Main Generator via a Primary Lockout.
- This is accomplished by ONE of the following:
  - If steam flow is isolated to the HP turbine, as indicated by Closure of all 4 Throttle Valves, four Generator Trip relay outputs will energize to trip the Generator
    - Closure means:
      - 4 of 4 closed limit switches indicating the TVs are closed or 4 of 4 LVDTs indicating position <5%.
  - 2/3 ET Header Pressures Tripped

ATTACHMENT 12
Drop Information
(Page 1 of 3)

The workstations and controllers are connected through a redundant Fast Ethernet communication network. Each workstation and Ovation controller residing on the network is referred to as a 'Drop".

In the Ovation environment, the term "Drop" is given to any device that is communicating on the network.

The Ovation Control System controllers and workstation drops are summarized below:

- Drop 2/52: Emergency Trip System primary and backup process controllers
- Drop 3/53: Main Turbine Speed and Load Control primary and backup process controllers (called the Operator Automatic / Over - speed Protection Control controller, OA/OPC)
- Drop 180: OPC DataLink and Backup Domain Controller Workstation
- Drop 200: Ovation System Server / Engineer Station / Ovation Process Historian Workstation (called the Combo Server)
- Drop 201: Primary Domain Server
- Drop 210: Operator Workstation
- Drop 211: Operator Workstation
- Drop AVServer: Anti-Virus Server

If DROP 2 or 3 fails and the partner DROP is in BACKUP Mode (YELLOW), then Ovation will fail to its partner DROP (DROP 2 partner is 52 and DROP 3 partner is 53). When an Ovation DROP fails over to the BACKUP DROP, then the system is in Single Failure to Turbine Trip, until the failed DROP is rebooted and indicates BACKUP Mode (YELLOW).

The following Ovation Point IDs can be used to determine DROP status:

TCE_DROP2STAT	DROP2 STATUS MONITOR	ALARM	NORMAL
TCE_DROP52STAT	DROP52 STATUS MONITOR	ALARM	NORMAL
TCE_DROP3STAT	DROP3 STATUS MONITOR	ALARM	NORMAL
TCE_DROP53STAT	DROP53 STATUS MONITOR	ALARM	NORMAL

47.

063 A4.01 / DC Electrical Distribution / Ability to manually operate and/or monitor in the control room: Major breaker and control power fuses

Given the following conditions:

- Unit 2 is at 100% power
- 2A EDG running loaded for its monthly surveillance

Subsequently:

- Annunciator B-56, 2A EMERG D/G Bkr Failure/ Start Inhibit/ SS ISOL ALARMS
- 2A EDG Output breaker indicating lamp is DARK

Which ONE of the following completes the statements below?

The 2A EDG Output Breaker will ____(1)____ and ____(2)____ be operated from the Control Room.

A.	(1)	remain CLOSED
	(2)	can
B.	(1)	remain CLOSED
	(2)	can NOT
C.	(1)	immediately trip OPEN
	(2)	can
D.	(1)	immediately trip OPEN
	(2)	can NOT

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: see analysis “B” Part 2 incorrect: There is no control power so the breaker can not be operated from the CR. It is plausible that the charging spring is still charged so the breaker can be operated locally therefore it may also be operated from the CR.
B.	Correct:	Part 1 correct: This is an indication that the control power fuses for the breaker have blown. With no control power there is no tripping power so the breaker will remain closed. Part 2 correct: There is no control power so the breaker can not be operated from the CR.
C.	Incorrect:	Part 1 incorrect: Since the control power fuse has blown tripping power is not available therefore the breaker will not trip open. It is plausible that the applicant believes the alarm and light out mean the breaker has tripped open. Part 2 correct: see analysis “A”
D.	Incorrect:	Part 1 incorrect: see analysis “C” Part 2 incorrect: see analysis “A”

Question Number: 47

Tier: 2 Group: 1

K/A: 063 A4.01 / DC Electrical Distribution / Ability to manually operate and/or monitor in the control room: Major breaker and control power fuses

Importance Rating: 2.8 3.1

10 CFR Part 55: (CFR: 41.7 / 45.5 to 45.8)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required monitor and operate form the CR major breakers during a loss of DC power

Technical Reference: 2-ARP-01-B56

Proposed references to be provided: None

Learning Objective: PSL OPS 0702502-05

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

CAUSES: Any of the following:

- SS/953 in ISOLATE
- SS/954 in ISOLATE
- Breaker spring **NOT** charged within 7 sec of opening or loss of BKR closing power
- Low SF_6 gas pressure

2A EMERG D/G BKR FAILURE/ START INHIBIT/ SS ISOL

B-56

DEVICE:	SETPOINT:	LOCATION:
SS/953	SS/953 in ISOLATE	4.16KV SWGR 2A3 Cubicle 11, 2-20211
SS/954	SS/954 in ISOLATE	4.16KV SWGR 2A3 Cubicle 11, 2-20211
52b/1801	Breaker Open	125V DC Bus 2AA Ckt 7, 2-61107
74-2/953	De-energized	4.16KV SWGR 2A3 Cubicle 11, 2-20211

ALARM CONFIRMATION

1. SS/953 or SS/954 selected to ISOLATE.
2. Loss of amber breaker permissive indication at 4.16KV SWGR 2A3 Cubicle 11, 2-20211.
3. Local Gas Pressure amber LED on breaker is OFF.
4. Breaker position indicating lights for 2-20211, DG 4.16KV BREAKER (2A), are NOT LIT.

OPERATOR ACTIONS

NOTE

The amber lamp on the switchgear door being OFF is caused by the closing springs **NOT** being charged or by low SF_6 gas pressure of 34.3 psig. The amber Gas Pressure LED on the breaker will be OFF if any of the three SF_6 gas bottles reach a low-low pressure of 28.6 psig. If both the amber LED and the amber lamp are OFF, the cause is most likely a low-low gas pressure and the breaker must be replaced. If the amber LED on the breaker is ON but the amber lamp on the door is OFF, the cause either the charging spring motor, charging spring motor limit switch, or low gas pressure on one or more SF_6 bottles.

1. IF alarm due to **ENSURE** SS/953 and SS/954 in ISOL AND these are **NOT** required to be in ISOL position, THEN **RETURN** SS to NORM.
2. IF 4.16 KV SWGR 2A3 is de-energized, THEN **IMPLEMENT** 2-AOP-47.01A, Loss of a Safety Related AC Bus -Train A.
3. IF 2-61107, 2A BATTERY BUS TIE, is OPEN, THEN **CLOSE** for one attempt only.
4. IF both the Gas Pressure amber LED AND amber light are OFF, THEN **PERFORM** the following:
   A. **ENSURE** DC control power is supplied from 2-60116, 4.16 KV SWGR 2A3 DC CONTROL POWER. (125 VDC Bus 2A)
   B. **ENSURE** fuses are functional.
   C. IF DC control power is available, THEN **REQUEST** EM replace the circuit breaker due to low-low SF6 gas pressure.
5. IF breaker permissive amber light is OFF, THEN **PERFORM** the following:
   A. **ENSURE** DC control power is supplied from 2-60116, 4.16 KV SWGR 2A3 DC CONTROL POWER.
   B. **REQUEST** EM Department to verify fuses are functional.
   C. **VERIFY** breaker spring charges and amber light turns ON.
   D. IF breaker spring fails to charge, THEN **NOTIFY** EM Department.
6. **REVIEW** Technical Specifications for any required actions.

REFERENCES: 1. CWD 2998-B-327 sheet 953, 931, 954, 1801

Unit Numbering System

The unit numbering system is a numeric system that establishes a 5-digit code for each breaker. As an example, 4.16 kV bus 1A3 feeder breaker 20210 will be used.

202	10
Bus Code	Breaker Number

The first three-digit code is the Bus code and refers to the bus the breaker is physically located on as per the following partial list:

BUS	CODE
4.16 kV 1A2	201
4.16 kV 1A3	202
4.16 kV 1AB	205
6.9 kV 1A1	301
6.9 kV 1B1	302
480V LC 1A1	401
480V LC 1A2	402
480V MCC 1A1	408
480V MCC 1A2	409

The breaker number is the number assigned to that breaker as numbered on its associated bus. Using this system, breaker 20210 is breaker number 10 on the 1A3 4.16 kV Bus. Unit 2 uses the same breaker numbering scheme with a "2-" preceding each breaker number.

Breaker Operation

All major breakers in the 6.9 kV and 4.16 kV switchgear and 480V load centers have a control circuit and components that operate together to close and open the main breaker contacts. These controls are electrically powered from the Unit's 125 VDC buses. Loss of DC control power, therefore would result in loss of breaker control.

- 125 VDC AB Bus supplies control power to the AB 4.16 kV Bus and the AB 480V Load Centers.
- 125 VDC A Bus supplies all ‘A’ side 6.9/4.16 kV and 480V Buses.
- 125 VDC B Bus supplies all ‘B’ side 6.9/4.16 kV and 480V Buses.

- 125 VDC 1C or 2C Bus supplies control power to the 2A4 and 2B4 4.16 kV Buses. Transfer from the normal source (2C) to the alternate source (1C) is done with a manual break-before-make switch. A loss of DC power to 2A4 or 2B4 will not cause any breaker actuation; however, the bus will be without lockout relay protection.

There are four indicating lights located on the front of each 6.9/4.16 kV breaker; white, amber, red and green. They indicate the following (see NOP-53.01, *6900V and 4160V Breaker Operation* for specifics):

- The **White** light is the ground indication light. If this light is extinguished, a ground is present or the light bulb is burned out.
- The **Green** light indicates that 125 VDC control (trip) power is available and the breaker is open.
- The **Red** light indicates that 125 VDC control (trip) power is available, there is trip path continuity, and the breaker is closed.

- The **Amber** light indicates that the breaker's closing spring is charged. (Additionally on SF_6 breakers, the amber light also indicates SF_6 gas pressure is > 34.3 psig.)

The breaker contacts are tripped open by large trip springs. The springs are charged by DC motors. All breakers are operated by trip coils.

The main power distribution system 6.9/4.16 kV breakers must be racked out occasionally for maintenance and testing. Reference the 6900V and 4160V Breaker Operation Procedure. This procedure also contains minor troubleshooting guidance.

Figures 15 through 37 are schematic diagrams of major system breakers. Use the following guidance for drawing interpretation:

Most of these breakers have a NORMAL/ISOLATE switch.

- NORMAL position indicates control of the breaker has been transferred to another station besides local, usually the RTGB.

- ISOLATE position signifies that the breaker control is at the breaker itself and/or at a local control station such as the Hot Shutdown Panel.

48.

063 K1.03 / DC Electrical Distribution / Knowledge of the physical connections and/or cause effect relationships between the DC electrical system and the following systems: Battery charger and battery

Given the following conditions:

- Unit 1 is at 100% power
- 1AA Battery Charger is out of service
- 1A DC Bus voltage is 135 Vdc

Subsequently:

- The 1A Battery Charger is lost

Which ONE of the following completes the statements below?

1A DC Bus Voltage ____(1)____ lower IMMEDIATELY following the 1A battery charger trip.

The ____(2)____ can be aligned to the 1A Battery to maintain compliance with TS 3.8.2.3, D.C. Distribution Operating?

A.	(1)	will
	(2)	1AB battery charger ONLY
B.	(1)	will
	(2)	1AB, 1C or 1D battery chargers
C.	(1)	will NOT
	(2)	1AB battery charger ONLY
D.	(1)	will NOT
	(2)	1AB, 1C or 1D battery chargers

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: Bus voltage will immediately lower to battery terminal voltage on the loss of the charge. The Battery Charger normal output, to maintain a float charge, is 132-135Vdc. When the charger is lost, the float charge is no longer maintained and the bus voltage will lower to have the battery maintain DC loads at the battery terminal voltage. Over time, this voltage will continue to lower as the battery charge is diminished. Part 2 correct: When in Modes 1-4, only the 1AB charger can be used in place of the 1A and 1AA battery chargers and maintain compliance with Tech Spec 3.8.2.3.
B.	Incorrect:	Part 1 correct: see analysis "A" Part 2 incorrect: but plausible, 1C and the 1D battery chargers can be aligned to the 1A DC bus. This is normally performed in Modes 5 & 6 and is the 3rd alternate choice per 1-AOP-50.08. The applicant must recognize that if this alignment is made, Tech Spec compliance will not.
C.	Incorrect:	Part 1 incorrect: but plausible. The applicant may have the misconception that voltage will remain constant at the initial loss of the battery and overtime will lose voltage as the battery charge is used by the DC loads. Unit 1 does NOT have indication of battery discharge amps (unit difference) therefore the applicant must understand the indications that occur on a loss of the charger. The battery charger trouble alarm is not a true indicator if the battery charger has been lost. Part 2 correct: see analysis "A"
D.	Incorrect:	Part 1 incorrect: see analysis "C" Part 2 incorrect: see analysis "B"

Question Number: 48

Tier: 2 Group: 1

K/A: 063 K1.03 / DC Electrical Distribution / Knowledge of the physical connections and/or cause effect relationships between the DC electrical system and the following systems: Battery charger and battery

Importance Rating: 2.9 3.5

10 CFR Part 55: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required cause effect relationship between the battery charger and DC electrical bus

Technical Reference: 1-AOP-50.01A

Proposed references to be provided: None

Learning Objective: PSL OPS 0702503 - 7

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

and 137.5 VDC. Maximum charger output current is 345 amps. The minimum Tech Spec voltage is 129 VDC for the safety related battery buses.

Specific operating instructions are found in 1[2]-0960020, Vital 125V DC System Normal Operation and 1[2]-0960022, Non-Vital 125V DC System Normal Operation.

ABNORMAL OPERATIONS

For the A and B buses, if the either of the normally paralleled chargers fail, the other charger will pick-up the additional load. If all chargers to a DC bus fail, the battery continues to supply power. While on the battery, the voltage for a bus, or buses, tied to the battery will drop over time. The rate at which voltage drops is dependent upon the loads connected to the bus, condition of the battery, and other factors such as number and severity of grounds. DC operated components will begin to fail to function as voltage drops. This can cause equipment to prematurely operate or fail to operate when needed. To ensure the highest level of reliability, plant personnel perform various surveillances checking the condition of the 125 VDC system. These surveillances include checking specific gravity and electrolyte level of the cells, checking for grounds, and capacity discharge test.

GROUNDS

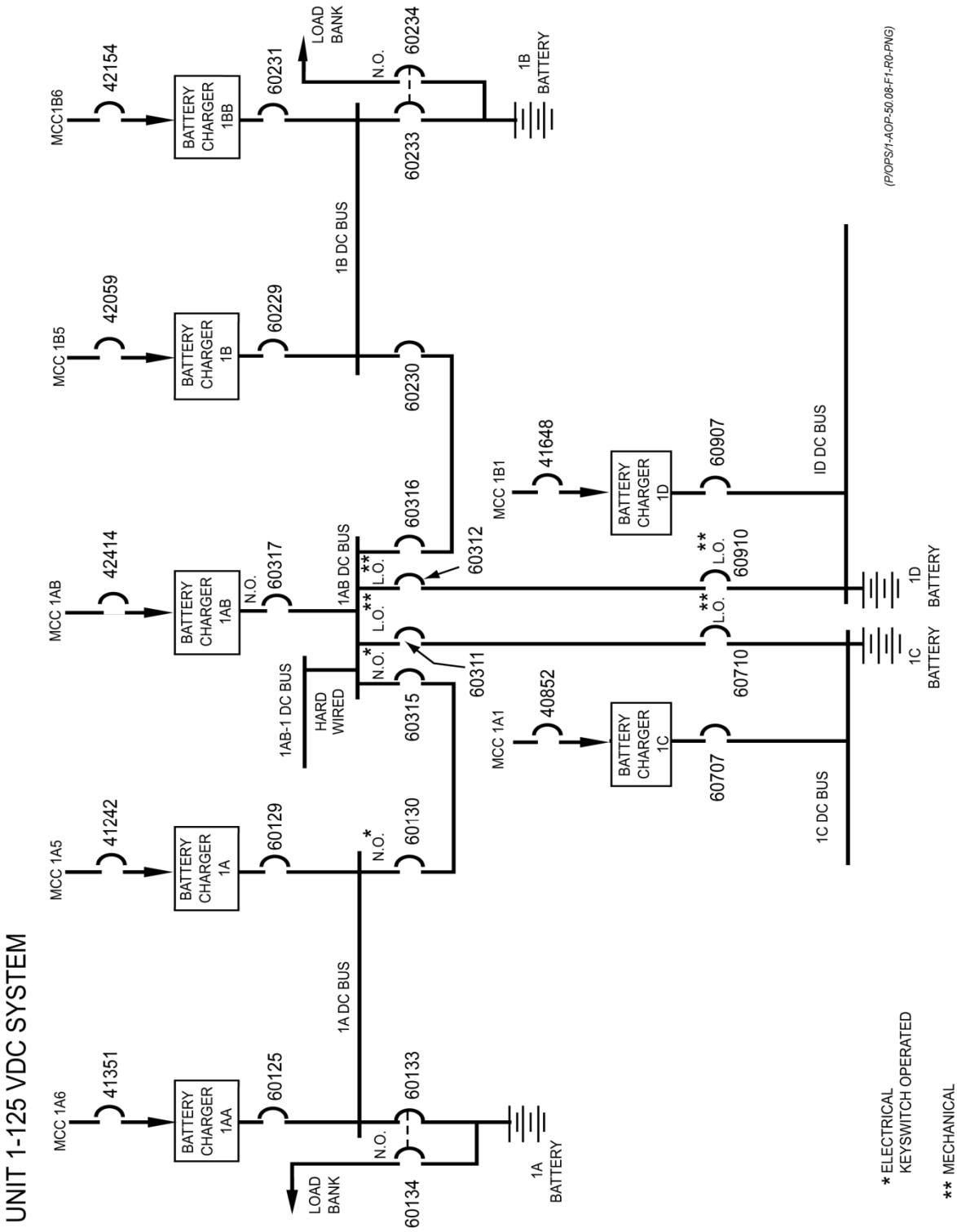
The 125 VDC system is capable of sustaining a full ground on either the positive or negative side of the system. If a ground subsequently developed on both the positive and negative sides of the system, a short circuit is developed causing protection devices (fuses or breakers) to isolate the affected portion of the system. This renders all components down stream of the protection devices inoperable.

DC grounds are of special concern in the control circuits for large (4160 & 6900V) breakers. The ability to remotely control the breaker or its automatic control functions, including protective trips, could be lost. For this reason, locating and isolating grounds must be performed promptly.

Abnormal procedures provide detailed instructions for locating and isolating DC grounds. The process involves systematically isolating portions of the 125 VDC distribution system while observing ground indications. This is accomplished by pulling fuses or opening switches and breakers. Once identified, corrective maintenance is performed. It should be noted that while the portion of the DC distribution system is isolated, all associated equipment using DC is inoperable. In cases where the DC is preventing actuation (undervoltage relays), loss of DC causes actuation of those components.

For details, refer to 1[2]-AOP-50.01, 125V DC Ground Diagnostic and 1[2]-AOP-50.02 through 50.06, 125V DC Bus Ground Isolation.

ATTACHMENT 2
Simplified One-Line Diagram of 125V DC System
(Page 1 of 1)



INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.1 General Actions (continued)

☐ **2.** **MARK** OOS battery chargers with an X in OOS column and **CIRCLE** alternate battery charger of choice for affected DC bus per Table 1:

Table 1
Alternate Battery Charger Assessment

		Normal Battery Chargers			Alternate Battery Chargers		
Battery	**DC Bus**	**Battery Charger AC Supply**	**Battery Charger**	**Battery Charger OOS (✖)**	**1st**	**2nd**	**3rd**
A	1A	MCC-1A5	1A		1AA	1AB	1C or 1D
		MCC-1A6	1AA		1A		
B	1B	MCC-1B5	1B		1BB	1AB	1D or 1C
		MCC-1B6	1BB		1B		
N/A	1AB	MCC-1AB	1AB		N/A	N/A	N/A
C	1C	MCC-1A1	1C		1AB	1A or 1AA	1B or 1BB
D	1D	MCC-1B1	1D		1AB	1B or 1BB	1A or 1AA

ELECTRICAL POWER SYSTEMS

D.C. DISTRIBUTION - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.3 As a minimum the following D.C. electrical sources shall be OPERABLE:

a. 125-volt D.C. bus No. 1A, 125-volt Battery bank No. 1A and a full capacity charger.

b. 125-volt D.C. bus No. 1B, 125-volt Battery bank No. 1B and a full capacity charger.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one of the required battery banks or busses inoperable, restore the inoperable battery bank or bus to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

b. With one of the required full capacity chargers inoperable, demonstrate the OPERABILITY of its associated battery banks by performing Surveillance Requirement 4.8.2.3.2.a.1 within 1 hour, and at least once per 8 hours thereafter. If any Category A limit in Table 4.8-2 is not met, declare the battery inoperable.

SURVEILLANCE REQUIREMENTS

4.8.2.3.1 Each D.C. bus train shall be determined OPERABLE and energized in accordance with the Surveillance Frequency Control Program by verifying indicated power availability.

4.8.2.3.2 Each 125-volt battery bank and charger shall be demonstrated OPERABLE:

a. In accordance with the Surveillance Frequency Control Program by verifying that:

1. The parameters in Table 4.8-2 meet the Category A limits, and

2. The total battery terminal voltage is greater than or equal to 129-volts on float charge.

5.4 Remove Battery Bank From DC Bus 1A (Alternate Power Supply Alignment)

NOTE

[Section 7.2 Commitment 2]

- In Modes 1-4, this alignment is only permissible for up to 2 hours maximum. Otherwise be in HOT STANDBY in the following 6 hours and in COLD SHUTDOWN within the following 30 hours.
- In Modes 5 and 6, at least 1 vital DC bus must be powered from its associated battery bank and charger; otherwise containment integrity must be established within 8 hours.

NOTE

- 125 VDC Bus 1AB is currently labeled as 1AB-D.C.-SWGR PANEL "1AB"
- 125 VDC Bus 1A is currently labeled as 1A-D.C.-SWGR PANEL "1A"

CAUTION

[Section 7.2 Commitment 3]

- Use of this configuration will require placing 125 VDC Bus 1A out of service and making an applicable log entry per ADM-09.22, Equipment Out Of Service.
- Parallel operation of two station batteries should be minimized.

1. **ENSURE** 125 VDC Bus 1AB is aligned to 125 VDC Bus 1A per 1-NOP-50.01AB, 125 VDC Bus 1AB (Class 1E) Normal Operation.

2. **VERIFY** selected non-vital Battery is capable of supporting cross-tie operations.

EM

3. **ENSURE** only one battery charger is supplying 125V DC Bus 1A.

4. **VERIFY** inservice battery charger output is less than 315 amps.

49. 064 K6.07 / EDG / Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: Air Receivers

Given the following conditions:

- Unit 2 SNPO Reports the following local alarm on the 2A Emergency Diesel Generator (EDG), Annunciator 5-1, Starting Air Pressure Low
- A relief valve failed open and reseated on the two Air Receiver Tanks with the following pressures being reported

2A1	2A2	2A3	2A4
100 psig	105 psig	75 psig	80 psig

Which ONE of the following completes the statements below?

The 2A EDG ____(1)____ start if required.

To restore the 2A EDG to an OPERABLE status, ____(2)____ of the 4 air receivers must be above the MINIMUM air pressure for EDG OPERABILITY.

A.	(1)	will
	(2)	2
B.	(1)	will
	(2)	4
C.	(1)	will NOT
	(2)	2
D.	(1)	will NOT
	(2)	4

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: The Air Start system is redundant, only two receivers are required to start a cold EDG at least 5 times. Minimum Operability requirements are at least TWO of the FOUR Air Receiver tanks above 129 psig. Part 2 correct: There are a total of 4 air start motors only two are required for a start. 85 psig is the minimum air pressure assumed to successfully start an EDG and is a design sizing criteria
B.	Incorrect:	Part 1 correct: See analysis A Part 2 incorrect, but plausible. The applicant may have the misconception that all four are required for operability, but not for start capability, and this would accommodate defense in depth for single failure criterion.
C.	Incorrect:	Part 1 incorrect but plausible. The applicant may have the misconception that 129psig is the minimum pressure for operability and start capability. 129 psig is the minimum air pressure for EDG operability. Part 2 incorrect: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 correct: See analysis B.

.

Question Number: 49

Tier: 2 Group: 1

K/A: 064 K6.07 / EDG / Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: Air Receivers

Importance Rating: 2.7 2.9

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required know how a loss of the air receivers will effect the EDG system

Technical Reference: 2-ARP-06-A(5-1)
2-OSP-59.01A 2A EDG Monthly Surveillance.
0711501, EDG

Proposed references to be provided: None

Learning Objective: PSL OPS 0702501-15

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	X
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

The after-cooler, filters and air dryers are seismically supported, and upon failure will not hinder operation of the air starting system.

Receivers

Four receivers are arranged into two sets of two for redundancy.

- 32 [36] cubic-foot capacity, each receiver.

Two receivers store enough air for starting a cold EDG at least 5 times. (Design sizing boxes)

- Cold EDG defined as at standby, with 85°F Oil & 125°F Water.

The 5 start capacity is based on initial minimum required operability pressure of 135 [129] psig. This assumes 50 scfm used per start during a 2-second duration start.

- **85 psig is the minimum air pressure assumed to successfully start an EDG and is a design sizing criteria.**

DIESEL OWNER'S GROUP IS TO ISSUE STATEMENT THAT 5-START CAPABILITY IS FOR DESIGN SIZING AND NOT REGULATORY CONCERN!

Two receivers independently supply air for two parallel air motors on one side of each of the 12- and 16-cylinder engines (four total). The other two receivers supply air to the other side of the engines for redundancy. A manual cross-connect (normally locked closed) allows any receiver pair to supply all eight air start motors, if necessary.

Four air distribution headers with four solenoid operated admittance valves (two per group of two receivers) provide redundancy in the event of air receiver failure.

Each receiver has a 0 to 300 psig pressure gauge, a low pressure **alarm** (170 [140] psig), and a pressure relief valve (205 psig). The alarm sounds locally on the EDG control panel and in the control room. [Unit 2 has a pressure switch at the inlet to each solenoid valve. At 110 psig, it generates an **alarm** on the local EDG control panel.]

(Unit 1 and 2 auto start pressure switches (180 [150] psig) were discussed with the electric compressor. Must ALL be > 200 psig for compressor auto stop.)

2.2 Limitations

1. Turbocharger and soakback lube oil flow are vital during EDG starts. If either engine has **NO** turbocharger oil flow (both the AC and associated DC lube oil pumps are off), or **NO** soakback lube oil flow, or **NO** lube oil flow at all, then that EDG should be disabled from automatic starting until turbocharger and soakback lube oil flow are restored.

- In an emergency with either **NO** turbocharger lube oil flow, **NO** soakback lube oil flow, or **NO** lube oil flow at all, and **NO** other power source available to the vital buses of that unit, then the EDG should be idle started and warmed up for two minutes before going to rated speed and being released for service.

2. The following lube oil temperature limits as indicated by calibrated pyrometer or TI-59-002A and TI-59-006A, lube oil cooler oil outlet temperatures, apply (Section 8.1.3, Management Directive 2):

- If engine oil temperature decreases to less than 90°F as determined by calibrated pyrometer, the EDG should be idle started (450 rpm) for warmup and the standby heaters operation verified.
- The EDG is inoperable if oil temperature is less than 85°F.
- A planned fast start of the EDG shall **NOT** be performed if oil temperature is less than 85°F.
- Starting the EDG with lube oil temperature less than 65°F may result in serious damage to the EDG. The EDG should be disabled from automatic starting until temperatures are restored to above 65°F.
- In an emergency with lube oil temperature less than 65°F and **NO** other power source available to the vital buses of that unit, the EDG should be idle started and warmed up for two minutes before going to rated speed and being released for service.

3. 2A EDG has an enhanced soakback oil system. As long as the oil gallery lower sight glass is full of oil, the engine bearings are pre-lubed and there is **NO** restriction on repeated starts of the engines.

4. Minimum design starting air pressure is 129 psig.

CAUSES: Any of the following:

- Electric air compressor failure to start due to:
  - misaligned or malfunctioning air receiver pressure switches
  - power supply problem
- Improper air dryer operation
- Air leak in excess of air compressor capacity
- Plugged air start strainer
- System valve misalignment
- Instrumentation malfunction

Other Considerations:

- PS-59-035A thru 038A start the S/U Electric Air Compressor at 150 psig and stop the compressor at 200 psig.

STARTING AIR PRESS LOW

5-1

DEVICE:	SETPOINT:	LOCATION:
PS-59-031A	140 psig lowering (low)	2A1 S/U Air Tank
PS-59-032A	140 psig lowering (low)	2A2 S/U Air Tank
PS-59-033A	140 psig lowering (low)	2A3 S/U Air Tank
PS-59-034A	140 psig lowering (low)	2A4 S/U Air Tank
PS-59-014A	110 psig lowering (low)	Engine 2A1 - North Side
PS-59-015A	110 psig lowering (low)	Engine 2A1 - South Side
PS-59-029A	110 psig lowering (low)	Engine 2A2 - North Side
PS-59-030A	110 psig lowering (low)	Engine 2A2 - South Side

ALARM CONFIRMATION

1. Any S/U Air Tank pressure indicator (PI-59-009A through PI-59-012A) indicates less than or equal to 140 psig.

OPERATOR ACTIONS

NOTE

For 2A EDG operability, 2A1 and 2A2, S/U Air Tanks, OR 2A3 and 2A4, S/U Air Tanks, shall be greater than 129 psig WITH V59082, Pressure Equalizing Valve for Start Up Air to Diesel Eng 2A1 and 2A2, CLOSED, for the EDG to be operable.

1. **NOTIFY** the Control Room of the alarmed condition.
2. IF S/U Air Tanks indicate less than or equal to 150 psig, THEN **PERFORM** the following:
   A. **VERIFY** 2A S/U Electric Air Compressor ON.
   B. **INSPECT** the area for significant air leakage.
   C. **ENSURE** the following pressure switches are in service:
      - PS-59-035A, Pressure Switch For S/U Air Tank 2A1/Air Compressor Control
      - PS-59-036A, Pressure Switch For S/U Air Tank 2A2/Air Compressor Control
      - PS-59-037A, Pressure Switch For S/U Air Tank 2A3/Air Compressor Control
      - PS-59-038A, Pressure Switch For S/U Air Tank 2A4/Air Compressor Control
   D. IF 2A S/U Electric Air Compressor is OFF, THEN **PERFORM** the following:
      (1) **VERIFY** MCC-2A7, Bkr 2-41412, Air Compressor Motor 2A, CLOSED.
      (2) **VERIFY** MCC-2A7, Bkr 2-41406, Reg. Guide 1.75 Isolation Compt. for 30ATEC Bkr & 480V Receptacles 2004 & 2005 and 2A Air Compressor, CLOSED.
      (3) **PRESS** the Thermal Overload RESET button.
      (4) **ENSURE** the control power fuse is checked and replaced as necessary.
      (5) **VERIFY** 2A EDG Air Start System alignment per 2-NOP-59.01A, 2A Emergency Diesel Generator Standby Lineup.
3. IF starting air system minimum requirement is **NOT** met: 2A1 and 2A2, S/U Air Tanks, OR 2A3 and 2A4, S/U Air Tanks, shall be greater than 129 psig, THEN **DECLARE** EDG 2A out of service.

REFERENCES:

1. CWD 2998-B-327 sheets 960, 1119 and 1609
2. P&ID 2998-G-096 sheet 1C

50.

073 A1.01 / Process Radiation Monitoring / Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRM system controls including: Radiation Levels

Given the following conditions:

- BOTH Units are at 100% power

Subsequently:

- The Unit 2 in-service waste gas decay tank ruptures during a gas release
- RC-26-61, Control Room Outside Air Int (North OAI Radiation Monitor) high alarm actuates

Which ONE of the following completes the statements below?

____(1)____ control room ventilation system(s) will transfer to recirculation mode.

____(2)____ CROAI intake duct(s) isolate(s).

A.	(1)	BOTH Units
	(2)	ONLY the NORTH
B.	(1)	BOTH Units
	(2)	BOTH the NORTH and SOUTH
C.	(1)	ONLY the Unit 2
	(2)	ONLY the NORTH
D.	(1)	ONLY the Unit 2
	(2)	BOTH the NORTH and SOUTH

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: This is plausible since a CIAS will place both Units ventilation systems in recirculation where RC-26-21, in high alarm will ONLY result in the affected Unit going to recirc. Part 2 incorrect: but plausible. If the applicant has the misconception that the North OAI rad monitor impacts only the North outside air intake. When this Rad Monitor actuates, it actuates the "A" train. This isolates the both "A" train OAI valves, one in each intake header.
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 correct: This isolates the both "A" train OAI valves, one in each intake header.
C.	Incorrect:	Part 1 correct: See analysis D. Part 2 incorrect: See analysis A
D.	Correct:	Part 1 correct: RC-26-21, in high alarm will ONLY result in the affected Unit 2 control room ventilation transferring to recirc. Part 2 correct: This isolates the both "A" train OAI valves, one in each intake header.

Question Number: 50

Tier: 2 Group: 1

K/A: 073 A1.01 / Process Radiation Monitoring / Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRM system controls including: Radiation Levels

Importance Rating: 3.2 3.5

10 CFR Part 55: (CFR: 41.5 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the PRM system and radiation levels impact on the system.

Technical Reference: PSL OPS 0711411

Proposed references to be provided: None

Learning Objective: PSL OPS 0702411-5

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

GENERAL DESCRIPTION

During normal operation, three redundant 50% capacity split system units (HVA-3A, B & C) air condition the control room and TSC. Two units are normally running with the third unit in a standby status available for manual actuation in the event of a failure of one of the operating units. Air from the Control Room and Technical Support Center is circulated through the air conditioning units and returned to the Control Room, Technical Support Center, and other areas as indicated on Figure 1. Outside makeup air is drawn in through two Outside Air Intakes (OAI) located on the north and south walls of the Reactor Auxiliary Building at elevation 78'9". During normal operation, the fresh air makeup is less than one air change per hour.

On receipt of a Unit-1 CIS or Unit-2 CIAS, high radiation detected on any Unit 1 Control Room OAI (CROAI) Radiation Monitors, or loss of power to radiation monitors, the Control Room Ventilation System automatically isolates and realigns to a recirculation mode. The booster fans (HVE-13A & B) are automatically started and the charcoal filter train dampers (D-18 & 19) are opened. Both outside air makeup lines are isolated by the closing of redundant valves (FCV-25-14, 15, 16 & 17). The kitchen and toilet exhaust ducts are isolated by redundant valves (FCV-25-24 & 25 and FCV-25-18 & 19). This is to prevent creating a negative pressure inside the Control Room. Part of the control room air is recirculated through the HEPA filter and charcoal adsorbers to provide a self-contained atmosphere in the Control Room. Note that a positive pressure is not maintained in this configuration. Air flow through the units is monitored and loss of flow conditions is annunciated on RTGB-101. The CONTROL ROOM ISOLATION VALVES FAILURE CIS OVERRIDE alarm on RTGB-101, annunciator B-35, indicates that FCV-25-14, 15, 16, 17, 18, 19, 24 or 25 is/are off their open seat, their control switch(es) are in the CLOSE position, or there has been a power failure to one or more of the valves.

The control room filtration system is used during post-LOCA operations to repressurize the Control Room with filtered air. Post-LOCA makeup air flow enters through one of the two air intake lines and passes through the HEPA filter and charcoal adsorbers. Thus, all makeup air is filtered. Control room pressure and intake air flow indication is provided on the back of RTGB 101.

Radiation is monitored in each air intake duct. There are two radiation monitors located in each Outside Air Intake Duct. When the operator needs to open the outside air makeup ducts he can determine which set of OAI isolation valves to open by observing the radiation monitors. The North Outside Air Intake is also provided with temperature switches TS-08-7B1 and TS-16-1A1. In the

Selector Switch in NORMAL

Manual Mode

- Local pushbuttons (START/STOP)
- Control Room HVCB switch

Auto Mode

- Both fans will start on a Unit-1 CIS or Unit-2 CIAS, outside air in High Radiation Signal, or failure of the outside air Radiation Monitor. Note that their associated inlet dampers D-18 and 19 auto open as well.

- Once auto-started, a seal in circuit will maintain the fans running unless manually stopped.

- Since each fan is rated for 100%, one fan can be manually stopped provided the other fan is running (as sensed by the opposite fans flow switch) when the auto start signal is present).

- If the fan that had been manually stopped after an auto-start senses a low flow condition in the other fan's plenum via FS-25 16A/16B, it will restart as long as the CIS/HI RAD/Rad Monitor Failure signal is still present. This is the result of the 'spring return to auto' control switch.

- If a LOOP or a loss of control power occurs, a running fan will stop. When power is restored a time delay relay will delay the fan start for 24 seconds. This design feature is concurrent with the EDG loading sequence.

Annunciators associated with the CREACS are:

- V-11 Motor Overload/SS Isolated
- V-23 Low Flow

Flow switches FS-25-9A & B provide the common CONTROL ROOM EMERG FILTRATION 2HVE-13A/13B LOW FLOW alarm on the HVCB, annunciator V-23, setpoint <597 cfm after a 10-second time delay. This time delay prevents inadvertent annunciation during fan starting. The CONTROL ROOM AIR CONDITIONING COMPRESSOR FAILURE alarms on the HVCB, annunciator W-19 and W-20, provide indication that the air conditioning units have failed.

For accident analysis the control room HVAC system is assumed to be operating in normal mode at the beginning of the event. At 30 seconds, the control room is isolated and recirculation flow is started. At 1.5 hours, filtered makeup flow to the control room is manually initiated which results in a decrease in the recirculation flow. DBA dose analysis assumes that the CRE is isolated; the CREACS fans are

Upon receipt of a Unit-1 CIS or Unit-2 CIAS, an outside air intake radiation monitor high alarm, or upon receipt of a Rad Monitor power failure, the CREACS fans HVE-13A and B automatically start, the outside air intake flow control valves and the kitchen and toilet exhaust flow control valves automatically close, both the CREACS fan and inlet dampers automatically open and 2 of 3 CRAC units start/run. The operator must manually stop the kitchen and toilet exhaust fans. The operator can secure one of the CREACS fans and open one of the outside air intake lines to pressurize the control room. The system now not only maintains the control room atmosphere as previously described in the normal operations sections, but also filters the control room air through HEPA filters and charcoal adsorbers to minimize any airborne radioactivity they may have resulted from the event.

In the event of a CIAS or high radiation signal followed by a loss of off-site power, the outside air intake isolation valves are designed to fail as is and the CREACS fans stop. Outside air is not drawn into the Control Room because the Control Room is pressurized during normal operation and the coasting down fan is discharging against a positive pressure in addition to overcoming ductwork and damper frictional losses. When sequenced onto the diesel generator, the valves automatically close and the CREACS fan is started.

HIGH OAI TEMPERATURE

The NORTH OAI is equipped with temperature switches. On high temperature, the NORTH OAI is isolated due to the auto closure of FCV-25-14/16. This is to protect against an auxiliary steam line rupture.

SMOKE IN OAI

Two smoke detectors are located in the supply ducts. The fire computer will alarm to alert the operators, but there is no automatic action.

AAG-638 & 639. These monitors are powered by 120VAC PPs-246/247 and as such will be available post loss of offsite power (LOOP).

Control Room Outside Air Intake (OAI) Radiation Monitors(RIM-26-61, 62, 65, & 66)

The four (4) control room outside air intake (OAI) monitors are now classified as process monitors on Unit 2 in 2-NOP-26.01 and airborne activity monitors in the FSAR. They are the same as some area monitors in that they have no sample flow path. These 4 monitors are physically located within the ventilation ducts coming into the control room. One set of two RMs are located in the north OAI duct and one set of two are located in the south duct. If activity gets high enough to alarm ¼ monitors, the Control Room Emergency Air Cleanup System (CREACS) will initiate. A full actuation by a monitor from each train (A and B) closes 4 OAI inlet dampers, 4 Toilet and Kitchen dampers, and starts both HVE-13A & 13B filter units to place the Control Room ventilation into recirculation. Actuation of only one detector will only close its train-specific dampers and start its train-specific filter unit and AC unit. Thus, the actuation of only one radiation monitor is just like the actuation of only one train of CIAS, it only actuates its train components. The setpoint for these detectors is $\leq$ 2 x background levels.

Each of the four control OAI monitors utilize two RD-25 beta-gamma scintillation detectors and a remote preamplifier assembly. One of the RD-25s is shielded to monitor only background gamma radiation, while the second RD-25 monitors beta and gamma radiation. The detector outputs are amplified by the pre-amp and sent to the RM-80. Local display and control of the control room OAI monitors is provided in the cable spreading room. RMCS designates these monitors as OAI-501, 502, 503, 521, 522, 523, 511, 512, 513, 531, 532, & 533. These monitors are powered by 120VAC PPs-246/247 and as such will be available post loss of offsite power (LOOP).
The CR OAI monitors are required by Technical Specification 3.3.3.1.

NON-SAFETY-RELATED AREA MONITORS

The 28 non-safety-related area monitors listed in Table 4 have been established in accordance with the location criteria previously noted, are used in their respective areas to perform the functions also stated earlier. Each non-safety-related area monitor

51.

073 K4.01 / Process Rad Monitoring / Knowledge of PRM system design feature(s) and/or interlock(s) which provide for the following: Release termination when radiation exceeds setpoint

Given the following conditions:

- Unit 2 is at 100% power
- A S/G Tube Leak develops on the 2A S/G

Subsequently:

- A S/G Tube Rupture occurs resulting in a SIAS

Which ONE of the following completes the statements below?

When the S/G Blowdown (SGBD) Rad Monitor RS-26-5, goes into HIGH alarm, flow is isolated from ____(1)____.

The SGBD containment isolation valve(s) ____(2)____ be overridden OPEN.

A.	(1)	the 2A S/G ONLY
	(2)	can
B.	(1)	the 2A S/G ONLY
	(2)	can NOT
C.	(1)	BOTH the 2A and 2B S/Gs
	(2)	can
D.	(1)	BOTH the 2A and 2B S/Gs
	(2)	can NOT

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: RM-25-5/6, S/G Blowdown Rad Monitors, will close ONLY their respective S/G blowdown isolation valve. Part 2 correct: These Containment isolation valves can be overridden open. This function is part of the SGTR mitigation strategy for the ruptured S/G cooldown.
B.	Incorrect:	Part 1 correct: See analysis A. Part 2 incorrect: These Containment isolation valves can be overridden open. It is plausible that the applicant believe that SGBD containment isolation valves can NOT be overridden open.
C.	Incorrect:	Part 1 incorrect: RM-25-5/6, when a High Rad condition exists, will close its respective S/G Blowdown and Sample Valves. It is plausible that the applicant believe that one RM will actuate both therefore isolating both S/Gs. Part 2 correct: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 51

Tier: 2 Group: 1

K/A: 073 K4.01 / Process Rad Monitoring / Knowledge of PRM system design feature(s) and/or interlock(s) which provide for the following: Release termination when radiation exceeds setpoint

Importance Rating: 4.0 4.3

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the PRM system design features for release termination

Technical Reference: 2-AOP-08.02

Proposed references to be provided: None

Learning Objective: PSL OPS 0702411-03

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.4 Steam Generator Isolation and Depressurization (continued)

7. (continued)

C. IF high radiation signal has closed 2A steam generator blowdown containment isolation valve,
THEN **PERFORM** the following:

(1) **PLACE** FCV-23-3, Stm Gen 2A Blowdown, in CLOSE / OVRD.

(2) **OPEN** FCV-23-3, Stm Gen 2A Blowdown.

(3) **OPEN** FCV-23-4, Stm Gen 2A Blowdown.

D. IF high radiation signal has closed 2B steam generator blowdown containment isolation valve,
THEN **PERFORM** the following: (RTGB-206)

(1) **PLACE** FCV-23-5, Stm Gen 2B Blowdown, in CLOSE / OVRD.

(2) **OPEN** FCV-23-5, Stm Gen 2B Blowdown.

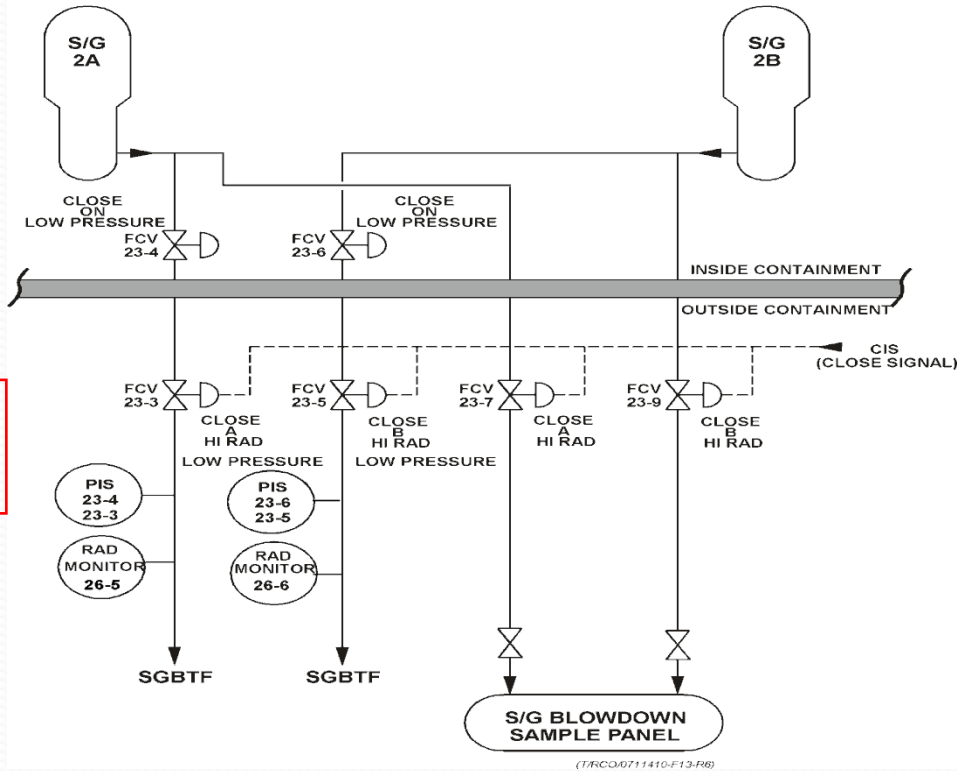
(3) **OPEN** FCV-23-6, Stm Gen 2B Blowdown.

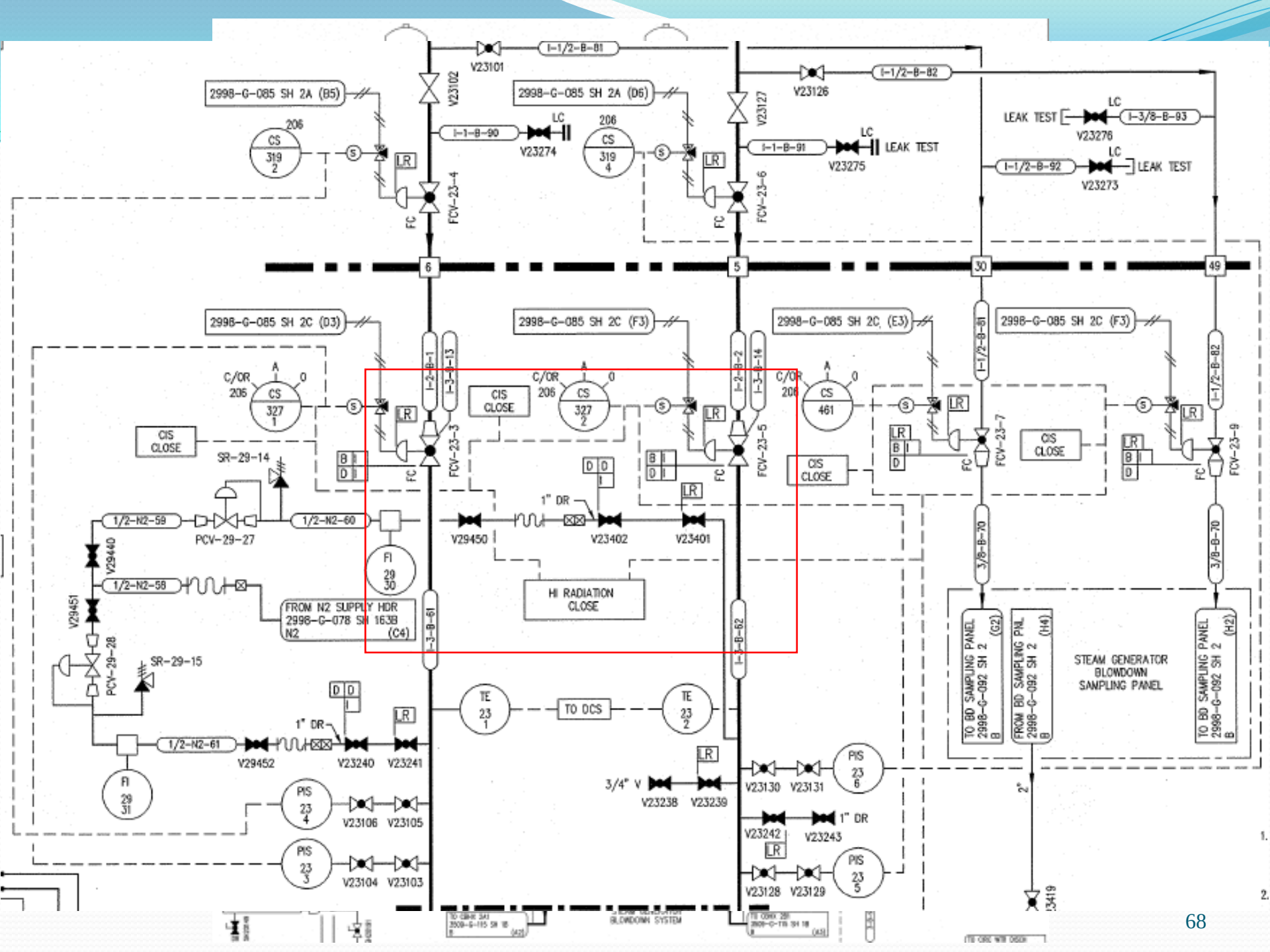
SG Blowdown Monitors RM-26-5, 6 – EO-3, EO-5, EO-12

- Located in the PASS Room
- Gamma sensitive scint detector
- Closes its respective S/G Blowdown and Sample valves on Hi Rad
- ODCM 3.3.3.9, Used in EPIP-01
- On Hi Rad or Loss Sample Flow :
  - Closes 2 BD OC Isolations
  - Closes 2 sample sink isolations.

  (Note : Each RM closes its associated pair of isolation valves 1 OC ,1 sample sink.)

Can override to reopen after auto closure.




2998-G-085 SH 2A (B5)
2998-G-085 SH 2A (D6)
2998-G-085 SH 2C (D3)
2998-G-085 SH 2C (F3)
2998-G-085 SH 2C (E3)
2998-G-085 SH 2C (F3)
V23101
V23102
V23126
V23127
V23274
V23275
V23276
V23273
LEAK TEST
FCV-23-4
FCV-23-6
FCV-23-3
FCV-23-5
FCV-23-7
FCV-23-9
CIS CLOSE
SR-29-14
SR-29-15
PCV-29-27
PCV-29-28
V29440
V29450
V29451
V29452
V23240
V23241
V23401
V23402
1" DR
HI RADIATION CLOSE
FROM N2 SUPPLY HDR 2998-G-078 SH 1638 N2 (C4)
TO DCS
TE 23 1
TE 23 2
PIS 23 4
PIS 23 3
PIS 23 6
PIS 23 5
V23106
V23105
V23104
V23103
V23130
V23131
V23238
V23239
V23242
V23243
V23128
V23129
3/4" V
2"
STEAM GENERATOR BLOWDOWN SAMPLING PANEL
TO BD SAMPLING PANEL 2998-G-092 SH 2 (G2)
FROM BD SAMPLING PNL 2998-G-092 SH 2 (H4)
TO BD SAMPLING PANEL 2998-G-092 SH 2 (H2)
BLOWDOWN SYSTEM

52.

076 A4.02 / Service Water / Ability to manually operate and/or monitor in the control room: SWS Valves

Which ONE of the following completes the statements below?

MV-21-2, Header “B” Isolation Valve (ICW) and MV-21-3, Header “A” Isolation Valve (ICW), ____(1)____ be operated from the Control Room.

To restore Instrument Air with A and B Instrument Air Compressors, MV-21-2 and MV-21-3 ____(2)____.

A.	(1)	can
	(2)	must be OPENED
B.	(1)	can
	(2)	can remain CLOSED
C.	(1)	can NOT
	(2)	must be OPENED
D.	(1)	can NOT
	(2)	can remain CLOSED

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: See analysis B Part 2 incorrect: ICW is the cooling water for TCW which is the normal cooling water supply to the IA compressors. IA compressors A and B are also equipped with a self-contained emergency cooling water system that can be utilized when TCW or ICW is not available. It is plausible that the applicant has a misconception on if IA compressors have an emergency cooling water system or which compressors it is contained on.
B.	Correct:	Part 1 correct: These MOVs can be operated from the control room on RTGB-102/202. Part 2 correct: ICW is the cooling water for TCW which is the normal cooling water supply to the IA compressors. IA compressors A and B are also equipped with a self-contained emergency cooling water system that can be utilized when TCW or ICW is not available.
C.	Incorrect:	Part 1 incorrect: Plausible because HCV-21-7A and B are safety related valves that are closed on a SIAS but cannot be operated from the control room. Part 2 incorrect: See analysis A
D.	Incorrect:	Part 1 incorrect: See analysis C Part 2 incorrect: See analysis B

Question Number: 52

Tier: 2 Group: 1

K/A: 076 A4.02 / Service Water / Ability to manually operate and/or monitor in the control room: SWS Valves

Importance Rating: 2.6 2.6

10 CFR Part 55: (CFR: 41.7 / 45.5 – 8)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how to operate ICW (SWS) valves from the CR

Technical Reference: PSL OPS 0711313

Proposed references to be provided: None

Learning Objective: PSL OPS 07023013 - 4

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

NOTES	LESSON OUTLINE
EO-10 due to the line on Unit 1 not being downstream of MV-21-3(2)	i) Line contains a flow restricting orifice to limit flow in the event of a lube water line break
	b. Non-essential headers
	1) Two (2) headers
	a) Supply cooling water to the following components:
EO-3d & 17b	i) TCW heat exchanger
	(a) Provides heat removal for secondary system components
EO-3e & 17b	ii) SGOBD heat exchanger
	(a) Removes heat from closed blowdown cooling which cools steam generator blowdown to the Steam Generator Blowdown Treatment Facility
Assumes blowdown not required on SGTR, not considered in Chapter 15 of UFSAR.	(b) Not required for safe shutdown of the plant or to mitigate the consequences of an accident
EO-10 Hypochlorite system not used. Aux Hypo is used.	iii) Hypochlorite system [Unit 2 only]
	iv) Lube Water System [Unit 2 only]
	(a) Line taps off common supply header to hypochlorite system allowing isolation of lube water system under accident conditions
	2) Motor-operated header isolation valves
	a) MV-21-2 and MV-21-3
MCC-1[2]A(B)6, A6 for 21-3, B6 for 21-3	i) Emergency powered MOVs
EO-4e, 4f & 17a	b) Close on SIAS
CWD says 40 sec on Unit 1, ARP says 30 no TEDB available. Unit 2 both values agree.	i) 30-second [65] SIAS reset via timing relay
	ii) Allows manual re-initiation of non-essential headers by just opening the valves (Appendix P of EOP-99).
	c) Ensures essential header operability
	d) Valves fail as is


INTAKE COOLING WATER
TURBINE COOLING WATER
MV-21-3 and 2

SUPPORT SYSTEMS

Turbine Cooling Water

Functions

- Cool cylinder heads for compressors A, B, C, D
- Cool intercoolers and after coolers
- Supplies makeup water for Instrument Air Emergency Cooling System

Interface Points

TCW is normally aligned to each compressors cylinder head water jacket as well as to the intercooler and aftercooler heat exchangers associated with the discharge air from the compressors. Reference Figures 2 & 3.

Failure Significance

- Normally C & D IA compressors are selected for operation.
- Loss of TCW results in compressor trip due to high temperature
  - Off-Normal Procedure will align Emergency Cooling System to A & B compressors (A & B compressors cannot use service water)
  - Off-Normal Procedure may direct C & D compressors be aligned for temporary cooling via service water system

Emergency Cooling Water System

Function

Provide a reserve supply of cooling water to the A & B IA compressors on a loss of Turbine Cooling Water (TCW)

Interface Points

The Emergency Cooling Water System is normally isolated via V13417 & V13420 (Reference Figure 3)

Key Components

- Emergency Cooling Water Pump
  - Power: 480V MCC AB

53.

076 K2.01 Service Water / Knowledge of bus power supplies to the following: Service Water

Given the following conditions:

- Unit 1 is at 100% power
- The 1A Intake Cooling Water (ICW) pump was secured due to mechanical problems and placed in the “Pull-To-Lock” position
- The crew entered 1-AOP-21.03A, Intake Cooling Water System Header and has mechanically and electrically aligned the 1C ICW pump to the “A” ICW header and 1A3 4.16kV bus
- The 1C ICW pump was started
- Prior to completing the remaining electrical re-alignment, a Loss of Offsite Power (LOOP) followed by a SIAS occurs

Which ONE of the following describes the ICW system response 10 SECONDS after the Emergency Diesel Generators loaded onto the vital 4.16 kV busses?

A.	No ICW pumps would be running
B.	BOTH the 1B and 1C ICW pumps would be running
C.	The 1B ICW pump would be the only running ICW pump
D.	The 1B ICW pump would be the only running ICW pump however the 1C ICW pump will auto start following a time delay

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	See analysis C. It is plausible that the applicant has a misconception related to the LOOP and SIAS that due to the large load the ICW pumps would place on the EDG that they will not automatically restart.
B.	Correct:	ICW Pump Controls 1) Remotely started and stopped from control room 2) Auto start on SIAS (C pump always has 9 sec time delay before auto start, A and B only on LOOP) Upon LOOP, red-flagged pumps automatically start and load onto Emergency Diesel Generators. – 9-sec load block for A & B Pump – 9-sec load block for C Pump – C will NOT start unless A or B Pull to Lock [or breaker racked out] and C aligned electrically to the same bus and previously running (After Close). Unit 1 requires MA or MB power for auto start
C.	Incorrect:	See analysis B. It is plausible that the applicant believe that the B pump would be the only running due to the C being mechanically and electrically aligned but thinking the C pump would not start on a LOOP.
D.	Incorrect:	See analysis C. It is plausible that the applicant believe that the C pump would also be running due to being mechanically and electrically aligned but awaiting the time delay to complete, not knowing ICW is on the 9 second block.

Question Number: 53

Tier: 2 Group: 1

K/A: 076 K2.01 Service Water / Knowledge of bus power supplies to the following: Service Water

Importance Rating: 2.7 2.7

10 CFR Part 55: (CFR: 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the power supplies to the ICW (SWS) pumps

Technical Reference: PSL OPS 0702313

Proposed references to be provided: None

Learning Objective: PSL OPS 0702313-07,11

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	X
Bank	

Question History: MOD BANK question for the 2019 NRC Exam

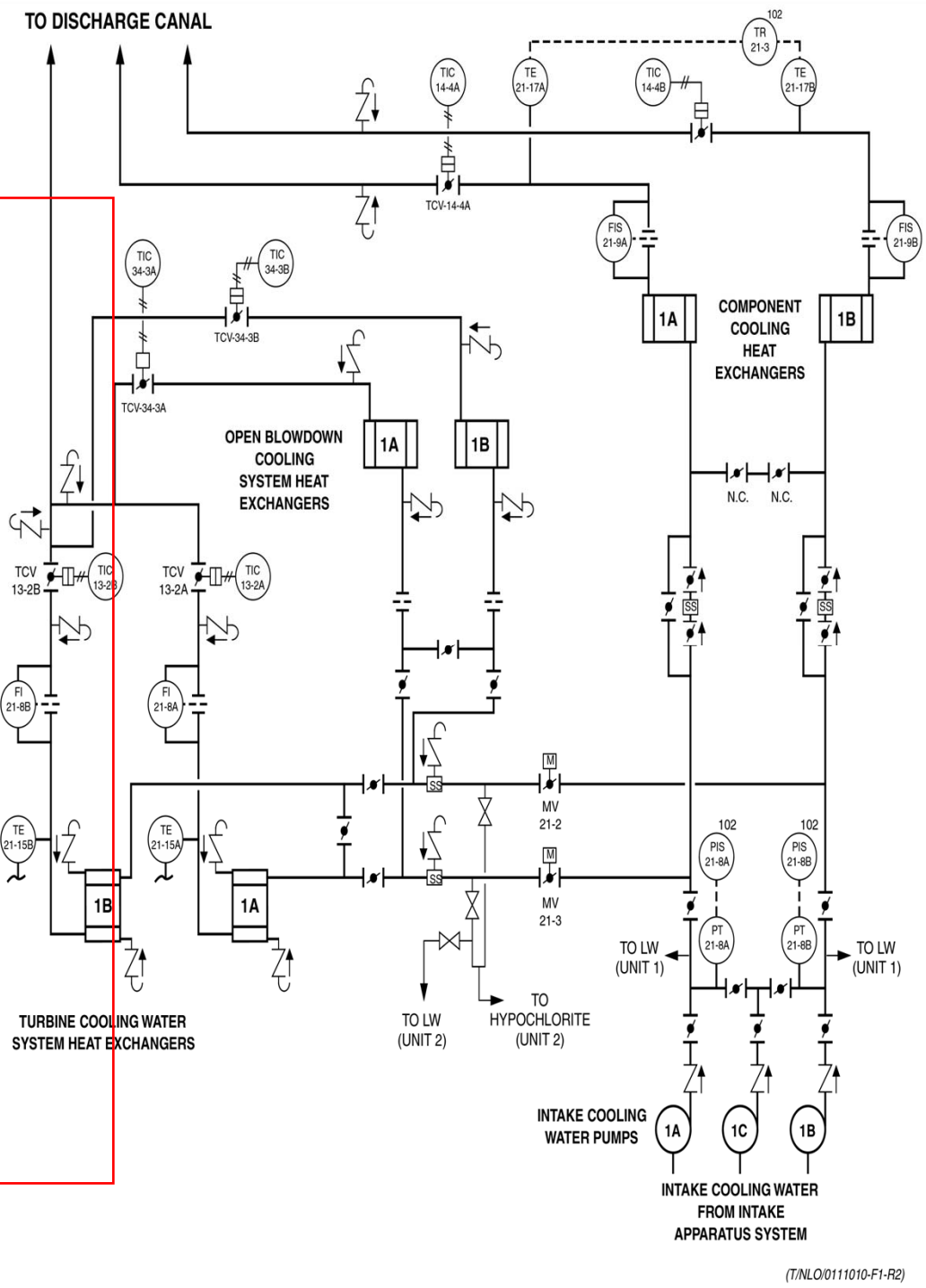
Comments: MODIFIED FROM 2014 AUDIT EXAM #52

NOTES	LESSON OUTLINE
	1) Suction at 18.5’ a) 10’ below level at which flow from Big Mud Creek would be initiated 2) Requires minimum of 4’ for design flow a) 8’ for 125% of rated capacity
	d. Lubrication and Cooling 1) Packing gland and pump bearings - self-lubricated and self-cooled 2) Upper and lower motor bearings - oil lubricated
EO-7a &11	e. Power Supplies (4160 VAC) 1) A Pump - A3 Emergency Bus 2) B Pump - B3 Emergency Bus 3) C Pump - AB Emergency Bus
Red flagged/After Start	4) Upon loss of off-site power, already running pumps automatically start and load onto EDG a) 9-sec load block for A & B pumps
Per CWD sh 834	b) 9-sec load block for C pump but only if aligned to same power as the ICW pump in pull to lock. And in Unit 1 there must be power to relay from either MA (1A ICW pump) or MB (1B ICW pump)
	f. Breaker Protection 1) Overcurrent trip 2) Undervoltage trip
Discuss importance of maintaining headers independent.	3) Ground fault (alarm only)
EO-6	g. Pump Controls
	1) Remotely started and stopped from control room
Discuss only one header is required for safe shutdown.	2) Auto start on SIAS (C pump always has 9 sec time delay before auto start, A and B only on LOOP)

NOTES	LESSON OUTLINE
	3) Restart on Loop if already running (red flagged) for A and B pump, C pump will start only if the pump it is replacing is in PTL.
	h. Pump Alignment
EO-10	1) C pump is “swing pump”
	a) Unit 1 - alignment to B header is preferred for Appendix R
Figure 1 of text	b) Unit 2 - alignment to A header is preferred for Appendix R
	2) C not started unless A or B OOS and C is mechanically and electrically aligned to appropriate header
EO-4a	i. Pump/motor Protection
	1) Motor overcurrent
	2) Low discharge header pressure
	a) Alarm at 30 psig decreasing
	j. Environmental Considerations
	1) Hurricane-proof enclosures and elevations ensure pump operation under all conditions
	a) Protected to 22.8’ elevation
	b) Only 4’ of suction submergence required for full flow
	3. ICW Headers
	a. Two (2) Essential Headers
	1) Each header contains the following components:
EO-3c & 17b	a) CCW heat exchanger
	i) Provides reactor auxiliary systems heat removal and removes decay heat from the reactor via the shutdown cooling system
	ii) Supplied by respective ICW pump
	b) Header isolation valves

ICW PUMPS – EO-4a, EO-7a, EO-11

- **Power Supplies - 4160 VAC**
  - A A3 Emergency Bus
  - B B3 Emergency Bus
  - C AB Emergency Bus
- **AB "swing bus."**
  - Unit 1: alignment to B header is preferred for Appendix R.
  - Unit 2: alignment to A header is preferred for Appendix R
- **Upon LOOP, red-flagged pumps automatically start and load onto Emergency Diesel Generators.**
  - 9-sec load block for A & B Pump
  - 9-sec load block for C Pump
  - C will NOT start unless A or B Pull to Lock [or breaker racked out] and C aligned electrically to the same bus and previously running (After Close). Unit 1 requires MA or MB power for auto start



ORIGINAL
Given the following:

- Unit 1 is operating at 100% power, steady state.
- The 1A Intake Cooling Water (ICW) pump was secured due to mechanical problems and placed in the “Pull-To-Lock” position.
- The crew entered 1-AOP-21.03A, “Intake Cooling Water System Header” and has mechanically and electrically aligned the 1C ICW pump to the “A” ICW header and 1A3 4.16kV bus.
- The 1C ICW pump was started.
- Prior to completing the remaining electrical re-alignment, a Loss of Offsite Power (LOOP) followed by a SIAS occurs.

Which ONE of the following describes the ICW system response 1 SECOND after the Emergency Diesel Generators (EDG’s) loaded onto the vital 4.16 kV busses?

A. No ICW pumps would be running.

B. The 1B ICW pump would be the only running ICW pump.

C. BOTH the 1B and 1C ICW pumps would be running.

D. The 1B ICW pump would be the only running ICW pump however the 1C ICW pump will auto start following a time delay.

54.

078 A3.01 Instrument Air / Ability to monitor automatic operation of the IAS, including: Air Pressure

Given the following conditions:

- Unit 2 is at 100% power
- The 2C Instrument Air Compressor is Running
- The 2B Instrument Air Compressor is Out of Service
- The 2A and 2D Instrument Air Compressors are in Standby

Subsequently:

- The 2C Instrument Air Compressor Trips
- Instrument Air (IA) pressure is 110 psig and LOWERING

Which ONE of the following completes the statements below?

The ____(1)____ Instrument Air Compressor will be the FIRST to START

If IA pressure continues to lower, the IA cross-tie valve will OPEN at ____(2)____.

A.	(1)	2A
	(2)	85 psig
B.	(1)	2A
	(2)	75 psig
C.	(1)	2D
	(2)	85 psig
D.	(1)	2D
	(2)	75 psig

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: The 2A is the is the pressure setpoint for the lag compressor to start. It is plausible that the applicant believe that this is the correct setpoint for the standby compressor to start. Part 2 correct: See analysis A.
B.	Incorrect:	Part 1 correct: See analysis A. Part 2 incorrect: This is the setpoint as described in 2-AOP-18.01, Section 4.2 .2.B note. The ability to maintain Steam Generator levels at full power conditions may be affected if Instrument Air pressure degrades below 75 psig. It is plausible that the applicant have the misconception that this is the setpoint at which cross-tie to the other unit opens.
C.	Correct:	Part 1 correct: The 2D standby compressor will start at 105 psig decreasing pressure. Part 2 correct: This is the setpoint as described in 2-AOP-18.01, Section 4.2 note. The automatic cross-tie feature of the Instrument Air System occurs at 85 psig lowering on the affected unit. The cross-tie valve on Unit 1 will close if either of the following conditions occur: ☐ Unit 1 Instrument Air header pressure lowers below 85 psig. ☐ Unit 2 Instrument Air header pressure rises above 95 psig.
D.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 incorrect: See analysis B.

Question Number: 54

Tier: 2 Group: 1

K/A: 078 A3.01 Instrument Air / Ability to monitor automatic operation of the IAS, including: Air Pressure

Importance Rating: 3.1 3.2

10 CFR Part 55: (CFR: 41.7 / 45.5)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the automatic operation of the IAS

Technical Reference: 2-AOP-18.01

Proposed references to be provided: None

Learning Objective: PSL OPS 0702413 - 4

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	
Bank	X

Question History: PSL LOIT Bank question for the 2019 NRC Exam

Comments:

Instrument Air Unit Cross-tie

Unit 1 and Unit 2 Instrument Air Systems can be automatically cross-tied if one unit loses Instrument Air pressure. This is accomplished through two pressure control valves, PCV-18-6 (Unit 1) and PCV-18-5 (Unit 2). **(Refer to Figure 1)**.

Both PCVs are normally closed. If one unit has low Instrument Air pressure, < 85 psig, the Instrument Air cross-tie valve for the **unaffected** unit **opens,** to supply Instrument Air. This valve then modulates, to maintain pressure in the affected unit at ≥ 85 psig.

If the Instrument Air header pressure in the affected unit increases to > 95 psig, the **open** signal to the cross-tie valve is removed.

If the Instrument Air header pressure for the originally unaffected unit becomes < 85 psig, the cross-tie valve **closes** to protect the unaffected unit.

Example: if Unit 1 Instrument Air header pressure < 85 psig, PCV-18-5 **opens and modulates** to maintain ≥ 85 psig. When Unit 1 Instrument Air pressure > 95 psig, PCV-18-5 **closes**. If during this event, Unit 2 Instrument Air header pressure drops to < 85 psig, PCV-18-5 **closes**.

Instrumentation & Controls

C & D Compressors

Normally one Instrument Air Compressor is operating continuously in "RUN" with the other compressor selected for "AUTO." Pressure is controlled by receiver pressure which operates a solenoid valve through a pressure switch. When de-energized, the solenoid valve admits air from the air receiver to the unloader valve, forcing down a plunger which depresses suction valve plates against spring pressure, keeping the plates open, causing the air output of the compressor to stop. A loss of electrical power to the unloading system will cause the compressor to unload. If receiver air pressure should continue to decrease, at 105 [100] psig, the "AUTO" selected air compressor would start and load.

When pressure decays to the intermediate level the machine will half load (half the inlet valves go closed) and will operate at 50% of rated capacity, continuously loading and unloading at half capacity. However if pressure continues to drop to the lower setpoint the "lead machine" closes all intake valves and operates at 100% of capacity restoring pressure. At the high setpoint the compressor reverts back to half capacity. If pressure continues to decrease with the "lead machine" at 100% capacity, the standby compressor starts. Once pressure is stabilized, at the upper setpoint, the standby compressor switch needs to be turned to **OFF** to stop the running standby machine, and then placed to **AUTO** to place it in standby.

The standby compressor starts automatically at 105 [100] psig decreasing. Each 400 scfm compressor operates:

FULL CAPACITY LOAD: Loads at 110 psig ↓ [105 psig ↓]
Unloads at 118.5 psig ↑ [113 psig ↑]

HALF CAPACITY LOAD: Loads at 115 psig ↓ [110 psig ↓]
Unloads at 120 psig ↑ [117 psig ↑]

If the C or D Instrument Air Compressor "AUTO"-starts, the operator should leave it in the "AUTO" operating mode until either the other compressor is operable or another supply of Instrument Air is operable, to allow momentary shutdown of the "AUTO"-running compressor to reconfigure its controls to "RUN" operating mode.

Instrument Air Dryer(s)

Use **1[2]-NOP-18.41**, "Instrument Air System Operation," to start up the Instrument Air Dryer(s):

Caution is necessary when manipulating dryer package valves. Review procedure steps carefully and completely prior to operating dryer controls and valves to avoid inadvertent isolation or air pressure loss to dryer components with subsequent Loss of Instrument Air.

During operation after a startup, verify at the local annunciator panel:

a) Power ON
b) Left Chamber Drying

- Inspect air filters frequently and clean or replace as necessary.

- Monitor proper operation of Instrument Air Dryers and promptly respond to Abnormal conditions.

- Verify proper air compressor operation frequently.

- Ensure that moisture/oil removal traps are functioning properly and increase surveillance of this function when Service Air is supplying Instrument Air.

The C & D Instrument Air Compressors' Inter-cooler Drain Trap operation is of major concern, since malfunction could cause water to enter the compressor oil sump.

Instrument Air System Response to a Header Rupture With No Operator Action

The consequences of an Instrument Air header rupture, in an isolable section of the system, can be mitigated if correct Operator actions occur. In the event operators are not available, or cannot respond, an Instrument Air header rupture (or other cause for a massive leak) could result in:

- A reactor trip
- System degradation which could cause severe transients, worsen plant response to transients, or cause conditions outside the plant's design bases
- Forced power reduction

Typically, an Instrument Air header rupture will cause Instrument Air Receiver pressure to decrease.

Assuming Unit 1 air receiver pressure decreased to < 110 psig, the running compressor would shift from half-load to full-load configuration.

At < 105 [100] psig the standby compressor would auto start in a full load configuration.

As header pressure continues to decrease < 85 psig, PCV-18-5, Unit 2 to Unit 1 instrument air crosstie will open to supply instrument air from Unit 2.

If the break is large enough to cause Unit 2 instrument air pressure to decrease to < 85 psig, PCV-18-5 will close to isolate Unit 1 from Unit 2 instrument air.

Decreasing air pressure below 75 psig will cause valves to begin to fail.

The failure positions for plant AOVs are identified on Table V and Table VI.

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2 Subsequent Operator Actions (continued)

NOTE

The automatic cross-tie feature of the Instrument Air System occurs at 85 psig lowering on the affected unit. The cross-tie valve on Unit 1 will close if either of the following conditions occur:

- Unit 1 Instrument Air header pressure lowers below 85 psig.
- Unit 2 Instrument Air header pressure rises above 95 psig.

* **2.** IF Instrument Air header pressure is less than 100 psig and lowering as indicated on PI-18-9/16, INSTR AIR & STA AIR PRESSURE, THEN **PERFORM** the following:

A. **VERIFY** standby instrumentair compressor (2C or 2D) has started.

A.1 IF loss of power has occurred, THEN **RESTORE** power as appropriate:

- PP-204, Ckt 18 - Master Control Panel (IAC 2C /2D) (TGB/20/33/A)
- 2C Air Compressor - 480V MCC-2A1, Bkr. 2-40802 (TGB/40/S-21/W-B)
- 2D Air Compressor - 480V MCC-2B1, Bkr. 2-41608 (TGB/40/S-33/E-H)

A.2 Manually **START** Instrument Air Compressor (2C or 2D).

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2 Subsequent Operator Actions (continued)

2. A. (continued)

A.3 IF neither 2C or 2D compressor can be started, THEN **PERFORM** both of the following:

- **START** 2A Instrument Air Compressor per Attachment 1, Operation of the 2A Instrument Air Compressors.
- **START** 2B Instrument Air Compressor per Attachment 2, Operation of the 2B Instrument Air Compressor.

B. **DISPATCH** personnel to investigate Instrument Air System for leaks, failures, or equipment malfunctions.

NOTE

- The ability to maintain Steam Generator levels at full power conditions may be affected if Instrument Air pressure degrades below 75 psig.
- Air operated valves and instrumentation may lose full range operating capability.

☐ **3.** **VERIFY** Instrument Air pressure is equal to or greater than 75 psig.

3.1 **EVALUATE** need to shut down unit per 2-AOP-22.01, Rapid Downpower.

55.

103 A3.01 Containment / Ability to monitor automatic operation of the containment system, including: Containment Isolation

Given the following conditions:

- Unit 1 is operating at 100% power
- PT-07-2A, Containment Pressure transmitter failed HIGH and has yet to be bypassed

Subsequently:

- A loss of the MD instrument bus occurs

Which ONE of the following describes **ALL** the ESFAS signals that will actuate?

A.	CIS and SIAS ONLY
B.	CSAS and SIAS ONLY
C.	CIS, MSIS and SIAS ONLY
D.	CIS, CSAS, MSIS and SIAS

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	This is correct both CIS on SIAS will actuate do the input from PT-07-2A, and the loss of the MD bus causing coincidence to be met on the signals that are not energize to actuate.
B.	Incorrect:	CSAS is energize to actuate, therefore the loss of the MD bus will not cause the coincidence to be met therefore no CSAS actuation.
C.	Incorrect:	CSAS is energize to actuate. On Unit 1 MSIS DOES NOT actuate on high containment pressure. This is only a Unit 2 function only
D.	Incorrect:	CSAS is energize to actuate, therefore the loss of the MD bus will not cause the coincidence to be met therefore no CSAS actuation. On Unit 1 MSIS DOES NOT actuate on high containment pressure. This is only a Unit 2 function only. The CIS on SIAS will actuate do the input from PT-07-2A, and the loss of the MD bus causing coincidence to be met on the signals that are not energize to actuate.

Question Number: 55

Tier: 2 Group: 1

K/A: 103 A3.01 Containment / Ability to monitor automatic operation of the containment system, including: Containment Isolation

Importance Rating: 3.9 4.2

10 CFR Part 55: (CFR: 41.7 / 45.5)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the automatic operation of Containment Isolation

Technical Reference: PSL OPS 0711401

Proposed references to be provided: None

Learning Objective: PSL OPS 0711401-8

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: #55 on 2010 PSL NRC Exam

- Power to each actuation cabinet is provided by an auctioneering circuit that is fed from two separate instrument AC buses. Refer to Figure 9.

DETAILED DESCRIPTION

ENGINEERED SAFEGUARDS CABINET

As shown on Figure 3, the engineered safeguards cabinet consists of four measurement cabinets (MA, MB, MC, and MD) for each input parameter and two logic matrix actuation cabinets (SA and SB). The four measurement channels are separated by metal barriers and are located between the actuation cabinets.

Measurement Cabinets

The four measurement channels are nearly identical except that cabinet MA houses the ATI panel on Unit 1 [left section of actuation cabinet SA]. Refer to Figure 3. At the top [near the center] of each measurement cabinet are six indicators which display the following parameters:

- Cntmt pressure
- Cntmt radiation
- RWT level
- Pzr pressure
- S/G pressure (A)
- S/G pressure (B)

Located underneath [above] the indicators are the twelve trip bistables. They are designated as follows:

- Cntmt pressure SIAS [SIAS/MSIS]
- Cntmt pressure CSAS
- Cntmt pressure CIS [CIAS]
- Cntmt radiation CIS [CIAS]
- RWT level RAS

- Pzr pressure SIAS
- Pzr pressure block
- SG/1A [2A] pressure MSIS
- SG/1A [2A] pressure block
- SG/1B [2B] pressure MSIS
- SG/1B [2B] pressure block
- Pzr Pressure DSS

The trip bistables, as shown on Figure 4, are provided with a dial indicating potentiometer for setpoint adjustment, a trip test pushbutton, and a lighted trip reset pushbutton. The trip reset pushbutton is illuminated when the trip bistable has tripped. The trip bistable will automatically return to a non- tripped condition as soon as the trip condition clears. The illuminated trip reset pushbutton and annunciator R-10 [Q-2], ENGINEERED SAFEGUARDS ATI FAULT, on RTGB 106 [206] will remain illuminated, even after the condition which tripped the bistable clears, until the ATI trip reset pushbutton is depressed.

- The illuminated trip reset pushbutton is not an indication of bistable condition, but an indication that a trip condition has existed.

  [Although they function almost identically, the Unit 2 trip bistables are cosmetically different. Figure 4 also shows the Unit 2 trip bistables. As shown, they contain a dial indicating potentiometer for setpoint adjustment, a trip Test Pushbutton, a lighted Trip Reset Pushbutton, two screwdriver adjustable potentiometers for TL1 and TL2 measurement, a Press to Test Pushbutton, and a ATI Self-Test light.]

Once the downstream actuation module has actuated, the removal of the trip signal or the resetting of the bistable has no effect on the condition of the actuation module and actuated components. ESFAS actuation can only be reset from RTGB 106 [206]. The trip bistables are also provided with adjustable potentiometers for calibration.

The trip bistable module receives the measurement signal (cntmt pressure, RWT level, etc.) and amplifies it. The signal is then divided and fed to an indicator and a resistive network where the trip point is set. Combined with the trip set level, the signal is fed to another amplifier that feeds into the digital circuitry. The digital circuitry initiates trip indication on the front of the bistable module, relay actuation for annunciation, and output to the isolation modules and the ATI circuitry housed within the bistable. In addition to receiving the

measurement signal, the bistable forms part of the ATI which continuously checks for proper operation of the trip circuits.

Both Unit 1 and Unit 2 have bistable module bypass key switches located on the measurement panels below each bistable module. **It is important to note that the Unit 1 bypass key switches do NOT always align with the associated module.** If a module becomes inoperable and/or requires maintenance, the bistable module bypass switch can be placed in the "bypass" position.

As shown on Figure 3, the isolation modules for train A are located just under the bistables [above the analog indicators]. There are nine ESFAS modules and one ATWS module (each train has isolation modules for that train's S/G only) labeled 1M101 - 1M109 and ATWS. The isolation modules receive the output of the trip bistables. Isolation is accomplished through an optical isolator that is a combination of a light emitting diode (LED) and a phototransistor.

When an isolation module is removed, a single trip signal is sent to the 2-out-of-4 logic matrices in the actuation modules, placing the circuitry in a 1/3 logic. When the single trip signal is received by each actuation module, the red "1/5" light on the respective actuation module will energize. The "1/5" light indicates that one of the five inputs into the actuation module (four bistables inputs and one test input) is providing a trip signal.

On Unit 1, the ATI panel is located just below the train A isolation modules on cabinet MA [located on cabinet SA]. This panel contains a series of indicating lights and a Reset Pushbutton. The ATI is capable of continuously monitoring the performance of the ESFAS and proving calibration of the bistables to within 5% of the required setpoint. The test system works by inserting a series of test signals or pulses into the trip bistables and then monitoring the output of the actuation modules. The 2 millisecond ATI test signal is not of sufficient duration to actuate the system. The signal is sent to selected bistable groups in the sensor cabinets to satisfy the 2-out-of-4 logic matrix. The first ATI pulse does not meet the bistable trip setpoint and the second ATI pulse exceeds the trip setpoint. The bistable passes a trip pulse through the isolation modules and actuation modules. The lamp associated with the automatic test unit flashes on for a quarter of a second during the undertrip test and remains off during the rest of the test cycle. [The ESFAS bistable trip lights and actuation trip lights, also blink sequentially as the bistables are tested.]

If the first pulse causes the bistable to output a trip voltage, then an ATI fault is indicated by the ATI test lamp not energizing in its proper sequence. An ATI fault is also indicated if the second pulse caused the bistable to output a non-trip voltage, resulting in the ATI test lamp remaining energized. In addition, the ATI checks and annunciates failures for the outputs of the isolation modules and the actuation modules. The ATI does not check the output relays, and in addition will fail to detect some failures where a single actuation module fails to an actuated position.

Each failure mode is identifiable to an individual channel because of the physical arrangement of the lamps on the front of the ATI. The test lamp pattern sequentially blinks from the left to the right interrogating two bistables at a time until the 34 actuation bistables are tested. Faulty operation of the ESFAS circuitry will result in an annunciator R-10 [Q-2], ENGINEERED SAFEGUARDS ATI FAULT alarm on RTGB 106 [206], as well as the ATI failure lamp on the ATI test panel.

On each of the measurement channels, there is a manual test panel. See Figure 5 [Figure 6]. The manual test panel is provided for I&C to set, and periodically verify, the bistable trip setpoints.

- Taking the spring-return calibration test switch out of the “operate” position removes that respective measurement channel’s input resulting in a 2-out-of-3 logic for that trip.

As shown on Figure 3, the train B isolation modules are located just below the manual test panel [above the analog indicators]. There are nine ESFAS modules and one ATWS module labeled 1M110 - 1M118 and ATWS. Like the train A isolation modules, there are no isolation modules for S/G 1A [2A].

The power supply fuse panel is located just below the train B isolation modules [bistable bypass key switches]. Refer to Figure 7. Indicator lights for various power supplies are located on this panel.

Actuation Cabinets

As shown on Figure 3, the two double actuation cabinets are located on both ends of the measurement cabinets. When facing the ESFAS cabinets, train SA is located on the left end and train SB is located on the right end. These cabinets house all the actuation modules, 3-out-of-4 block matrix modules, [ATI Panel] and the output relays. Some of the

ESFAS power supplies are also housed in these cabinets. Refer to Figure 8. There are also switches provided for the manual testing of these modules.

Power to the ESFAS is supplied from the four instrument AC buses: MA, MB, MC, and MD, in the cable spreading room. Refer to Figure 9. The four channels of instrument AC are completely separate to eliminate interconnection between redundant elements and to ensure that a loss of electrical power or electric fault on one circuit cannot affect another circuit. Actuation trains SA and SB require redundant power sources (115 VAC) to ensure reliable operation of the output relays. If there were not redundant power sources, the “de-energize-to-actuate relays” would actuate upon a single failure, while the “energize-to-actuate relays” would fail to operate upon a single failure.

The redundant source of power for cabinet SA is from instrument bus MC, routed through a transformer in measurement cabinet MC. For cabinet SB, the redundant source is from instrument bus MD, routed through a transformer in measurement cabinet MD.

The output circuit of the actuation module, Figure 10, is divided so that the ATI monitoring signal passes through an optical isolator. An output is provided for trip annunciation and to the sequence of events recorder. The actuation module also accepts remote reset, remote trip (manual actuation), and block functions from RTGB 106 [206]. Block and trip lights are provided on the actuation modules. The output relays in each actuation module provide the contact actuations necessary to initiate the specified safeguards function.

The signals from the 3-out-of-4 block matrix modules are "and" gated with signals from the spring-return block key switches on RTGB 106 [206] to block SIAS from pzr pressure and MSIS from S/G pressure when the plant is being shutdown. The blocked condition is indicated by the block light on the module being energized. A block can only be initiated when 3-out-of-4 channels have reached a value at which an annunciator alerts the operator of a block permissive and an amber light is energized at the block key switch. Automatic block removal occurs when 2-out-of-4 channels reset. The block permissive setpoints are ≤ 1725 psia [≤ 1836] for SIAS and ≤ 700 psia for MSIS.

A manual test panel is located on the actuation cabinet as shown on Figure 3. This panel contains a Test Permissive and a Test Group Switch used by I&C to test each actuation module. Refer to Figure 12.

- **SIAS is a de-energize-to-actuate signal.**

There are four independent pzr pressure transmitters (PT-1102A, B, C, and D) and four independent cntmt pressure transmitters (PT-07-2A, B, C, and D).

The following paragraphs describe the operation of a pzr pressure measurement and actuation channel. Refer to Figure 13. Other channels are similar and will not be described in detail when their actuation signals are discussed; only deviations from the pzr pressure channel will be given.

PT-1102A converts the pzr pressure to a 4-20 mA current. This current signal is split in RTGB 106 [Foxboro cabinets] into two separate 4-20 mA loops. Loop 1 feeds the signal to the reactor protection system's high pzr pressure trip unit, the TM/LP trip unit, pressure indicator PI-1102A, and to pressure indicating alarm PIA-1102A. Loop 2 feeds its signal to the engineered safeguards measurement channel where the bistable trip unit will sense this signal.

Several annunciators on RTGB 106 [206] associated with SIAS actuation are:

- R-5 [R-6], SIAS CHANNEL A/B ACTUATION
- R-15 [R-16], PZR PRESS SIAS CHANNEL TRIP
- R-16 [Q-3], CNTMT PRESS SIAS CHANNEL TRIP
- R-25[R-26], PZR PRESSURE SIAS CHANNEL PRETRIP

At the trip unit bistable, the signal is compared to the predetermined setpoint. If the channel parameter reaches the setpoint, the bistable initiates a channel trip. The signal from the trip bistable is fed through separated isolation modules to both SIAS coincidence logic matrices (SA and SB). The logic matrices control the output relays. If the required coincidence of 2-out-of-4 trip bistable signals is present, the SIAS output relays for that particular train will de-energize and the SIAS is actuated.

A bypass keyswitch is provided to remove a trip function from one of the measurement channels for maintenance and testing. This effectively changes the required actuation logic to 2-out-of-3. This still satisfies the single failure criteria.

- Main feedwater pumps 1[2]A and 1[2]B
- Heater drain pumps 1[2]A and 1[2]B
- Main transformer coolers 1[2]A and 1[2]B
- Isophase Bus Cooling fans 1[2]A and 1[2]B

[NORMAL/OVERRIDE switches (SS-A/1978 & SS-B/1978) allow or prevent the Unit 2 SIAS trips listed above.

- OVERRIDE used during 2-OSP-69.24/25 to prevent trips
- Annunciators G-2 & G-3 alarm when respective selector switch in OVERRIDE
- NORMAL enables SIAS trips
- Switches are located on front of relay boxes (B2534 NA & B2535 NB) in the turbine building switchgear room]

Containment Isolation Actuation Signal (CIS [CIAS])

A CIS [CIAS] automatically actuates the cntmt isolation system and supporting systems as listed in EOP-99.

- A CIS [CIAS] is actuated by SIAS, or by either 2-out-of-4 high cntmt pressure (**5 psig [3.5 psig]**) signals, or 2-out-of-4 high cntmt radiation (**10 R/hr in modes 1 through 4, 90 mR/hr in mode 6 – when moving recently irradiated fuel**) signals.

- CIS [CIAS] is a **de-energize-to-actuate** signal.

There are four independent cntmt pressure transmitters (PT-07-2A, B, C, and D) and four independent cntmt radiation monitors (RD-26-3, 4, 5, and 6).

The operation of the measuring channels, actuation channels, isolation modules, manual and automatic testing, and output relays of the CIS [CIAS] is similar to the operation of the SIAS. Refer to Figure 14. The CIS [CIAS] is also divided into groups for testing purposes.

- CIS [CIAS] is not provided with blocking modules. If auto SIAS on low pressurizer pressure is blocked, CIS [CIAS] can only be automatically actuated as a result of high cntmt pressure (directly or by SIAS on containment pressure) or radiation.

Separate control switches for manual initiation of each actuation train (SA and SB) of the CIS [CIAS] are provided on RTGB 106 [206]. As with the SIAS, these switches have

RESET/AUTO/CIS [CIAS] ON positions and are provided with a "Think" Pushbutton to prevent accidental actuation. SIAS must be reset prior to the reset of CIS[CIAS]. This may require RTGB 106[206] keyswitch blocking of the SIAS signal if Pressurizer pressure is below the SIAS actuation setpoint.

Several annunciators associated with CIS [CIAS] actuation on RTGB 106 [206] are:

- Q-15 [P-13], CNTMT PRESS HIGH CIS CHANNEL TRIP
- Q-16 [P-5], CNTMT RAD HIGH CIS CHANNEL TRIP
- Q-5 [P-3], CIS CHANNEL A/B ACTUATION
- Q-25 [P-23], CNTMT PRESS HI CIS PRETRIP
- Q-26 [P-15], CNTMT RAD HI CIS PRETRIP

Containment Spray Actuation Signal (CSAS)

A CSAS automatically actuates the Containment Spray System and supporting systems as listed in EOP-99.

- A CSAS is actuated by 2-out-of-4 HI-HI cntmt pressure (**10 psig [5.4 psig]**) signals AND a coincident SIAS signal.

- CSAS is an **energize-to-actuate** signal.

There are four independent cntmt pressure transmitters (PT-07-2A, B, C, and D). Note that these are the same transmitters used for the SIAS and CIS [CIAS] signals.

The operation of the measuring channels, actuation channels, manual and automatic testing, and isolation modules of the CSAS is similar to the operation of the SIAS. Like the SIAS and CIS [CIAS], the CSAS is divided into groups for testing purposes.

- The CSAS output relays are designed to be energized to actuate in order to prevent spurious spray system operation on a loss of power to one of the two 125V DC buses.

- CSAS is NOT provided with blocking modules.

Separate control switches for manual initiation of each train of the CSAS are provided on RTGB 106 [206]. These switches have the similar positions and are operated in the same way as those previously described.

Several annunciators associated with CSAS actuation on RTGB 106 [206] are:

- R-11 [S-17], CNTMT PRESS HIGH CSAS CHANNEL TRIP
- R-1 [S-7], CSAS CHANNEL A/B ACTUATION

Recirculation Actuation Signal (RAS)

An RAS automatically transfers the suction of the Safety Injection Pumps and the Containment Spray Pumps from the RWT to the cntmt sump. This is accomplished by opening the two sump outlet valves while simultaneously closing the RWT outlet valves and closing the pump mini-flow recirculation valves to the tank. Unit 1 has a key switch to allow auto action to close the mini-flow recirculation valves

- The cntmt sump outlet valves open within 30 seconds.
- The RWT outlet isolation valves close within 90 seconds.
- Concurrent with the transfer of the pump suctions, the Low Pressure Safety Injection (LPSI) pumps are automatically stopped to prevent dead-heading of the pumps due to loss of the recirculation flow path.

The different stroke times of the RWT isolation valves and cntmt sump outlet valves ensure the safeguards pumps have adequate NPSH at all times during operation. RAS automatic actions are detailed in EOP-99.

- RAS is initiated by 2-out-of-4 low RWT level **(4' [5.67'])** signals. (5.67’ is typically rounded to 6’.)
- RAS is an **energize-to-actuate** signal.

There are four independent level transmitters (LT-07-02A, B, C, and D).

Operation of the RAS circuitry is similar to the operation of the CSAS. Refer to Figure 16. The RAS output relays are energized to actuate in order to prevent spurious actuation. It is essential that the RWT outlet valves remain open and the sump outlet valves remain closed to ensure that the required quantity of borated water is injected into the RCS (therefore the cntmt sump) prior to recirculation.

Main Steam Isolation Signal (MSIS)

The MSIS terminates blowdown of steam from both S/Gs and stops the normal feedwater flow to both S/Gs by closing the main steam and main feedwater isolation valves. On Unit 1, an MSIS signal trips the main feedwater pumps, the heater drain pumps, and the condensate pumps. A list of the components activated by the MSIS is given in EOP-99.

- MSIS is actuated by 2-out-of-4 low S/G pressure **(600 psia)** signals [and/or 2-out-of-4 high cntmt pressure **(3.5 psig)** signals.]
- MSIS is a **de-energize-to-actuate** signal.

There are four independent channels of S/G pressure transmitters for each S/G (PT-8013A, B, C, and D and PT-8023 A, B, C, and D). [On Unit 2, the cntmt pressure trips for MSIS come from a common cntmt pressure bistable used for SIAS.]

As shown in Figure 17, an initiation signal, generated by either channel, will actuate the isolation of both S/Gs. It should be noted, however, that the ESFAS system does not "auctioneer" S/G A & B pressures. The 'A' actuation channel looks only at 'A' S/G pressure and actuates 'A' train MSIS on 'A' S/G low pressure only. The same is true for B actuation channel. This means that it requires 2 of 4 low S/G pressure signals from the same S/G to actuate an A or B MSIS signal.

For example, if the 'A' SG pressure caused a MSIS and 'B' SG pressure remained above the MSIS setpoint, then the red light above the 'A' MSIS actuation switch would be on and the Green light above the 'B' MSIS actuation switch would be on. All actuations would take place on both trains due to the interposing relays (discussed below).

The operation of the measuring channels, actuation channels, isolation modules, output relays, and manual and automatic testing of the MSIS is similar to the operation of the SIAS. It is also divided into groups for testing purposes.

- MSIS is provided with a manual block for low S/G pressure actuation to permit shutdown depressurization of the Main Steam System without initiating MSIS. The block is a manual operator action performed by a NORM/BLOCK spring-return key switch on RTGB 106 [206].

SIMPLIFIED ESFAS FLOW DIAGRAM

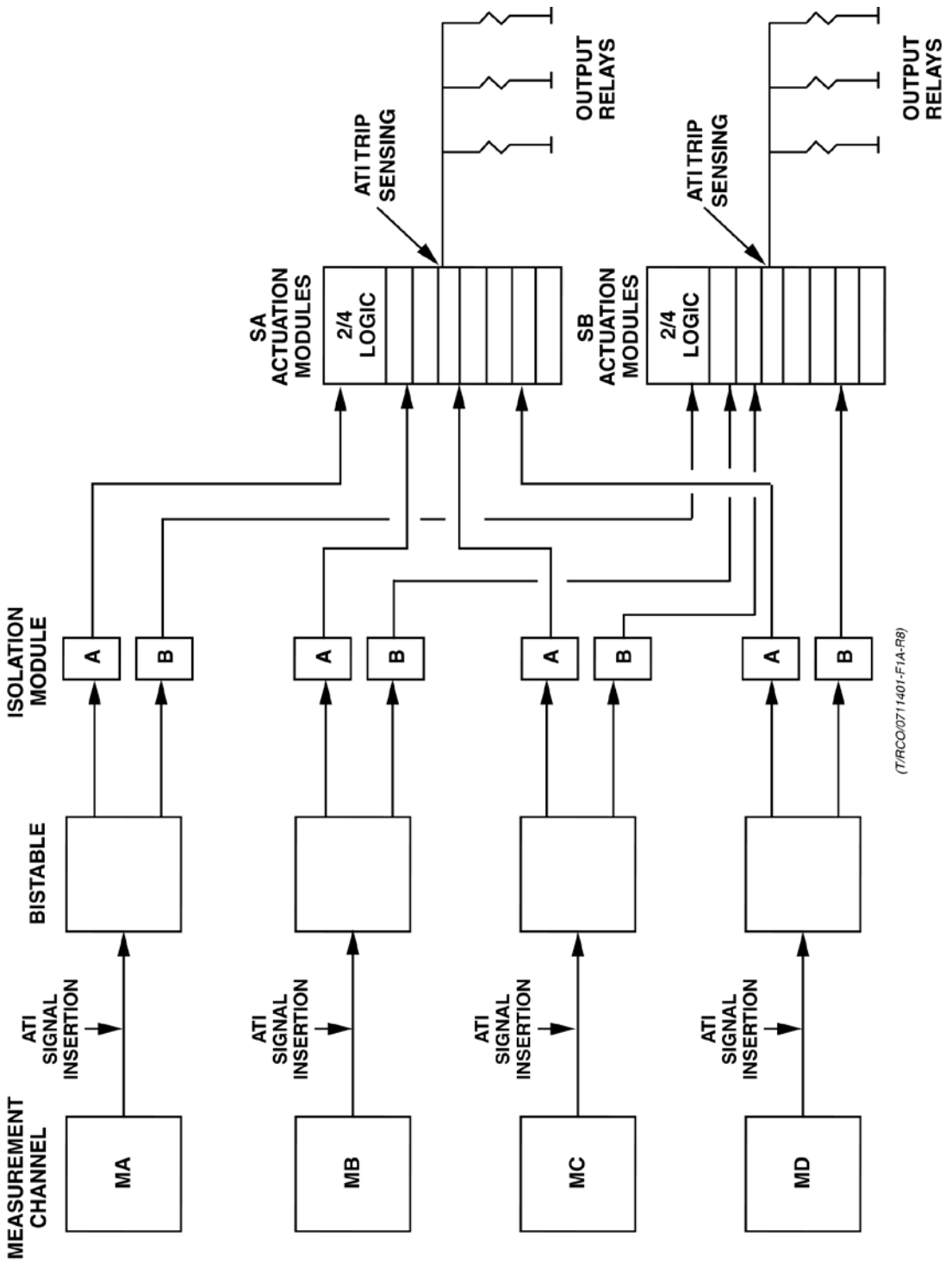


FIGURE 2

ESFAS SYSTEM POWER SUPPLY

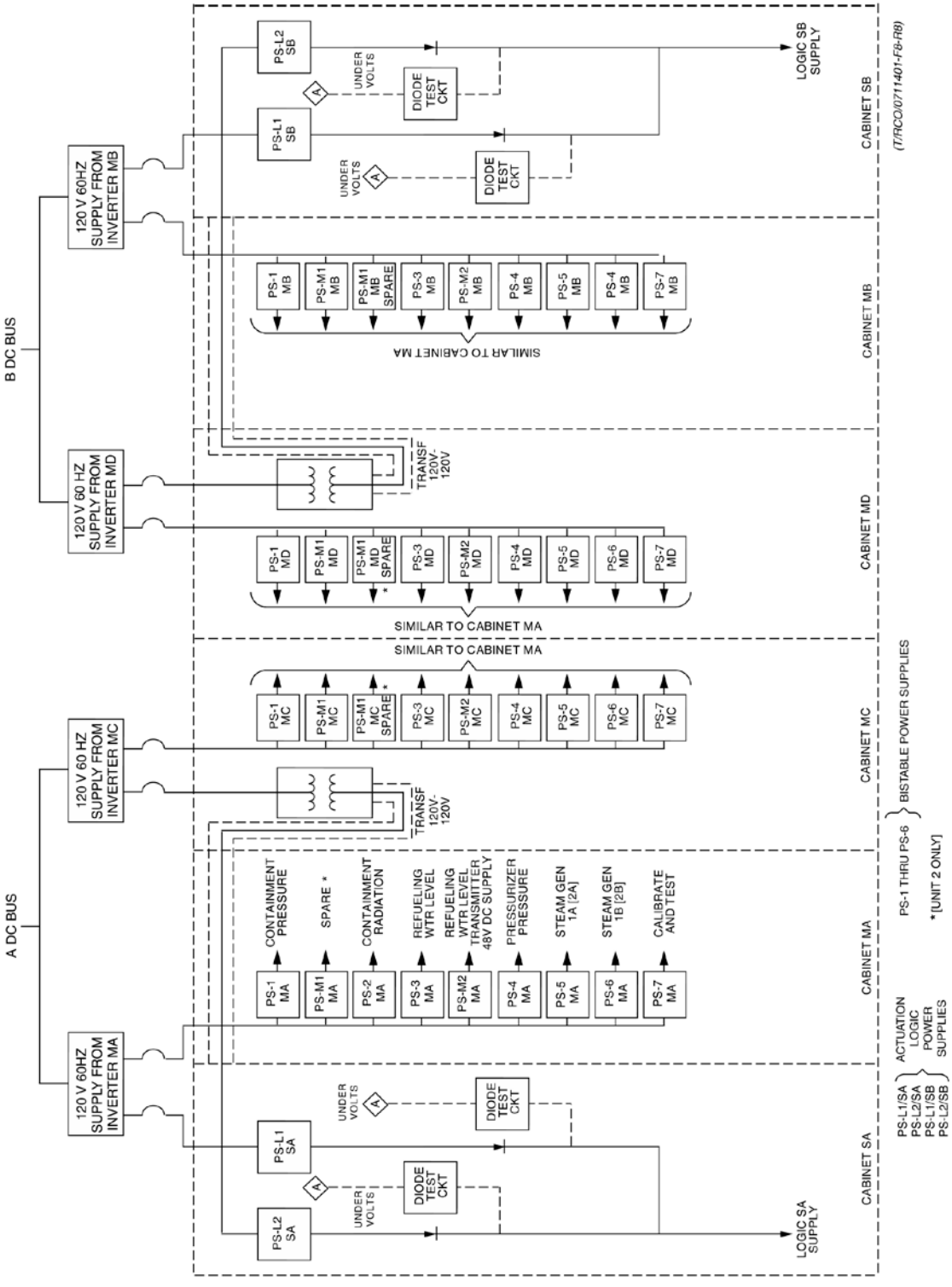


FIGURE 9

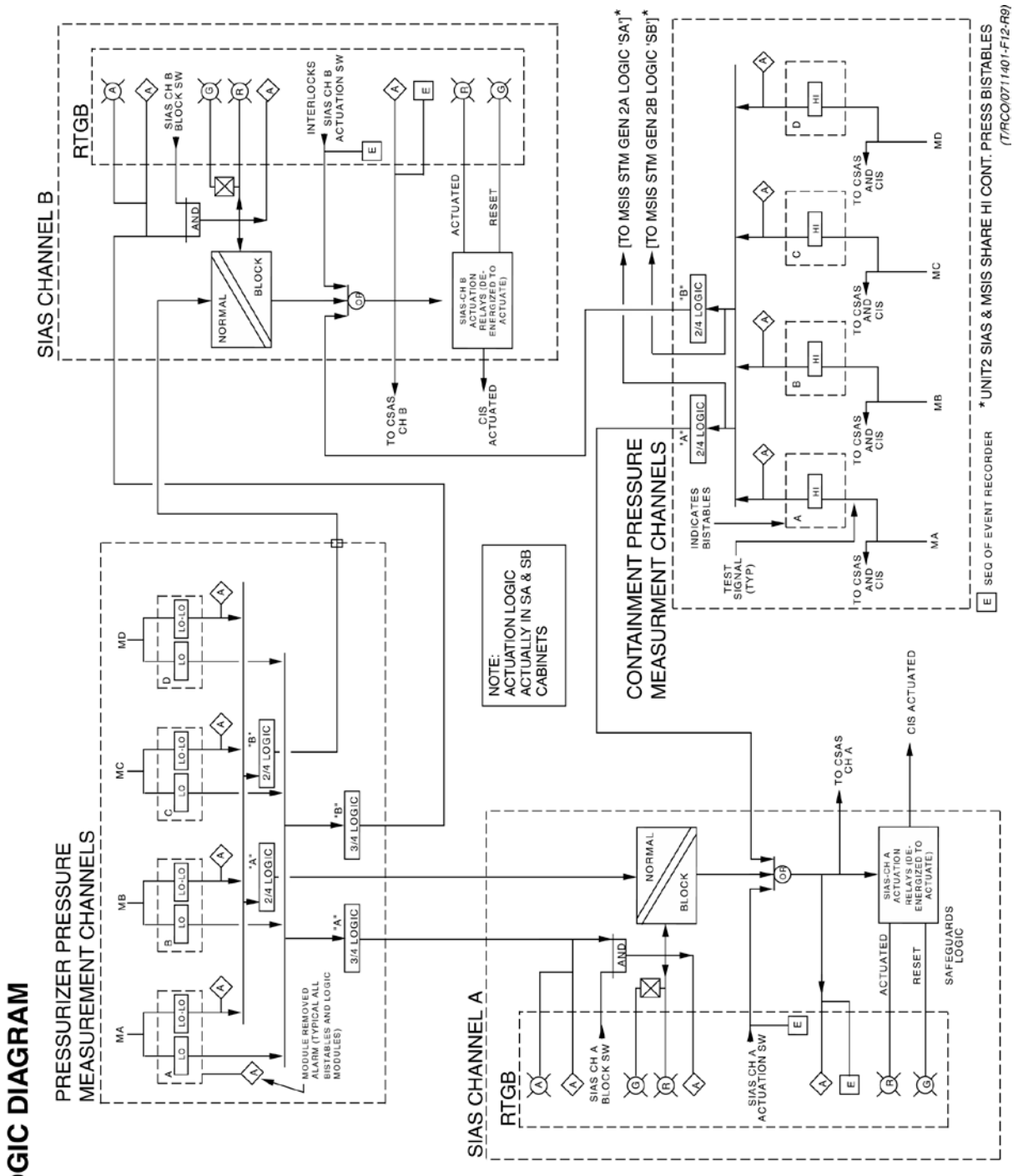

SIAS LOGIC DIAGRAM
SIAS CHANNEL B
RTGB
SIAS CH B BLOCK SW
INTERLOCKS
SIAS CH B ACTUATION SW
AND
NORMAL
BLOCK
ACTUATED
RESET
SIAS-CH B ACTUATION RELAYS (DE-ENERGIZED TO ACTUATE)
TO CSAS CH B
CIS ACTUATED
[TO MSIS STM GEN 2A LOGIC 'SA']*
[TO MSIS STM GEN 2B LOGIC 'SB']*
CONTAINMENT PRESSURE MEASURMENT CHANNELS
"B" 2/4 LOGIC
"A" 2/4 LOGIC
INDICATES BISTABLES
TEST SIGNAL (TYP)
TO CSAS AND CIS
MA
MB
MC
MD
HI
LO
LO-LO
PRESSURIZER PRESSURE MEASUREMENT CHANNELS
"A" 3/4 LOGIC
"B" 3/4 LOGIC
MODULE REMOVED ALARM (TYPICAL ALL BISTABLES AND LOGIC MODULES)
NOTE: ACTUATION LOGIC ACTUALLY IN SA & SB CABINETS
SIAS CHANNEL A
RTGB
SIAS CH A BLOCK SW
SIAS CH A ACTUATION SW
TO CSAS CH A
CIS ACTUATED
SIAS-CH A ACTUATION RELAYS (DE-ENERGIZED TO ACTUATE)
SAFEGUARDS LOGIC
E SEQ OF EVENT RECORDER
*UNIT2 SIAS & MSIS SHARE HI CONT. PRESS BISTABLES
(T/RCO/0711401-F12-R9)

FIGURE 13

CIAS LOGIC DIAGRAM

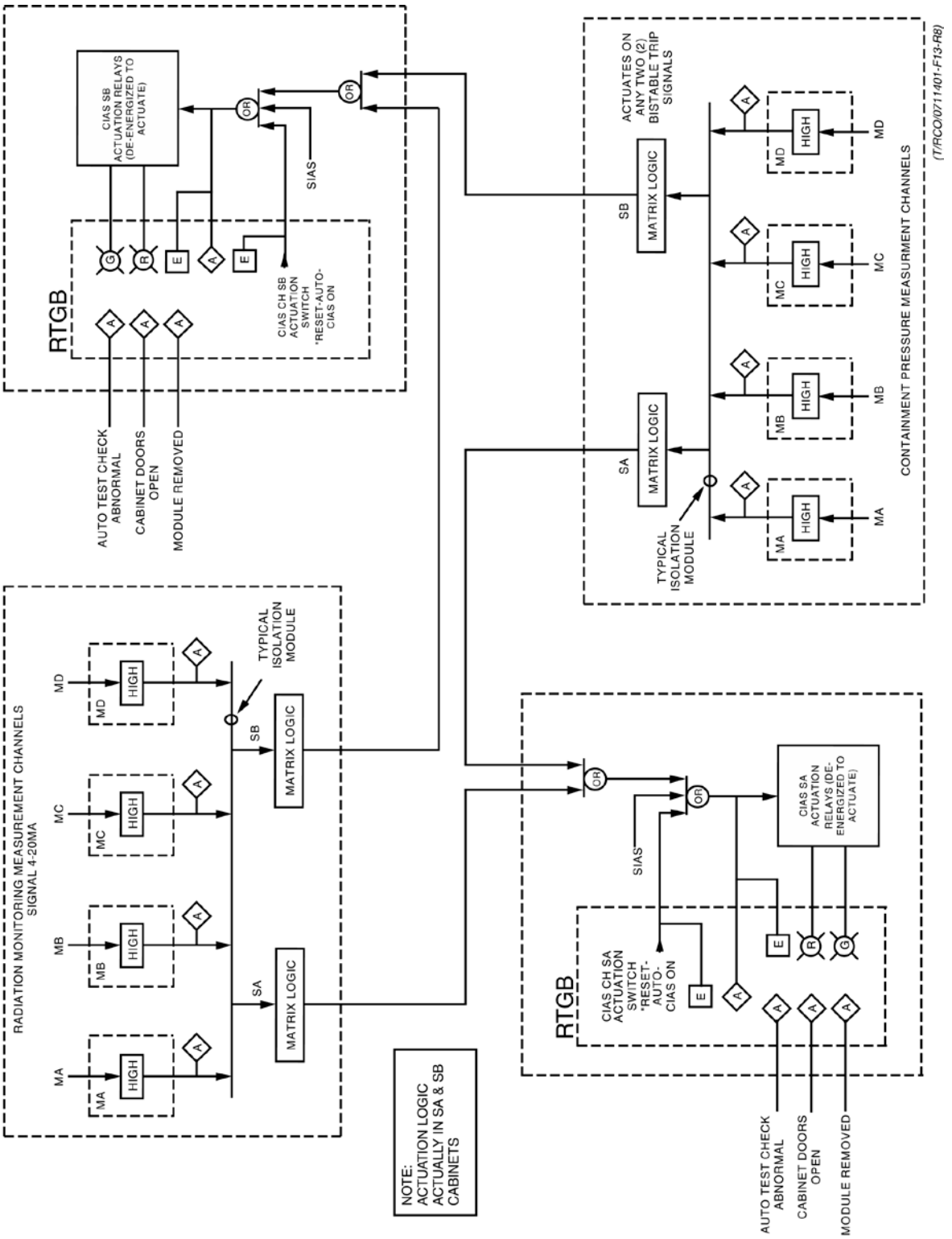


FIGURE 14

CSAS LOGIC DIAGRAM

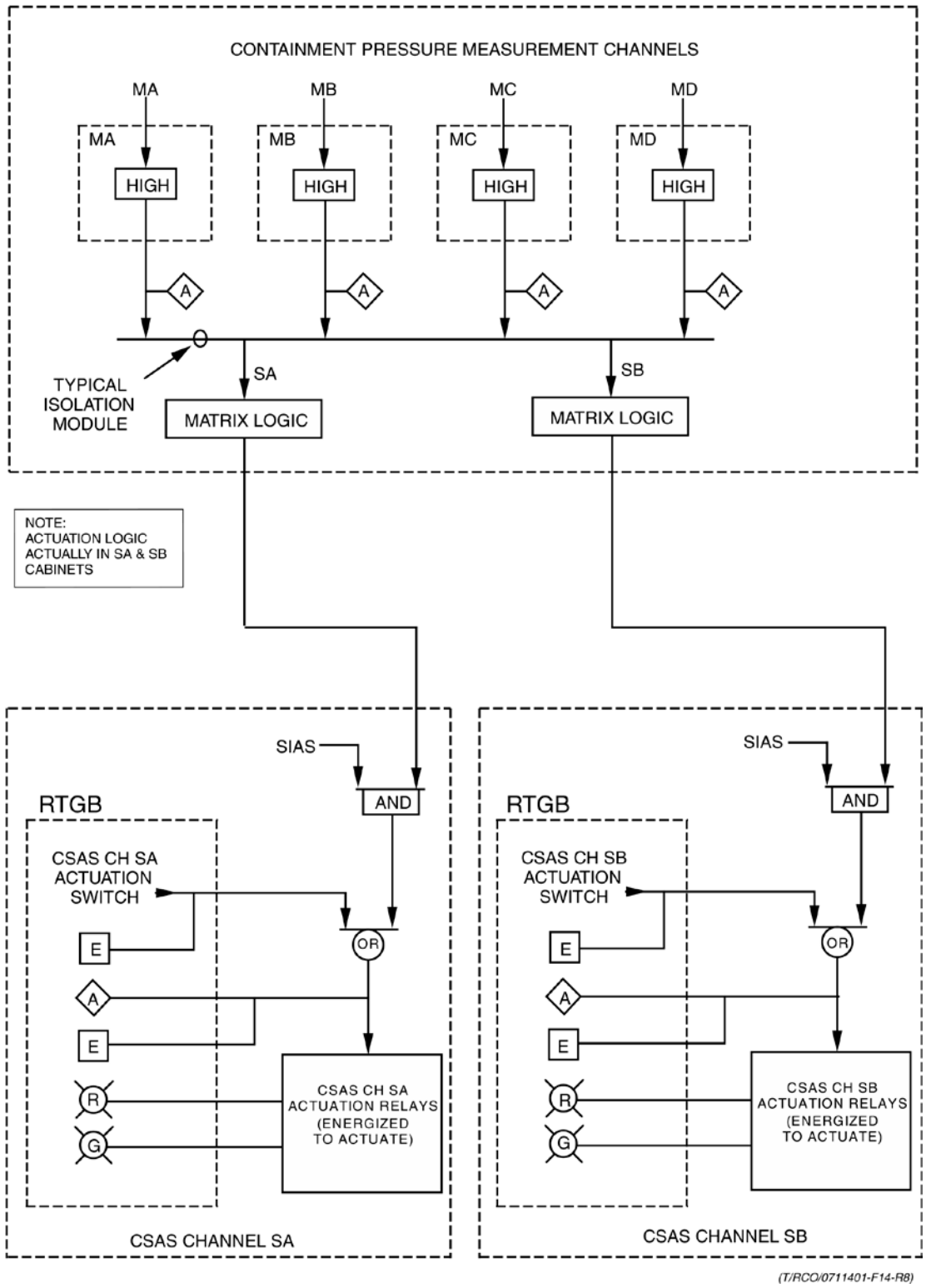


FIGURE 15

RAS LOGIC DIAGRAM

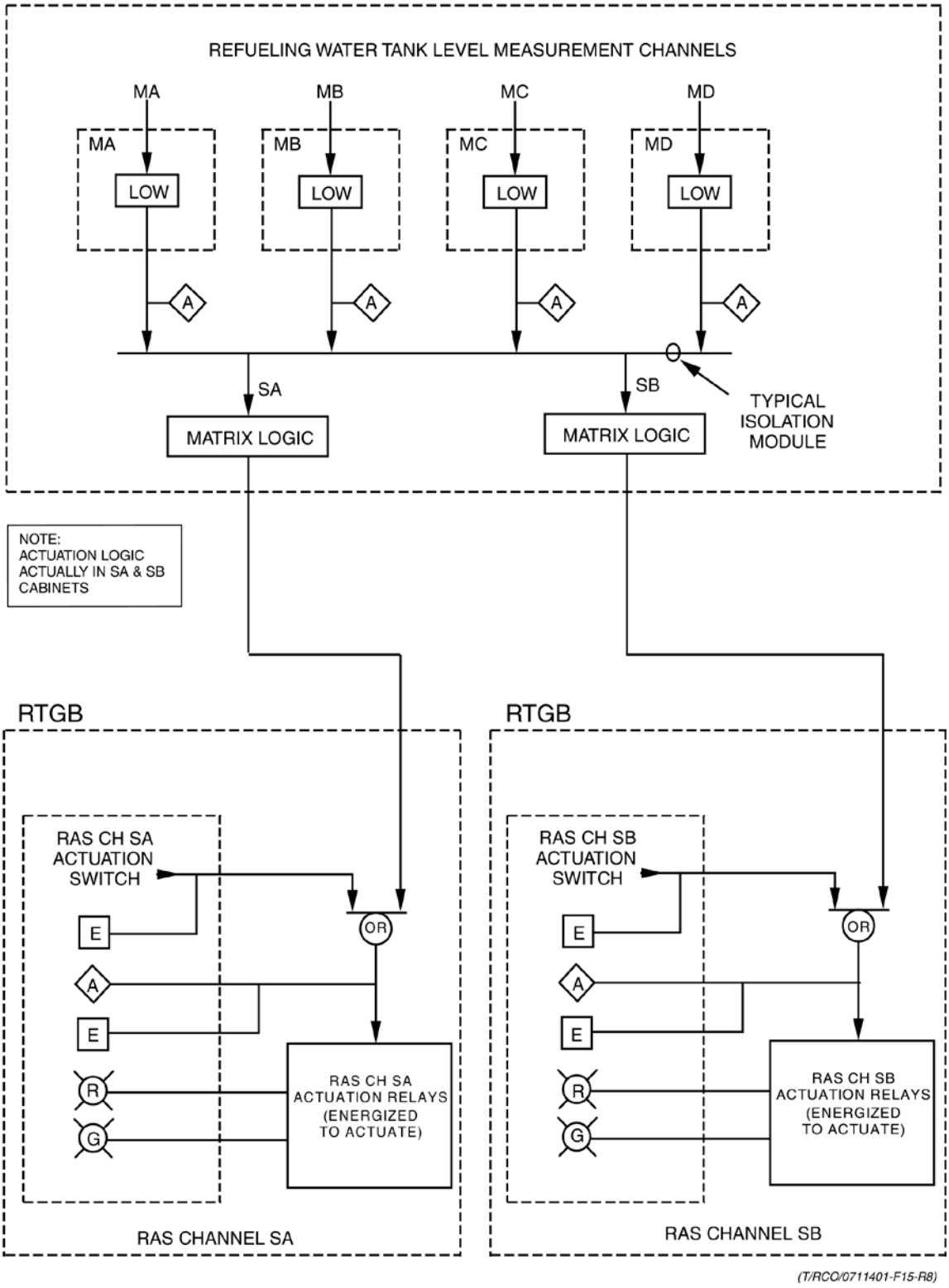


FIGURE 16

ORIGINAL QUESTION FROM 2010 NRC

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	103A3.01	
	Importance Rating	3.9	

Containment: Ability to monitor automatic operation of the containment system, including: Containment Isolation

Proposed Question: RO 55

Unit 1 is operating at 100% power. PT-07-2A, 'Containment Pressure' transmitter failed high and has yet to be bypassed. A loss of the MD instrument bus occurs.

Which ONE of the following defines **ALL** the ESFAS signals that will actuate?

A. CIAS, CSAS, MSIS and SIAS

B. CSAS, SIAS

C. CIAS, MSIS and SIAS

D. CIAS, SIAS

Proposed Answer: D

Explanation (Optional):

A. CSAS is energize to actuate. On Unit 1 MSIS DOES NOT actuate on high containment pressure. This is only a Unit 2 function only.
B. CSAS is energize to actuate.
C. On Unit 1 MSIS DOES NOT actuate on high containment pressure. This is only a Unit 2 function.
D. Correct.

Technical Reference(s): Lesson Text 0711401 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: _____

Learning Objective: Lesson Plan 0702401 Obj. 8 (As available)

Question Source: Bank # 2004

Modified Bank # _____ (Note changes or attach parent)

ORIGINAL QUESTION FROM 2010 NRC

	New	
Question History:	Last NRC Exam	
Question Cognitive Level:	Memory or Fundamental Knowledge	
	Comprehension or Analysis	x
10 CFR Part 55 Content:	41.7	
	45.5	

Comments:

56.

002 K5.09 Reactor Coolant / Knowledge of the operational implications of the following concepts as they apply to the RCS: Relationship of pressure and temperature for water saturation and subcooling conditions

Given the following conditions:

- Unit 2 tripped from 100% power due to a ESDE inside containment
- 2-EOP-05, ESDE is in progress at step 28, Verify Letdown in service
- RCS Pressure is 2200 psia and being controlled by aux spray
- Pressurizer Level is 80% and slowly RISING
- Pressurizer Water Temp on TIA-1101 is 570 °F
- SIAS has been RESET per 2-EOP-99 Appendix P, Restoration of Components Actuated by ESFAS

Which ONE of the following completes the statement below?

IF letdown is established and Pressurizer Level is lowered to 65%, RCS pressure _____.

A.	can be controlled at its current value by controlling aux spray
B.	can be controlled at its current value by the operation of PZR heaters
C.	will drop uncontrollably to < 1300 psia and SIAS will automatically actuate
D.	will drop uncontrollably to < 1300 psia but SIAS will NOT automatically actuate

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Plausible. If the applicant has the misconception that the pressurizer water is at saturation and being controlled by aux spray. Any pressure drop will be limited by the pressurizer water flashing to steam.
B.	Incorrect:	Plausible. If the applicant has the misconception that the pressurizer heaters will heat the water to flash to steam to limit the pressure drop. The heaters will not quickly heat the water for this to be effective.
C.	Correct:	The pressurizer is NOT at saturation temperature for 2200 psia. As letdown is restored and Pressurizer level is lowered, the pressure at which the pressurizer water would flash to steam and limit the pressure drop is 1220psia. As level is lowered, pressure will lower rapidly. At 1736 psia, SIAS will actuate.
D.	Incorrect:	Plausible. Appendix P resets the SIAS. Blocking of SIAS on lowering pressure is ONLY allowed if it is controlled.

Question Number: 56

Tier: 2 Group: 2

K/A: 002 K5.09 Reactor Coolant / Knowledge of the operational implications of the following concepts as they apply to the RCS: Relationship of pressure and temperature for water saturation and subcooling conditions

Importance Rating: 3.7 4.2

10 CFR Part 55: (CFR: 41.5 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required know that you must achieve saturated conditions in the Pressurizer to draw a bubble and the operational implications of the heatup on TS limits.

Technical Reference: 2-GOP-502, Steam Tables

Proposed references to be provided: None

Learning Objective: PSL OPS 0702801-3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: BANK question from 2017 NRC Exam # 36

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

NOTE

All of the following are necessary for restoration of Letdown:

- Instrument Air
- Non-essential sections of MCCs 2A6 and 2B6 energized energized (for Q Valves)
- SIAS and CIAS reset

*	**28.**	**VERIFY** letdown IN SERVICE.	**28.1** IF both of the following conditions are MET: • Letdown flow is DESIRED • HPSI throttle criteria are MET THEN **PERFORM** the following: **A.** **DIRECT** HP to monitor the VCT hallway for rising radiation levels. **B.** **RESTORE** Letdown per Appendix P, Restoration of Components Actuated by ESFAS.

APPENDIX P
RESTORATION OF COMPONENTS ACTUATED BY ESFAS
(Page 1 of 19)

NOTE

These sections may be performed as needed based on plant conditions.

Section 1 - SIAS Block and Reset
Section 2 - CIAS Reset
Section 3 - MSIS Block and Reset
Section 4 - CSAS Reset and Component Restoration
Section 5 - System / Component Restoration
- 5.1 – Instrument Air
- 5.2 – Component Cooling Water
- 5.3 – Emergency Diesel Generators
- 5.4 – Recovering Power to Pressurizer Heaters
- 5.5 – Charging and Letdown
- 5.6 – Safety Injection
- 5.7 – Ventilation
- 5.8 – Miscellaneous Components
  - A. - Containment Sample
  - B. - Steam Generator Blowdown
  - C. - Containment Waste Gas
  - D. - Reactor Drain Tank
  - E. - ICW to TCW Heat Exchangers
  - F. - RCP Bleedoff
  - G. - Primary Water to Containment
  - H. - SIAS Reset Pushbuttons on RTGB-206

SECTION 1: SIAS BLOCK and RESET

NOTE

Reset of SIAS will not be possible until containment pressure is lowered below SIAS actuation setpoint.

☐ **1.** VERIFY the following plant parameters:

- ☐ Containment pressure is less than 3.4 psig (3 out of 4 safety channels) and NOT rising.
- ☐ Annunciator Q-3, Cntmt Press SIAS Channel Trip, is NOT illuminated.

☐ **2.** ENSURE Table 1, Safety Injection Actuation Signal, has been completed.

APPENDIX P
RESTORATION OF COMPONENTS ACTUATED BY ESFAS
(Page 2 of 19)

SECTION 1: SIAS BLOCK and RESET (continued) A Train (√) B Train (√)

☐ **3.** If **BOTH** of the following conditions are met,

- SIAS Block Permissive amber lights (above the keyswitches) are illuminated ___ ___
- Annunciator R-8, SIAS Channel A/B Actuation Block Permissive, is illuminated ___ ___

Then **BLOCK** SIAS as follows:

A. PLACE SIAS BLOCK Channel Keyswitch to BLOCK. ___ ___

B. VERIFY SIAS Channel Actuation Blocked Alarm is illuminated. R-9___ R-10___

CAUTION
If Appendix A, Sampling Steam Generators or Appendix J, Restoration of CCW and CBO to the RCPs has been performed, Then resetting SIAS will CLOSE the associated train 'N' Header Valves.

☐ **4.** **RESET** SIAS as follows:

A. PLACE SIAS Manual Actuation Handswitch to RESET. ___ ___

B. VERIFY the red actuation light clears and the green reset light illuminates. (above the handswitch) ___ ___

NOTE
Annunciator R-6 will NOT clear until **BOTH** trains of SIAS have been reset.

☐ **C.** VERIFY Annunciator R-6, SIAS Channel A/B Actuation, is NOT illuminated.

End of Section 1

APPENDIX P
RESTORATION OF COMPONENTS ACTUATED BY ESFAS
(Page 13 of 19)

SECTION 5: SYSTEM / COMPONENT RESTORATION
(continued)

5. Charging and Letdown.

☐ **A.** ENSURE the Inventory Control Safety Function is configured to support loss of Charging.

☐ **B.** PLACE **ALL** charging pumps in STOP.

☐ **C.** CLOSE V2508, BA Gravity Feed 2B.

☐ **D.** CLOSE V2509, BA Gravity Feed 2A.

☐ **E.** STOP BA Pump 2A and RETURN switch to AUTO.

☐ **F.** STOP BA Pump 2B and RETURN switch to AUTO.

☐ **G.** CLOSE V2514, Emergency Borate.

☐ **H.** OPEN V2650, BA Tank 2A Recirc Valve, by placing the control switch to RESET and then to OPEN.

☐ **I.** OPEN V2651, BA Tank 2B Recirc Valve, by placing the control switch to RESET and then to OPEN.

☐ **J.** If suction from the VCT is desired,
Then perform the following:

- ☐ **1.** ENSURE VCT level is between 40% to 54%.
- ☐ **2.** OPEN V2501, VCT Outlet Valve, by placing its control switch to CLOSE / RESET and then to OPEN.
- ☐ **3.** RESTORE Charging and Letdown.
REFER to 2-AOP-02.03, Charging and Letdown.

☐ **K.** If suction from the RWT is desired,
Then perform the following:

- ☐ **1.** ENSURE adequate level in RWT.
- ☐ **2.** OPEN V2504, Refuel Water to Charging Pumps.
- ☐ **3.** PLACE all Charging Pumps in AUTO.

ORIGINAL QUESTION FROM 2017 NRC

36. 010K5.01 Pressurizer Pressure Control/ Knowledge of the operational implications of the following concepts as they apply to the PZR PCS: Determination of condition of fluid in PZR, using steam tables

Given the following conditions:

- Unit 2 tripped from 100% power due to a ESDE inside containment
- 2-EOP-05, ESDE is in progress at step 28, Verify Letdown in service
- RCS Pressure is 2200 psia and being controlled by aux spray
- Pressurizer Level is 80% and slowly RISING
- Pressurizer Water Temp on TIA-1101 is 570 °F
- SIAS has been RESET per 2-EOP-99 Appendix P, Restoration of Components Actuated by ESFAS

Which ONE of the following completes the statement below?

IF letdown is established and Pressurizer Level is lowered to 65%, RCS pressure _____.

A.	can be controlled at its current value by controlling aux spray
B.	can be controlled at its current value by the operation of PZR heaters
C.	will drop uncontrollably to < 1300 psia and SIAS will automatically actuate
D.	will drop uncontrollably to < 1300 psia but SIAS will NOT automatically actuate

ORIGINAL QUESTION FROM 2017 NRC

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Plausible. If the applicant has the misconception that the pressurizer water is at saturation and being controlled by aux spray. Any pressure drop will be limited by the pressurizer water flashing to steam.
B.	Incorrect:	Plausible. If the applicant has the misconception that the pressurizer heaters will heat the water to flash to steam to limit the pressure drop. The heaters will not quickly heat the water for this to be effective.
C.	Correct:	The pressurizer is NOT at saturation temperature for 2200 psia. As letdown is restored and Pressurizer level is lowered, the pressure at which the pressurizer water would flash to steam and limit the pressure drop is 1220psia. As level is lowered, pressure will lower rapidly. At 1736 psia, SIAS will actuate.
D.	Incorrect:	Plausible. Appendix P resets the SIAS. Blocking of SIAS on lowering pressure is ONLY allowed if it is controlled.

ORIGINAL QUESTION FROM 2017 NRC

Question Number: 36

Tier: 2 Group: 1

K/A: 010K5.01 Pressurizer Pressure Control/ Knowledge of the operational implications of the following concepts as they apply to the PZR PCS: Determination of condition of fluid in PZR, using steam tables

Importance Rating: 3.5 4.0

10 CFR Part 55: (CFR 41.5)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required know that you must achieve saturated conditions in the Pressurizer to draw a bubble and the operational implications of the heatup on TS limits.

Technical Reference: 2-GOP-502, Steam Tables

Proposed references to be provided: None

Learning Objective: PSL OPS 0702801-3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2017 NRC RO Exam

Comments:

57.

011 A3.03 / Pressurizer Level Control / Ability to monitor automatic operation of the PZR LCS, including: Charging and Letdown

Given the following conditions:

- Unit 1 is at 100% power
- Pressurizer Level LOWERS to 61% due to a transient

Which ONE of the following completes the statements below?

____(1)____ backup charging pump(s) will automatically start.

Charging flow will increase to the design capacity flow rate ____(2)____.

A.	(1)	ONE
	(2)	immediately
B.	(1)	ONE
	(2)	after 3 minutes
C.	(1)	TWO
	(2)	immediately
D.	(1)	TWO
	(2)	after 3 minutes

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: But plausible. If on Unit 2 only 1 backup charging pump would start in this condition Part 2 correct: See analysis C.
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 incorrect: But plausible. On Unit 2 Charging flow does not immediately rise to design flow due to the recirculation valve being open and closing over 170 seconds.
C.	Correct:	Part 1 correct: On Unit 1 the deviation on 5% from program will result in both backup charging pumps starting. Part 2 correct: On Unit 1 the charging pumps will immediately discharge design flow.
D.	Incorrect:	Part 1 correct: See analysis A. Part 2 incorrect: See analysis B.

Question Number: 57

Tier: 2 Group: 2

K/A: 011 A3.03 / Pressurizer Level Control / Ability to monitor automatic operation of the PZR LCS, including: Charging and Letdown

Importance Rating: 2.9 3.2

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how the PPLCS system and CVCS system operate to maintain Pzr Level.

Technical Reference: 1/2-AOPO-01.01

Proposed references to be provided: None

Learning Objective: PSL OPS 0702205 - 7

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

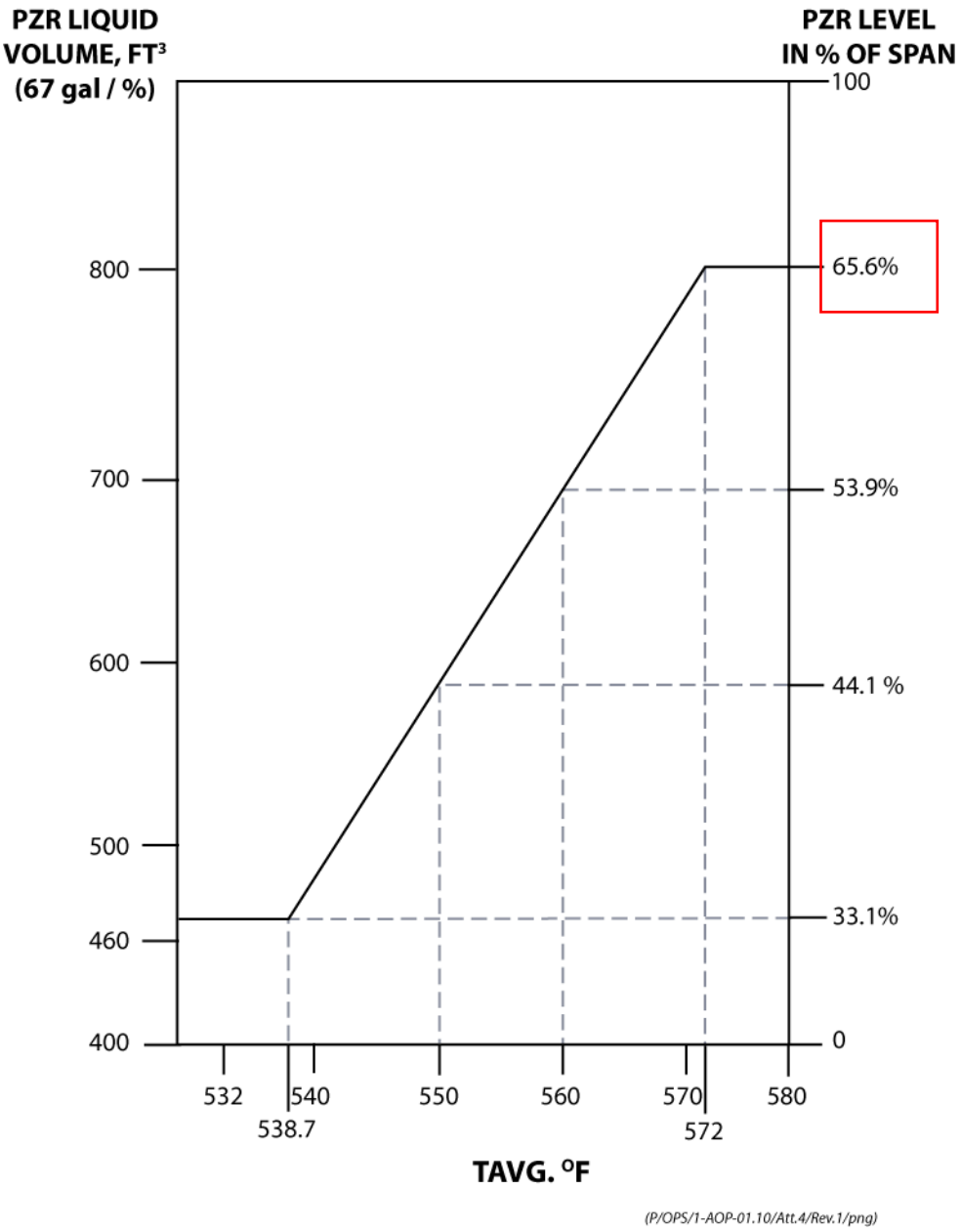
Question History: PSL LOIT Bank question for the 2019 NRC Exam

Comments:

ATTACHMENT 3
Automatic Responses to Pressurizer Level Deviations
(Page 1 of 1)

PRESSURIZER LEVEL SETPOINTS	
Pressurizer Level (%)	**Automatic Responses**
+9% rising	Letdown flow increases to maximum (128 gpm)
+5% rising	High level alarm
+3.6% rising	All backup heaters energize if in automatic Both backup charging pumps receive stop signal
0%	**DEVIATION FROM RRS SETPOINT FOR PRESSURIZER LEVEL**
-1% lowering	Letdown flow lowers to minimum (29 gpm)
-1% rising	First backup charging pump stops
-2% rising	Second backup charging pump stops
-3% lowering	First backup charging pump starts
-4% lowering	Second backup charging pump starts
-5% lowering	Low level alarm All charging pumps receive backup start signal
28% indicated level	All Pressurizer heaters deenergize

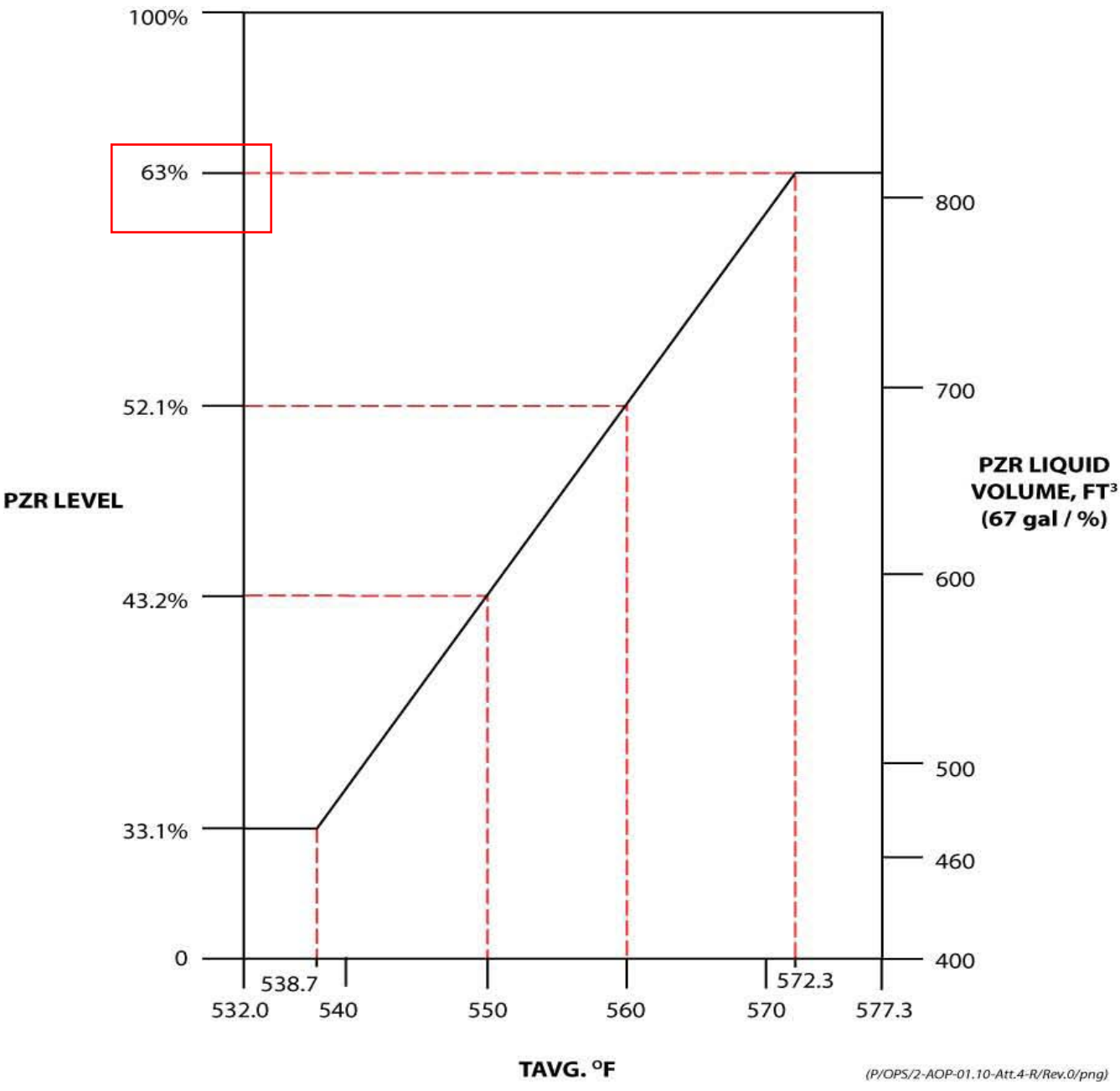
ATTACHMENT 4
Pressurizer Level Program Graph
(Page 1 of 1)



ATTACHMENT 3
Automatic Responses to Pressurizer Level Deviations
(Page 1 of 1)

PRESSURIZER LEVEL SETPOINTS	
Pressurizer Level (%)	**Automatic Responses**
>68%	Pressurizer in-operable per TS 3.4.3
67% indicated level or +5% deviation	High level alarm
+9% rising	Letdown flow increases to maximum (128 gpm)
+3.6% rising	All backup heaters energize if in automatic and pressure is <2275 psia Backup charging pumps receive a backup stop signal
0%	**DEVIATION FROM RRS SETPOINT FOR PRESSURIZER LEVEL**
-1% lowering	Letdown flow decreases to minimum (29 gpm)
-1% rising	Backup charging pump stops
-3% lowering	Backup charging pump starts
-5% lowering	Low Level Alarm and Backup charging pump receives a backup start signal
27% indicated level	All Pressurizer heaters deenergize Respective Pressurizer heater transformer feeder breaker opens
<27% indicated level	Pressurizer is in-operable per TS 3.4.3

ATTACHMENT 4
Pressurizer Level Program Graph
(Page 1 of 1)



- Between 0% and 15% Reactor power, Pressurizer level is constant at 33.1%.
- Between 90% and 100% Reactor power, Pressurizer level is constant at 63%.

3. Any pump in “Stop” will remain off.

Response to Pump Protective Devices:

The reciprocating plunger charging pumps used at St. Lucie require a minimum of 9 psia at the pump suction. The VCT pressure and level are maintained at values (23 to 30 psig and > 5% level) sufficient to ensure the minimum NPSH requirements and the charging pump suction stabilizers minimize the acceleration head losses. However, the pumps are also protected by low suction pressure trips at 10 psia. The charging pumps on each unit will automatically stop on:

- Low pump suction pressure – Trip at 10 psia
- Low oil pressure (Unit 2 only) – Trip at 4.0 psig

In addition to the above, alarms will be received for:

- Low oil pressure
- Low stuffing box water level
- Breaker overload
- Low pump oil level
- Low gear reducer oil level

Response to Recirc Valve Operation [Unit 2 Only]:

Unlike Unit 1, the charging pumps on Unit 2 are designed with recirculation valves. The design is not for protection of the charging pump, as relief valves serve the over pressure protection requirement, but for the thermal stress protection of the charging and letdown lines at the regenerative heat exchangers.

When a charging pump is started, the open recirc valve directs the effluent back to the VCT. The recirc valve will then modulate closed over a 170-second period thereby slowly increasing flow to the regenerative heat exchanger. This procedure slows the flow transient and therefore moderates any possible thermal shock to the piping.

As long as the charging pump breaker remains closed, the recirc valve will remain closed allowing full charging flow to the regenerative heat exchanger. During normal operations, if a thermal overload occurs in the valve motor during the closing cycle, the

58.

015 K2.01 / Nuclear Instrumentation Knowledge of bus power supplies to the following: NIS channels, components and interconnections

Given the following conditions:

- Unit 1 is at 100% power
- The following RPS indications are observed:
    - Two (2) K relays K1 and K2 are de-energized
    - Channel “A” Wide Range Nuclear channel indicating **‘0’**
    - Channel “A” Linear Range Nuclear channel indicating **‘0’**

Which ONE or the following describes the failure that has caused the above condition and the status of the RPS Trip Circuit Breakers (TCBs)?

A loss of the _____.

A.	‘A’ CEA MG set. Four (4) TCBs are open
B.	‘A’ 125V DC bus. Eight (8) TCBs are open
C.	‘A’ Instrument bus. Two (2) TCBs are open
D.	‘A’ Instrument bus. Four (4) TCBs are open

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Loss of one CEA MG set will have no effect as long as the other MG set is operating and the bus tie breaker is closed, which is the normal operating practice.
B.	Incorrect:	A loss of A DC bus will result in a loss of two instrument busses, four K relays opening and eight TCB's opening
C.	Incorrect:	Loss of Instrument bus will result in four TCB's opening.
D.	Correct:	Each K relay operates two TCB's. Two logic matrix relays will open two K relays.

Question Number: 58

Tier: 2 Group: 2

K/A: 015 K2.01 / Nuclear Instrumentation Knowledge of bus power supplies to the following: NIS channels, components and interconnections

Importance Rating: 3.3 3.7

10 CFR Part 55: (CFR: 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the bus power supplies to the NIS components

Technical Reference: Lesson Text 0711404

Proposed references to be provided: None

Learning Objective: PSL OPS 0702404 Obj. 7

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: BANK question from 2011 PSL NRC Exam # 57

Failures that affect the logic portion of the circuit:

- Indicating lights identify inadvertent operation of matrix relay contacts.

- Shorting of the pairs of trip contacts in the logic ladders prevents the matrix trip relays from being released. These failures can be detected during matrix relay testing by observing that the trip relays do not drop out.

- Grounds in the logic matrix have no effect and are indicated by the ground detection circuits. Application of external voltages to the matrices have no effect due to the system being ungrounded.

- Single 120VAC instrument power supply failures to a logic matrix causes 4 TCBs to open on one side. See Figure 3. This is due to de-energization of only two logic matrix relays in a logic matrix. In the case of a loss of instrument bus MA, two logic matrix relays are lost in logic matrices AB, AC & AD. The loss of these logic matrix relays result in opening trip path contacts in trip paths 1 & 2 . When K relays 1 & 2 de-energize the drop out of the TCB undervoltage trip relays and pickup of the shunt trip relays will open TCBs 1, 5, 2, & 6. Assuming a normal electrical lineup no plant trip will occur. A loss of both power supplies results in a de-energization of all four logic matrix relays causing all 8 TCBs to open tripping the plant. Note a loss of a single 120VAC instrument power supply will directly drop out a single K relay and opens its associated 2 TCBs.

- Loss of a single 125 VDC power supply will result in a reactor trip due to the loss two instrument buses MA/MC on loss of "A" 125VDC or MB/MD on loss of "B" VDC. In the case of a loss of "A" 125VDC power is lost to all 4 logic matrix relays of logic matrices AB & AC and to the undervoltage trip relays for TCBs 1, 5, 3 & 7. All 4 Trip paths & associated K relays are de-energized which forces TCBs 1thru 8 to open as the undervoltage trip relays of all the TCBs and the shunt trip relays of TCBs 2, 6, 4 & 8 operate. See Figure 3.

- Failure of the trip relays of a logic matrix to deactivate has no effect since there are six logic matrices, whose trip relay contacts will initiate trip action and cause the protective action to be completed.

- Control channels and protective channels are independent.
- A reactor trip is initiated by a 2-out-of-4 coincidence of trip signals.
- Protective system logic can be changed to a 2-out-of-3 coincidence logic by bypassing a channel for maintenance or testing. If that channel is now placed in the tripped condition, then this results in a 1-out-of-3 logic for the remaining channels.
- Power to the channels is provided by independent preferred power supply buses.
- Four trip signals to two CEDM power supplies are generated by a 2-out-of-4 coincidence logic to initiate protective action.
- All trip units and logic matrices are de-energize to trip.
- Trip logic is 1-out of 2 taken twice
- Four separate 120 VAC instrument buses supply protective system AC power.
- An alarm and/or a measurement channel trip is initiated on loss of power to that channel.
- RPS can be tested in all modes.
- Manual trip and automatic trip circuits are independent of one another.
- Where possible, trip signals are preceded by alarms (pretrip alarms) to alert the operator to undesirable operating conditions so corrective action can be taken and a reactor trip averted. (Exceptions include the Loss of Load [Loss of RCP Component Cooling Water] trips)

GENERAL DESCRIPTION

The RPS is provided to protect the reactor from AOOs that occur as a result of system malfunctions, faulty operations, or component failures requiring immediate protective action. In order to ensure protection under these conditions, the RPS monitors a number of plant parameters essential to the safe operation of the plant. The RPS trip signals are:

- Variable High Power Level
- High Rate of Change of Power (Startup Rate)
- Low Reactor Coolant Flow
- Low Steam Generator Water Level
- Low Steam Generator Pressure
- High Pzr Pressure
- Thermal Margin/Low Pressure (TM/LP)
- Loss of Load
- High Cntmt Pressure
- Local Power Density (LPD)
- [Loss of RCP Component Cooling Water]
- Asymmetrical Steam Generator Transient (ASGT) – via TM/LP

The parameters are supplied to four protective channels: A, B, C, and D as input signals to the trip units. There are two types of trip units:

- Bistable trip units (BTUs)
- Auxiliary trip units (ATUs): Loss of load, LPD, [Loss of RCP CCW] trips only

The bistable trip units receive analog input signals; the auxiliary trip units receive on-off input signals from auxiliary contacts.

The outputs from the trip units are arranged to form 6 coincidence logic matrices: AB, AC, AD, BC, BD, and CD. These 6 logic matrices are grouped in such a way as to represent all possible 2-out-of-4 combinations of trip signals. When one of the six logic matrices trips, a signal is supplied to four matrix relays that in turn also trip and provide trip signals to each of the four circuits that interrupt AC power to the Control Element Drive Mechanism (CEDM) power supplies. This de-energizes the magnetic coils used to hold the control element assemblies (CEAs). Refer to Figure 1.
A manual trip independent of RPS trips bypasses all trip logic and directly de-energizes the four circuits that interrupt AC power to the CEDM power supplies.

The CEDMs are powered by two 150 KW motor generator (MG) sets which receive their power from 480 VAC LCs-1A2/1B2) [2A2/2B2]. Each MG set is capable of providing

adequate power to hold all control rods and sustain the motion of any element already being stepped during a one-second loss of power to the MG set's motor. The MGs are arranged in parallel, so that the loss of a single MG does not result in the release of CEAs.

Each power supply source is separated into two buses. Each bus passes through two pairs of trip circuit breakers (each pair actuated by a different trip path) in series so that, although both sides must be de-energized to release the CEAs, there are two separate means of interrupting each side of the line. This arrangement provides a means of testing the RPS at power. CEDM power supplies are covered in detail in the CEDS RCO lesson text, 0711405. To trip it would take 1 out of the two pairs of trip circuit breakers per side. This results in a one out of two taken twice actuation trip logic. See Figures 1 & 3.

The four protective channels that monitor the NSSS parameters are independent and isolated from each other. All measuring circuits are ungrounded, with interconnecting wiring run through separate conduits and wiring trays. Each channel has a separate cabinet to provide channel isolation.

Figure 2 illustrates the front panel layout of the RPS cabinet assembly. It includes the following components:

- Cabinet Assembly
- Trip Status Panel
- RPS Power Supplies
- Nuclear Instrumentation (NIs)
- RPS Calibration and Indication Panels (RPSCIP)
- Trip Units
- Trip Test Cable Panels
- Trip Inhibit Switch Panels
- Logic Test Modules and Test Power Supply
- Auxiliary Logic Assemblies
- Core Protection Calculator # 1 (CPC-1)
- Core Protection Calculator # 2 (CPC-2)

TRIP PATHS

The four trip channels, A, B, C, and D and their associated trip unit relays are arranged to provide a 2-out-of-4 coincidence logic. The relay contacts are distributed among six logic matrix ladders designated as AB, AC, AD, BC, BD, and CD representing all possible 2-out-of-4 trip combinations. Each logic ladder supplies power to four matrix relays. Refer to Figures 17 and 18.

Recall that each trip unit has five relays: two alarm relays (trip and pretrip); and three trip relays that operate the contacts in the logic matrices. Each trip relay operates two contacts in its associated logic ladder: one to maintain the matrix relays energized (normal contact) and one to provide trip indication (trip contact). When the trip relay is energized, the "normal contact" is closed and the "trip contact" is open. When the trip relay de-energizes, the "normal contact" opens and the "trip contact" closes. The "trip contact" aligns power to the small red lights on the front of the trip units. The contacts depicted in Figures 17 and 18 are operated by the trip relays. For normal (energized) operation (Figure 17), current (depicted by arrows) flows from the power supplies, down the outside of the "ladder", up through matrix relays AB1, AB2, AB3, and AB4, through closed contacts A10-1 to A1-1 and B10-1 to B1-1, and finally to the positive terminals of the power supplies.

A TM/LP trip occurring in channels A and B will prevent current from flowing through the matrix relays. As shown on Figure 18, an open circuit will exist at contacts A7-1 and B7-1. The only current flow is through the "trip contacts" and trip indicator lights. The matrix relays de-energize and four trip path ‘K’ relays will de-energize causing the ‘K’ contacts in the TCB circuits to open. Subsequently, all TCBs open and all CEAs insert. The red "trip relay contact" lights indicate which channels and trip unit(s) have operated contacts in the logic matrix.

If only one channel trips, a current flowpath still exists and a reactor trip does not occur. Also, if a TM/LP trip occurs in channel A (A7-1), and an LPD trip occurs in channel B (B10-1), again a reactor trip does not occur. Two-out-of-four of the **same** NSSS trip unit must trip for a logic ladder circuit to be fully interrupted. Each logic matrix contains four matrix relays, all of which de-energize when the associated logic ladder is fully interrupted. If the associated matrix ladder is not fully interrupted, none of the logic matrix relays de-energize.

Each matrix has two 28 VDC power supplies, each powered from a different instrument bus. Failure of one matrix power supply only de-energizes two of the four matrix relays (e.g.,

REACTOR PROTECTIVE SYSTEM BLOCK DIAGRAM

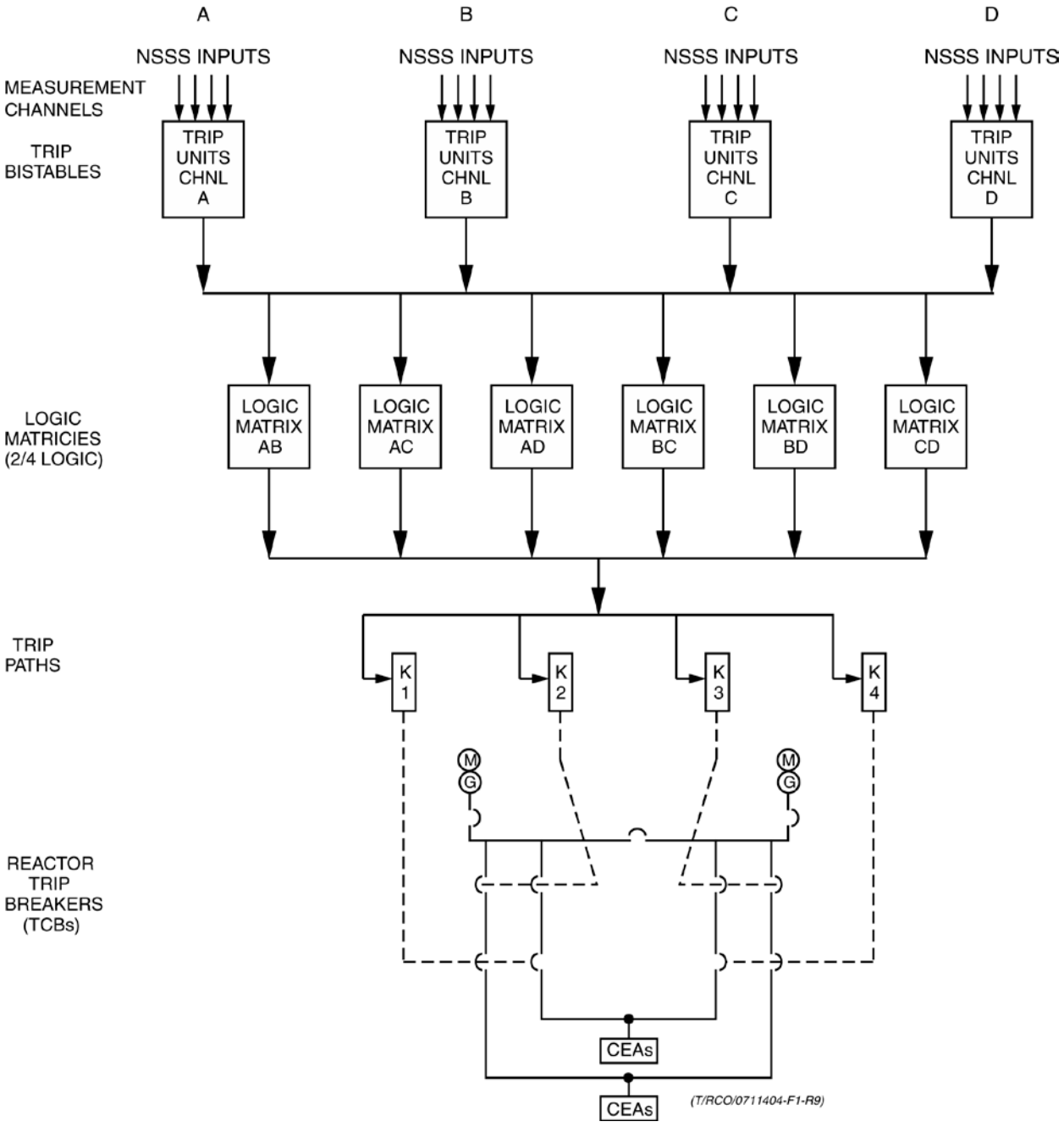


FIGURE 1

SIMPLIFIED FUNCTIONAL DIAGRAM OF THE REACTOR PROTECTIVE SYSTEM

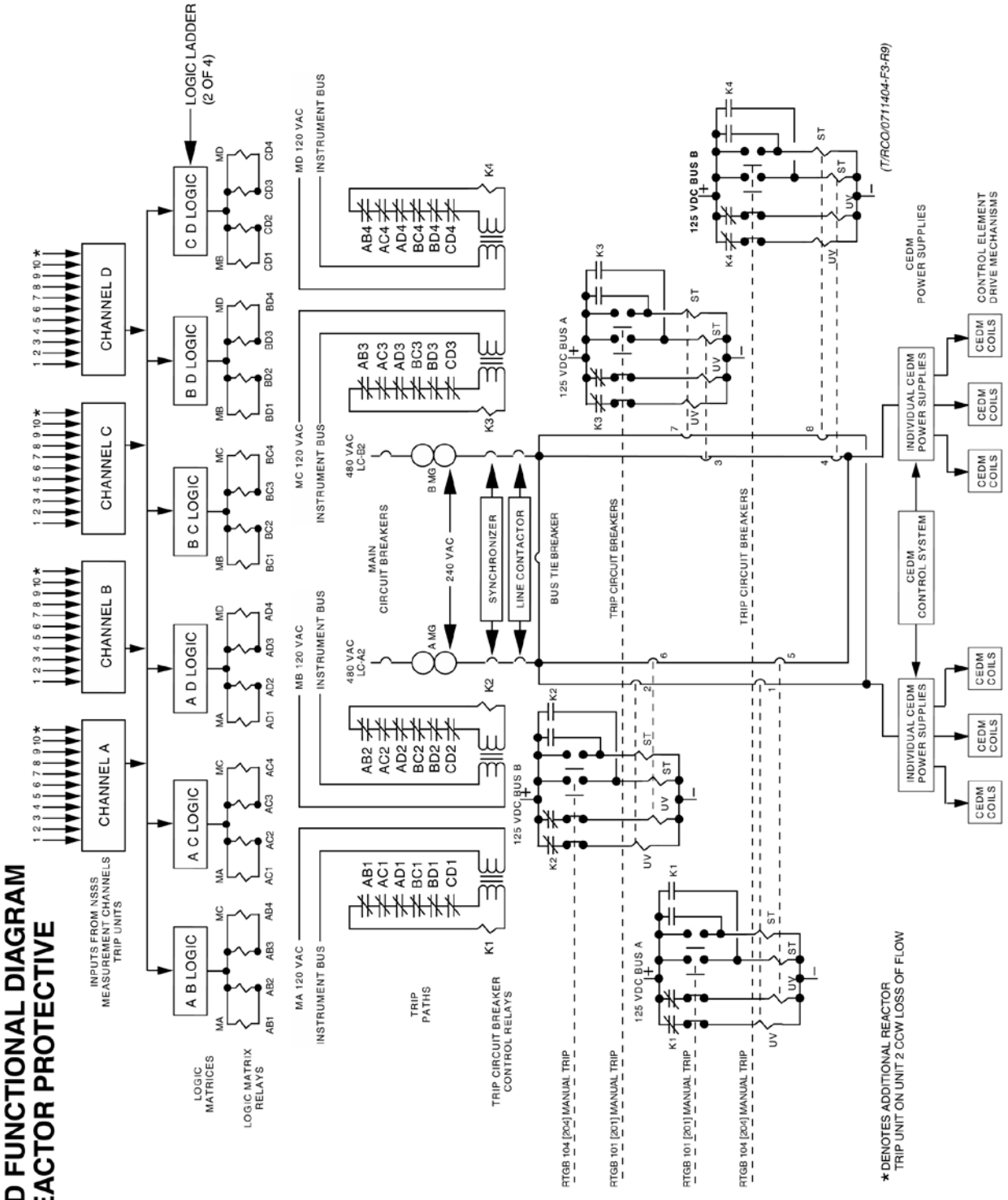


FIGURE 3

ORIGINAL QUESTION FROM 2011 NRC

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	015K2.01	
	Importance Rating	3.3	

Nuclear Instrumentation: Knowledge of bus power supplies to the following: NIS channels, components, and interconnections

Proposed Question: RO 57

Unit 1 is at 100% power with the following RPS indications:

- Two (2) K relays K1 and K2 are de-energized.
- Two (2) logic matrix relays open.
- Channel 'A' Wide Range Nuclear channel indicating '0'.
- Channel 'A' Linear Range Nuclear channel indicating '0'.

Which ONE or the following states the failure that has caused the above condition and the status of the RPS Trip Circuit Breakers (TCB's)?

A loss of :

A. 'A' Instrument bus. Four (4) TCB's are open.

B. 'A' Instrument bus. Two (2) TCB's are open.

C. 'A' CEA MG set. Four (4) TCB's are open.

D. 'A' 125V DC bus. Eight (8) TCB's are open.

Proposed Answer: A

Explanation (Optional):

A. Correct, each K relay operates two TCB's. Two logic matrix relays will open two K relays.
B. Loss of Instrument bus will result in four TCB's opening.
C. Loss of one CEA MG set will have no effect as long as the other MG set is operating and the bus tie breaker is closed, which is the normal operating practice.
D. A loss of A DC bus will result in a loss of two instrument busses, four K relays opening and eight TCB's opening.

ORIGINAL QUESTION FROM 2011 NRC

Technical Reference(s): Lesson Text 0711404 (Attach if not previously provided)

Proposed references to be provided to applicants during examination:

Learning Objective: PSL OPS 0702404 Obj. 7 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New x

Question History: Last NRC Exam

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis x

10 CFR Part 55 Content: 41.7

Comments:

59.

017 K1.01 / In-core Temperature Monitor / Knowledge of the physical connections and/or cause effect relationships between the ITM system and the following systems: Plant Computer

Which ONE of the following provides input to the Qualified Safety Parameter Display System (QSPDS) Subcooled Margin Monitor (SMM)?

A.	MAXIMUM HJTC temperature
B.	Representative CET temperature
C.	Auctioneered HIGH Thot temperature
D.	Safety Channel LOW Pressurizer pressure

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	This is plausible, HJTC temperatures are used for determination of RVLMS which is a shared indication with the subcooling margin monitor on the Qualified Safety Parameter Display system.
B.	Correct:	Used in calculation of the SMM – The core exit thermocouples respond to the coolant temperature at the core exit and their signal indicates superheat after the coolant level drops below the top of the core and, thus, provide an approximate indication of the depth of core uncovery.
C.	Incorrect:	This is plausible, auctioneered high Thot is used in the distributed control system for calculation of PPDIL/PDIL
D.	Incorrect:	This is plausible. The safety channels are used in RPS and ESFAS but not for calculation of the subcooling margin monitor. PT-1107 and 1108, WR pressure channels are used.

Question Number: 59

Tier: 2 Group: 2

K/A: 017 K1.01 / In-core Temperature Monitor / Knowledge of the physical connections and/or cause effect relationships between the ITM system and the following systems: Plant Computer

Importance Rating: 3.2 3.2

10 CFR Part 55: (CFR: 41.2 to 41.9 / 45.7 to 45.8)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the relationship between the ITM and the PC

Technical Reference: PSL OPS 0711407

Proposed references to be provided: None

Learning Objective: PSL OPS 0702411 - 3

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

Description of Sensors

Saturation Margin Monitor

The Saturation Margin Monitor (SMM), using input from existing Resistance Temperature Detectors (RTD) in the hot and cold legs and from the pressurizer pressure sensors, detects the initial occurrence of saturation during LOCA events and during loss of heat sink events.

Fluid temperature measurements from the Heated Junction Thermocouples (HJTC) and the signals from core exit thermocouples are input to calculate and display degrees superheat (up to about 1800°F) in addition to degrees subcooling.

The signals from the HJTC temperature measurements provide information about possible local differences in temperature between the reactor vessel upper head/upper plenum (location of the HJTC) and the hot or cold legs (location of the RTD's).

The core exit thermocouples respond to the coolant temperature at the core exit and their signal indicates superheat after the coolant level drops below the top of the core and, thus, provide an approximate indication of the depth of core uncovery.

The SMM can be used for detection of the approach to ICC, namely Condition 1 (loss of subcooling), and Condition 3 (core uncovery). The SMM is not capable of indicating the existence of Condition 2 when the coolant is at saturation conditions and the level Is between the top of the vessel and the top of the core.

Resistance Temperature Detectors (RTD)

The RTDs sense the initial occurrence of saturation. However, the RTD range is not adequate for ICC indications during core uncovery since, as the uncovery proceeds, the superheated steam temperature may quickly exceed the upper limit of the RTD range. The core exit thermocouples and the unheated thermocouples in the HJTC are then used.

Heated Junction Thermocouples (HJTC)

The HJTC show the liquid inventory of the mixture of liquid and vapor coolant above the core. These are the instruments which show the approach to ICC in Condition 2, namely the period from the initial occurrence of saturation conditions until the start of core uncovery.

Core Exit Thermocouples (CET)

The core exit thermocouples show the approach to ICC after core uncovery for the event analyzed. As mentioned above, the core exit thermocouples respond to the coolant temperature at the core exit and indicate superheat after the core is no longer completely covered by coolant. Except for a time delay of about 200 to 400 seconds, depending on event, the trend of the change in superheat corresponds to the trend of core uncovery as well as to the accompanying trend of the change in cladding temperature.

System Functional Description

Subcooling and Saturation

The parameters measured to detect subcooling and saturation are the RCS coolant temperature and the pressurizer pressure. Temperature is measured in the hot legs for typical LOCA type events and is measured in the vessel upper head region for cooldown events. The measurement range extends from the shutdown cooling conditions up to saturation conditions at the pressurizer safety valve setpoint. The response time is such that the operator obtains adequate information during those events which proceed slowly enough for him to observe and to act upon the information from the instrument display.

The information which is derived from the reactor vessel temperature and pressure measurements is the amount of subcooling during the initial approach to saturation conditions and the occurrence of saturation during Condition 1. Following core recovery, the reestablishment of subcooled conditions is obtained. During Condition 3, core uncovery, coolant superheat is measured.

Coolant Level Measurement in Reactor Vessel

The Reactor Coolant System is at saturation conditions until sufficient coolant is lost to lower the two-phase level to the top of the active core. A Reactor Vessel Level Monitoring System provides a direct measurement during this period. The parameter which is measured is the collapsed liquid level above the fuel alignment plate. The collapsed level represents the amount of liquid mass which is in the reactor vessel above the core. Measurement of the collapsed water level is selected because it is a direct indication of the water inventory.

HIGH PRESSURIZER PRESSURE TRIP SYSTEM (TYPICAL)

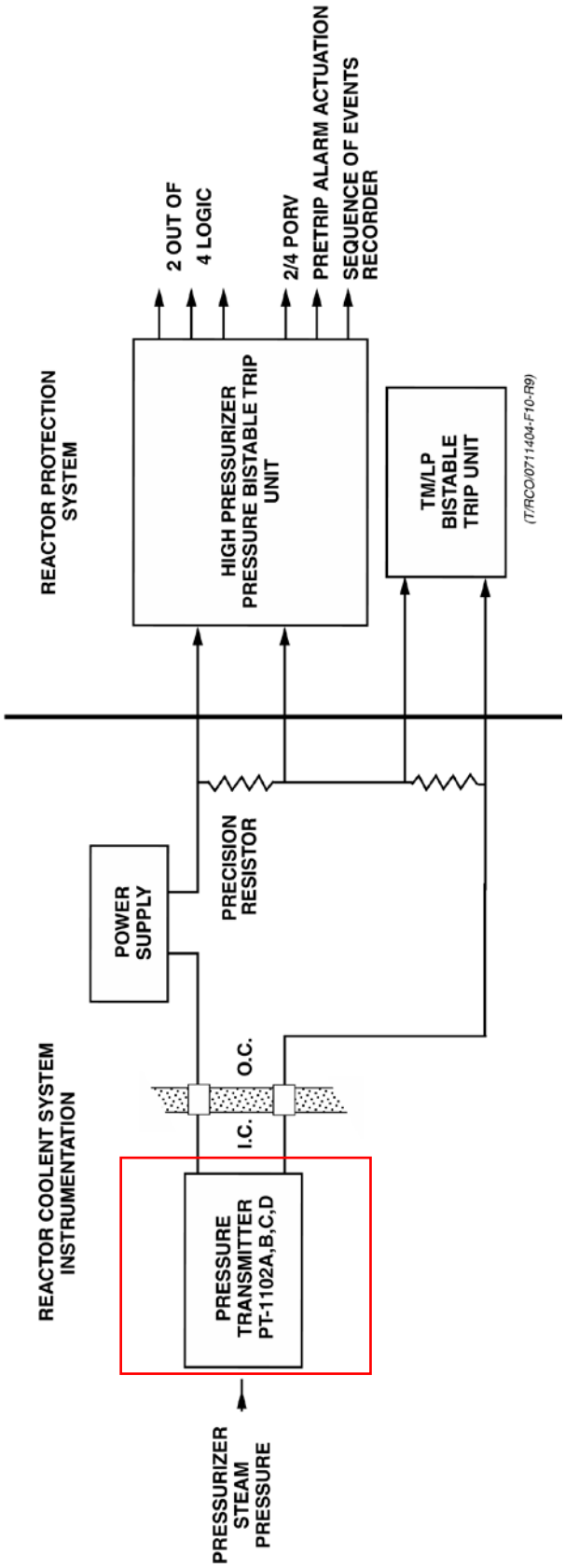
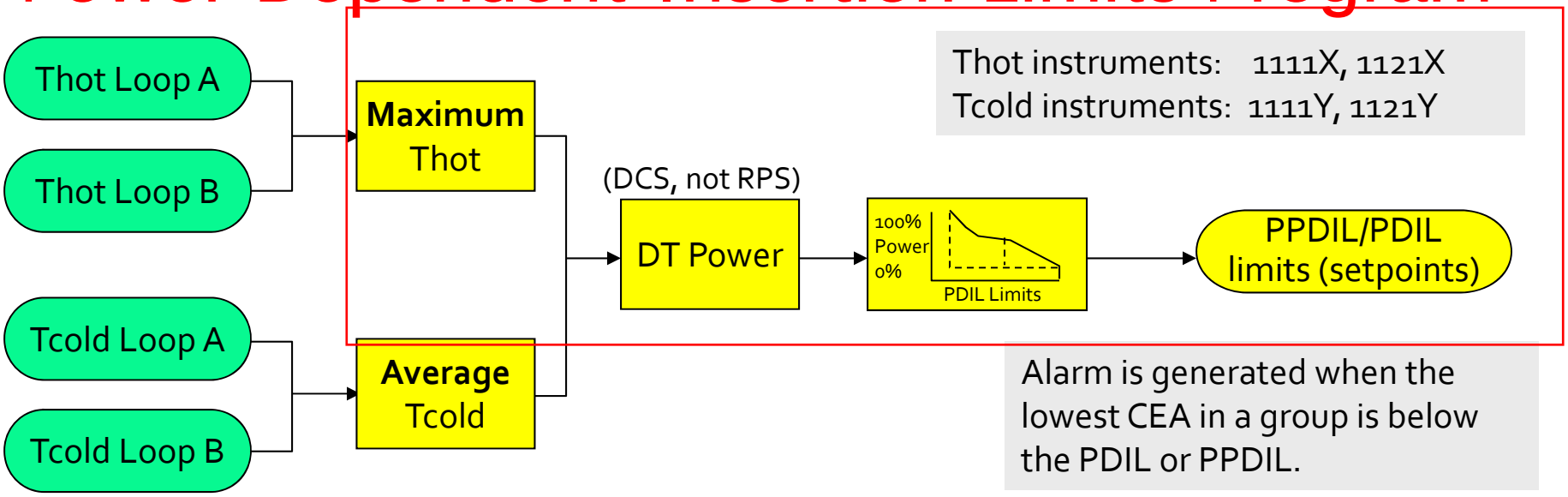


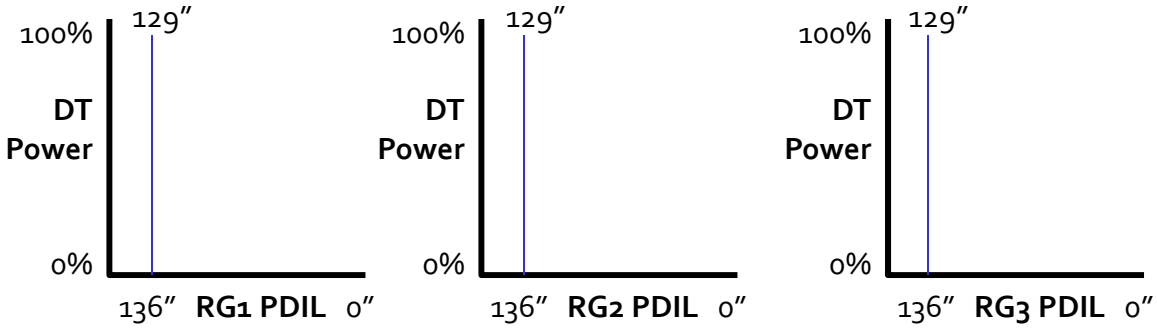
FIGURE 9

Power Dependent Insertion Limits Program

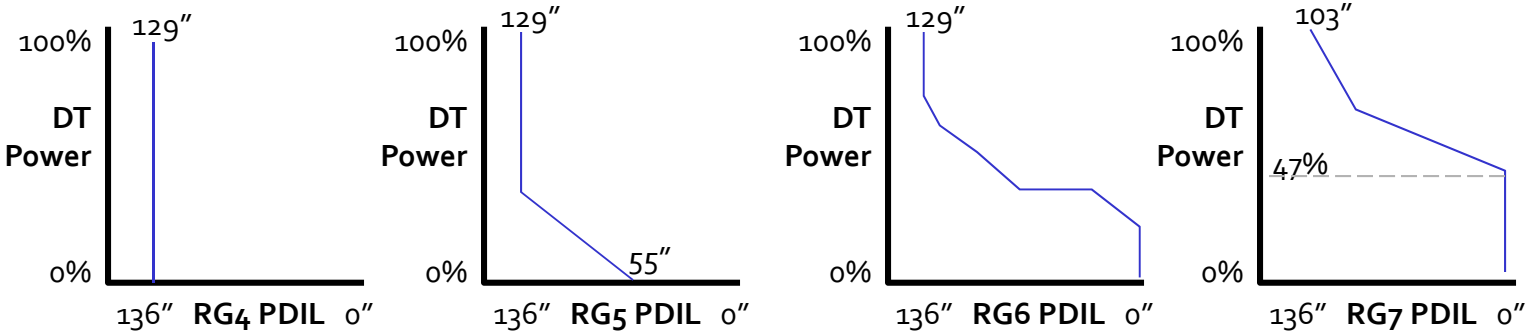


Thot instruments: 1111X, 1121X
Tcold instruments: 1111Y, 1121Y

Alarm is generated when the lowest CEA in a group is below the PDIL or PPDIL.



PDIL "curves" in COLR are stored in DCS as a series of constants (x, y coordinates) that define the curve breakpoints



60. 027 A2.01 / Containment Iodine Removal / Ability to (a) predict the impacts of the following malfunctions or operations on the CIRS; and (b) based on those predictions, use Procedures to correct, control, or mitigate the consequences of those malfunctions or operations: High temperature in the filter system

Given the following conditions:

- Unit 2 has experienced a LOCA
- 2-EOP-03, LOCA is in progress
- Hydrogen Purge is in progress in accordance with 2-EOP-99, Appendix N, Hydrogen Purge System Operation
- Annunciator X-1, Cont Cntmt/H2 Purge Adsorber Temp High Alarms
- H2 Purge Flow Exhaust indicates 50 cfm

Which ONE of the following completes the statements below?

In accordance with 2-EOP-99, Appendix N, the crew is required to____(1)____.

In accordance with 2-ARP-01-X1, Iodine Desorption occurs at approximately ____(2)____.

A.	(1)	secure the hydrogen purge
	(2)	200 °F
B.	(1)	secure the hydrogen purge
	(2)	300 °F
C.	(1)	throttle open FCV-25-28, Continuous Containment / Hydrogen Purge Control Valve Bypass to raise flow
	(2)	200 °F
D.	(1)	throttle open FCV-25-28, Continuous Containment / Hydrogen Purge Control Valve Bypass to raise flow
	(2)	300 °F

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: plausible since this is the required action of ARP-01-X1 if the condition cannot be corrected. EOP-99 App N requires the operator to maintain flow at 100 cfm. Per the ARP, flows less than 55 cfm can result in the high temperature condition. Part 2 incorrect: plausible since this is the alarm setpoint for annunciator X-1. Per the ARP, iodine desorption begins at 300F.
B.	Incorrect:	Part 1 incorrect: see analysis "A" Part 2 correct: see analysis "D"
C.	Incorrect:	Part 1 correct: see analysis "D" Part 2 incorrect: see analysis "A"
D.	Correct:	Part 1 correct: Per 2-EOP-99 Appendix N, directs the operator to "maintain flow rate of approximately 100 cfm" by adjusting FCV-25-28. Per 2-ARP-01-X1, flows of less than 55 cfm may result in the alarm due to insufficient flow. Part 2 correct: Per 2-ARP-01-X1, iodine desorption occurs approximately at 300F and charcoal ignition at approximately 640F.

Question Number: 60

Tier: 2 Group: 2

K/A: 027 A2.01 / Containment Iodine Removal / Ability to (a) predict the impacts of the following malfunctions or operations on the CIRS; and (b) based on those predictions, use Procedures to correct, control, or mitigate the consequences of those malfunctions or operations: High temperature in the filter system

Importance Rating: 3.0 3.3

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know to predict the impacts and mitigate the consequences of a High Temp in the filter system

Technical Reference: 2-EOP-99, App N. 2-ARP-01-X1

Proposed references to be provided: None

Learning Objective: PSL OPS 0702602 - 5

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

APPENDIX N
HYDROGEN PURGE SYSTEM OPERATION
(Page 1 of 2)

A Train (√) B Train (√)

CAUTION
Close coordination between the Technical Support Center and the Control Room is required to ensure personnel safety with regard to radioactive release rates, exposure and potential for hydrogen burn / explosion.

☐ **1.** ENSURE FCV-25-35, Continuous Containment Purge Exhaust to Vent Stack is CLOSED.

NOTE
If a CIAS is present FCV-25-20 and FCV-25-21 will need to be overridden open.

☐ **2.** OPEN the following valves:

- ☐ FCV-25-20, Continuous Cntmt. Purge Isol. Valve.
- ☐ FCV-25-21, Continuous Cntmt. Purge Suction.

☐ **3.** OPEN H_2 purge discharge to the desired train SBVS.

FCV-25-34, H_2 Purge Discharge to SBVS 'A'. ___

FCV-25-29, H_2 Purge Discharge to SBVS 'B'. ___

☐ **4.** ENSURE FCV-25-9, Continuous Containment / Hydrogen Purge Control Valve Filter Inlet, is CLOSED.

☐ **5.** THROTTLE OPEN FCV-25-28, Continuous Containment / Hydrogen Purge Control Valve Bypass, 10 to 20%.

☐ **6.** START the desired train SBVS fan.

HVE-6A ___

HVE-6B ___

APPENDIX N
HYDROGEN PURGE SYSTEM OPERATION
(Page 2 of 2)

A Train (√) B Train (√)

NOTE
FCV-25-26 and FCV-25-36 will not open until a negative differential pressure exists between the Containment and outside air.

☐ **7.** OPEN the following valves:

- ☐ FCV-25-26, Continuous Containment / Hydrogen Purge Makeup
- ☐ FCV-25-36, Continuous Containment / Hydrogen Purge Makeup

☐ **8.** START ONE Hydrogen Purge Fan.

HVE-7A ___

HVE-7B ___

☐ **9.** ADJUST FCV-25-28, Continuous Containment / Hydrogen Purge Control Valve Bypass, to maintain a flow rate of approximately 100 cfm.

☐ **10.** MONITOR Plant Stack radiation levels and Containment hydrogen concentration during purge operation.

END OF APPENDIX N

CAUSES: Any of the following:
- Low air flow through the charcoal adsorber
- Temperature instrumentation malfunction

CONT CNTMT/ H_2 PURGE ADSORBER TEMP HIGH

X-1

DEVICE:	SETPOINT:	LOCATION:
TR-25-3	Multiple Inputs	HVCB Panel
TE-25-58 (Channel 2)	200°F rising	RAB/50/S-RA1Z/E-RAF
TE-25-59 (Channel 3)	200°F rising	RAB/50/S-RA1Z/E-RAF
TE-25-60 (Channel 4)	200°F rising	RAB/50/S-RA1Z/E-RAF
TE-25-61 (Channel 5)	200°F rising	RAB/50/S-RA1Z/E-RAF

ALARM CONFIRMATION

1. TR-25-3, TEMPERATURES, Channels 2 through 5, CONT. CNTMT/H2 PURGE SYS HVE-7A/7B CHARCOAL ADSORBER, indicate 200°F and rising.
2. TR-25-3, TEMPERATURES, Channel 6, AFTER CONT. CNTMT/H2 PURGE CHARCOAL ADSORBER, indicates 200°F and rising.

OPERATOR ACTIONS

NOTE

- High charcoal temperatures are postulated to occur only as a result of restricted air flow rates less than 55 cfm.
- Iodine desorption occurs at approximately 300°F and charcoal ignition at approximately 640°F.

1. **VERIFY** proper operation of Continuous Containment/H2 Purge, as follows:
   - HVE-7A or HVE-7B, CONTINUOUS CNTMT/H2 PURGE FAN, RUNNING
   - FCV-25-20, CONTINUOUS CNTMT PURGE ISOL VLV, OPEN
   - FCV-25-21, CONTINUOUS CNTMT PURGE ISOL VLV, OPEN
   - FCV-25-9, CONTROL VALVE FILTER INLET, OPEN
   - FCV-25-35, EXHAUST VALVE, OPEN (Key 192)
   - FCV-25-28, CONTROL VALVE BYPASS, CLOSED
   - UR-25-1, CONTINUOUS CNTMT H2 PURGE FLOW/ΔP, Channel 6, CONT. CNTMT/H2 PURGE FLOW EXHAUST TO SHIELD BUILDING VENT SYSTEM, indicates greater than 55 cfm
2. IF the problem is **NOT** immediately corrected, THEN **STOP** the running H2 Purge Exhaust Fan.
3. **NOTIFY** Chemistry.

REFERENCES:
1. CWD 2998-B-327 sheets 480
2. P&ID 2998-G-879 sheet 3

SYSTEM OPERATION

1-NOP-25.05, "Containment Ventilation Systems", provides instruction for system operation.

Prerequisites include:

- Align the system per 1-NOP-25.03, "Ventilation Systems Initial Alignment"
- Containment fan coolers are operating
- Containment ambient air temperature is <120°F.

Applicable notes include:

- High charcoal temperature is postulated to occur only if air flow is <55 cfm
- Iodine desorption occurs at ~300°F
- Charcoal ignition occurs at ~640°F.

The containment airborne radioactivity removal fans will normally be operated as directed by the Chemistry Department. During operation the charcoal adsorber temperature and HEPA filter differential pressure should be closely monitored on RTGB 106. If a high temperature alarm is received on the charcoal adsorber of the non-operating fan, the fan should be started immediately and preparations made for replacement of the charcoal adsorber. While the fan(s) are running, containment iodine should be sampled to determine if iodine buildup is of sufficient magnitude to cause heat buildup.

Each HEPA filter is provided with local differential pressure gauges. The upstream HEPA filter differential pressures are also displayed on RTGB 106 [HVCB] by PDIS-25-8A and PDIS-25-8B which are fed by PDT-25-8A and PDT-25-8B. These pressure differential transmitters also provide the SHIELD BUILDING VENT SYSTEM A (B) HEPA FILTER HIGH DIFFERENTIAL PRESSURE [SHIELD BLDG HEPA FLT VENT A (B) D/P HI] alarms at a pressure of 3" water.

Charcoal Adsorbers

Each filter subsection contains 18 charcoal adsorbers for the removal of fission product iodine. The adsorbers contain activated coconut shell impregnated charcoal. They are 99.9% efficient for iodides with 5% in the form of CH_3I at 70% relative humidity and 150°F. As humidity and/or temperature increase, the efficiency of the charcoal decreases.

To monitor temperature of the charcoal adsorber, each charcoal train has four (TE-25-25, 26, 27 and 28 for train A and TE-25-31, 32, 33 and 34 for train B) temperature detectors. The outputs of these detectors are displayed on TR-25-2 on RTGB 106 [HVCB]. The SHIELD BUILDING VENTILATION SYSTEM A (B) CHARCOAL ADSORBERS HIGH TEMPERATURE alarms at 200°F. Temperature downstream of the charcoal adsorbers is measured by TE-25-29 and 35 and is also displayed on TR-25-2. Local downstream temperature indication is also provided.

Humidity detectors, ME-25-1 and 2 are provided to monitor the inlet humidity to each charcoal adsorber train. This humidity indication is displayed locally on MI-25-1 and 2. The SHIELD BUILDING VENTILATION SYSTEM A (B) HIGH HUMIDITY [SHLD BLDG VENT A (B) HUMD HI] alarms at a humidity of 70%.

Local indication of the differential pressure for each charcoal adsorber is also provided in the HVAC room.

2.2 Limitations (continued)

13. High charcoal temperatures are postulated to occur only as a result of restricted air flow rates less than 55 cfm during accident conditions.

14. Iodine desorption occurs at approximately 300°F and charcoal ignition at approximately 640°F.

15. If purging Containment prior to Containment entry, it may be desired to raise purge flow rate by throttling FCV-25-10 in the CLOSE direction. This will aid in reducing the number of purges required to achieve SAT samples of Containment Atmosphere prior to personnel entry. This guidance is in Section 4.2, Purging Containment Using the Filter Train.

16. Release shall be terminated immediately if a High Alarm condition is received on any operable Plant Vent Channel.

A. These channels include:

(1) Pumping System Failure

(2) Beta Particulate Activity

(3) Iodine Activity

(4) Low Range Gas Activity

(5) Medium Range Gas Activity

(6) High Range Gas Activity

B. A release shall **NOT** be restarted until the cause of the alarm has been determined.

61.

033 K3.03 / Spent Fuel Pool Cooling / Knowledge of the effect that a loss or malfunction of the Spent Fuel Pool Cooling System will have on the following: Spent fuel temperature

Given the following conditions:

- Unit 2 experienced a LOCA
- 2-EOP-03, LOCA is in progress
- Pressurizer pressure is 1580 psia

Which ONE of the following completes the statement below?

Spent fuel pool temperature will continue to rise until _____.

A.	SIAS is reset AND the CCW 'N' header isolation valves are taken to CLOSE and then OPEN
B.	CCW 'N' header isolation valves are taken to CLOSE and then OPEN. SIAS reset NOT required
C.	the CCW MOVs to / from the Fuel Pool heat exchangers are opened from the 'A' or 'B' essential headers by taking the switches to SIAS OVERRIDE OPEN
D.	SIAS is reset and the CCW MOVs to / from the Fuel Pool heat exchangers are opened from the 'A' OR 'B' essential headers by taking the switches to LOCKED CLOSED and return to OPEN

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Unit 2 Fuel Pool Hx is supplied from the essential CCW headers, not the 'N' header.
B.	Incorrect:	This would be correct if question was Unit 1 as Unit 1 Fuel Pool heat exchanger is supplied by the CCW 'N' header.
C.	Incorrect:	Switches do not have SIAS override, however plausible as many switches do have SIAS override such as the CCW 'N' header valves
D.	Correct:	SIAS must be reset and valves taken to LOCKED CLOSED and return to OPEN (i.e. this control switch does not have an override feature

Question Number: 61

Tier: 2 Group: 2

K/A: 033 K3.03 / Spent Fuel Pool Cooling / Knowledge of the effect that a loss or malfunction of the Spent Fuel Pool Cooling System will have on the following: Spent fuel temperature

Importance Rating: 3.0 3.3

10 CFR Part 55: (CFR: 41.7 / 45.6)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how a loss of SFP cooling will affect SFP temperature.

Technical Reference: PSL OPS 0711209

Proposed references to be provided: None

Learning Objective: PSL OPS 0702209 - 4

Cognitive Level:

Higher	X
Lower	

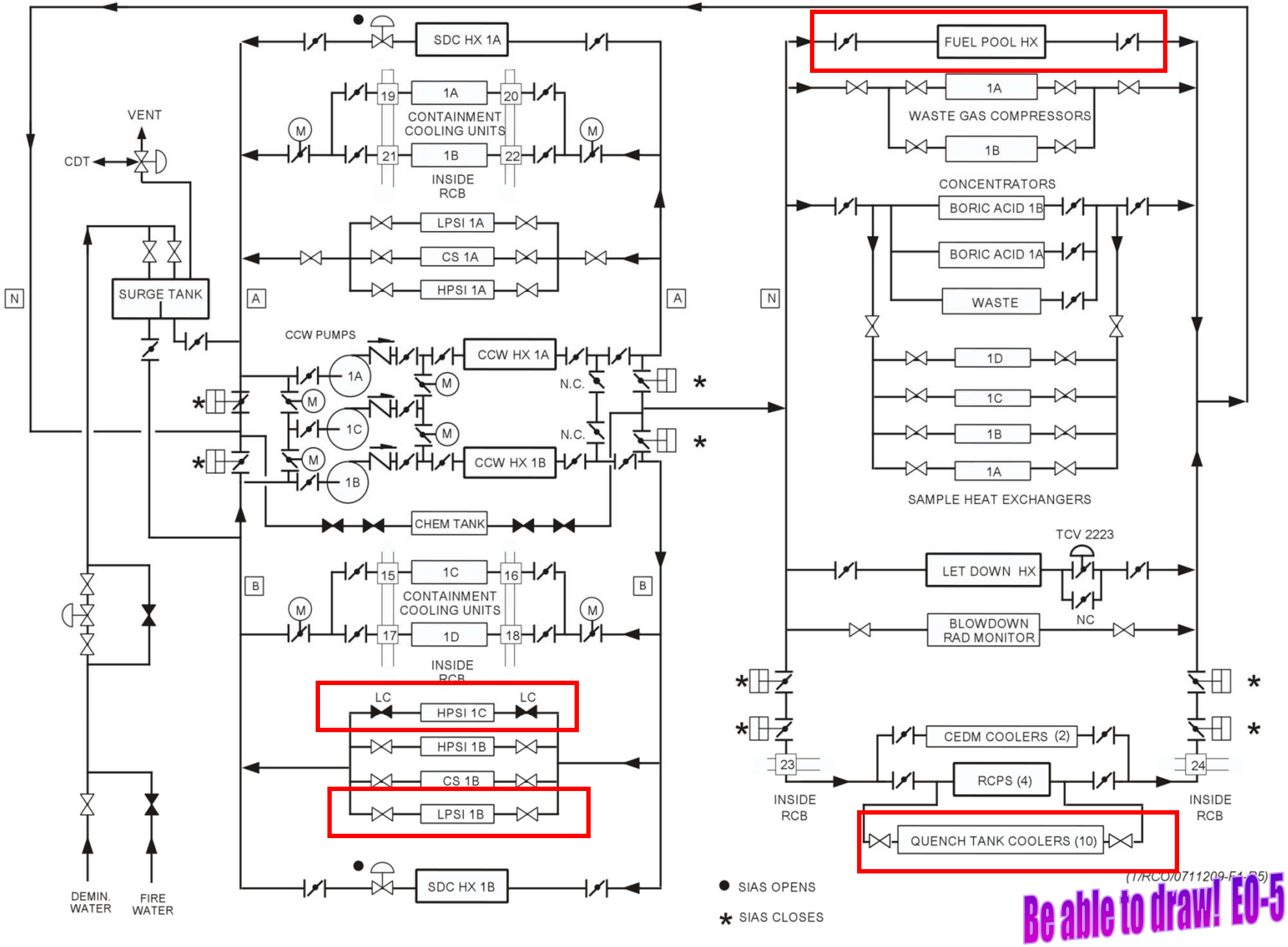
Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

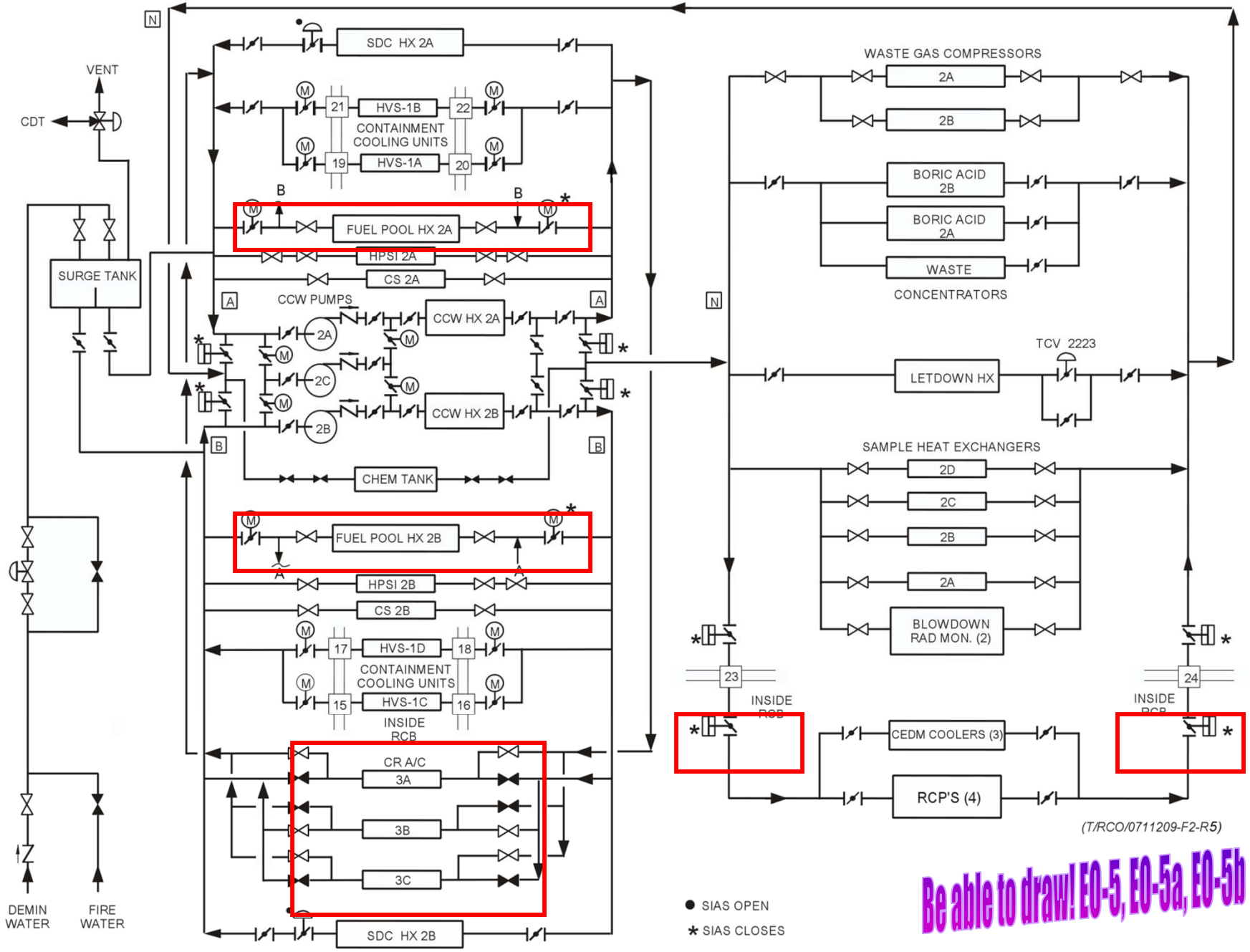
Comments: Bank question on PSL 2010 NRC Exam #60

UNIT 1 - COMPONENT COOLING WATER SYSTEM



Be able to draw! EO-5

UNIT 2 - COMPONENT COOLING WATER SYSTEM



DETAILED DESCRIPTION- EO-3b,EO-11, EO-6

{SPENT FUEL POOL HEAT EXCHANGER COOLING}
one hx, supplied by **N header**

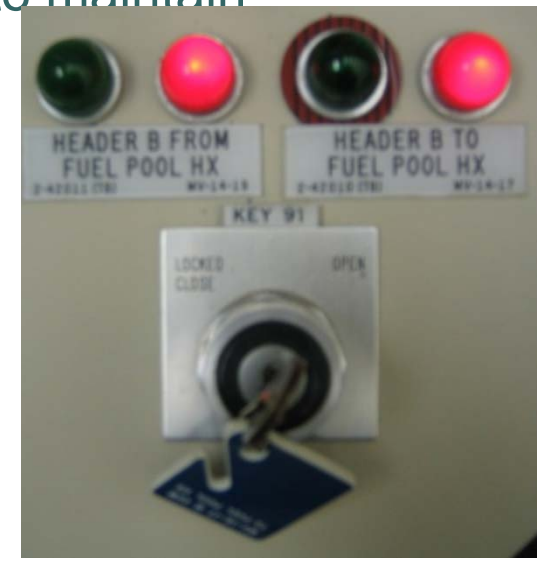
SIAS isolates

- flow varies 2900-3600 gpm
  throttle manual discharge butterfly valve
- flow indication on RTGB 106
  hi/lo flow alarm
- CR high and low flow alarms
  (3700 gpm and 2850 gpm, respectively)
- temperature indication
  behind RTGB 102 and with local temperature indication

DETAILED DESCRIPTION- EO-3b, EO-11, EO-6, EO-4g

[SPENT FUEL POOL HEAT EXCHANGER COOLING]
two hxs, either of which can be supplied by either **essential header**

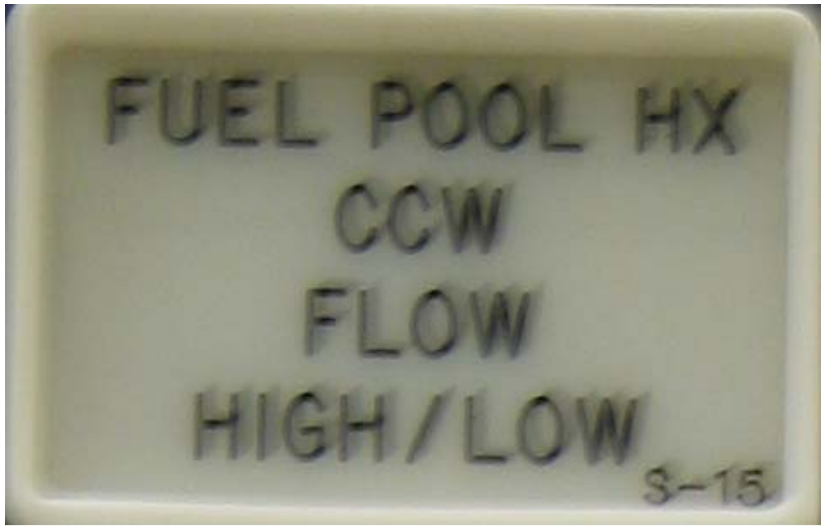
- only one essential header at a time open to maintain independence
- normal supply header: B
- normal in-service heat exchanger: A
- one CR CS operates one supply and one header valve simultaneously
  - "captured key" type switch ensures only one header open at a time
  - both header supply valves close on SIAS (in addition to N header valves, which can be re-opened)
  - both header discharge valves open only to 20% open (which lights CR red open light)
  - Can be opened further locally per Appendix in Mode 6



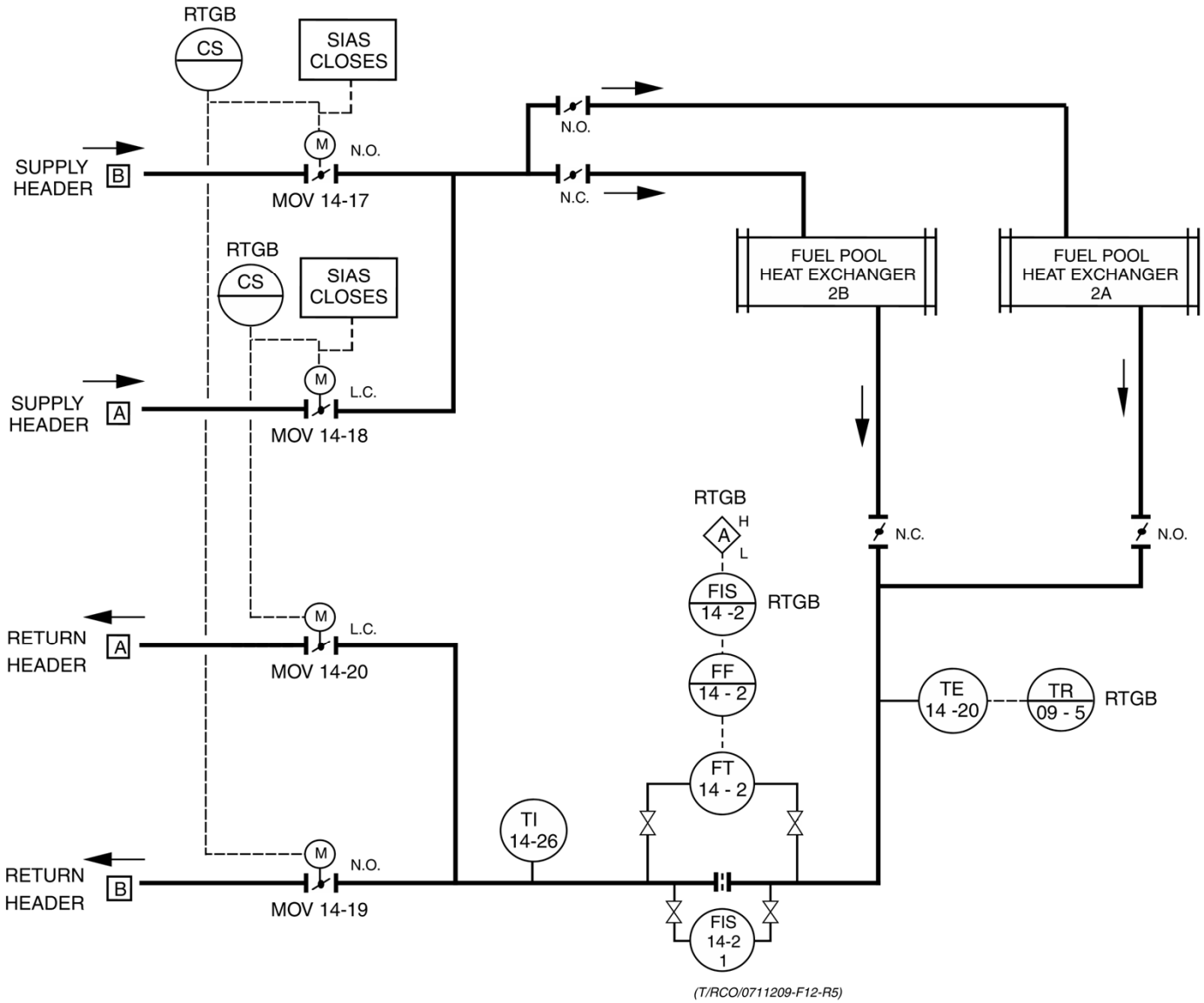
DETAILED DESCRIPTION- EO-18i,EO-6, EO-11

[SPENT FUEL POOL HEAT EXCHANGER COOLING]

- MOVs at 0.5’ el, east end of pipe tunnel
- flow and temperature indication on RTGB
- high and flow CR alarms
  3700 gpm and 2850 gpm, respectively
- Loss of CCW Cooling will result in a loss of spent fuel cooling. Spent Fuel Pool temperature will rise



UNIT 2 - CCW TO FUEL POOL HEAT EXCHANGERS



ORIGINAL QUESTION FROM 2010 NRC

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	033K3.03	
	Importance Rating	3.0	

Spent Fuel Pool Cooling: Knowledge of the effect that a loss or malfunction of the Spent Fuel Pool Cooling System will have on the following: Spent fuel temperature

Proposed Question: RO 60

Unit 2 is in 2-EOP-03, 'LOCA'. Pressurizer pressure is 1580 psia.

Spent fuel pool temperature will continue to rise until:

A. CCW 'N' header isolation valves are taken to CLOSE and then OPEN. SIAS reset NOT required.

.

B. the CCW MOV's to / from the Fuel Pool heat exchangers are opened from the 'A' or 'B' essential headers by taking the switches to SIAS OVERRIDE OPEN.

C. SIAS is reset and the CCW MOV's to / from the Fuel Pool heat exchangers are opened from the 'A' OR 'B' essential headers by taking the switches to LOCKED CLOSED and return to OPEN.

D. SIAS is reset AND the CCW 'N' header isolation valves are taken to CLOSE and then OPEN.

Proposed Answer: C

Explanation (Optional):

A. Incorrect. This would be correct if question was Unit 1 as Unit 1 Fuel Pool heat exchanger is supplied by the CCW 'N' header.
B. Incorrect. Switches do not have SIAS override, however plausible as many switches do have SIAS override such as the CCW 'N' header valves.
C. Correct, SIAS must be reset and valves taken to LOCKED CLOSED and return to OPEN (i.e. this control switch does not have an override feature)
D. Incorrect. Unit 2 Fuel Pool Hx is supplied from the essential CCW headers, not the 'N' header.

Technical Reference(s): PSL OPS 0711209 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: _____

ORIGINAL QUESTION FROM 2010 NRC

Learning Objective: PSL OPS 0702209 Obj. 4 (As available)

Question Source: Bank # _____
Modified Bank # _____ (Note changes or attach parent)
New x

Question History: Last NRC Exam _____

Question Cognitive Level: Memory or Fundamental Knowledge _____
Comprehension or Analysis x

10 CFR Part 55 Content: 41.7
45.6 _____
_____

Comments:

62.

034 K6.02 / Fuel Handling Equipment / Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System: Radiation monitoring systems

Given the following conditions:

- Unit 2 is in refueling operations performing a full core offload

Which ONE of the following radiation monitors, if it were to fail HIGH, would IMMEDIATELY require fuel handling operations to STOP?

A.	CIAS area monitor RR-26-3
B.	Spent Fuel area monitor RIM-26-7
C.	Spent Fuel process monitor RR-26-2
D.	Containment Process Particulate and Gas monitor RC-26-25

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	NOTE: There is no direct correlation or automatic action associated with radiation monitoring and Fuel Handling systems. CIS alarm logic is 1 out 4 of so the CIS alarm would be sounding A single CIAS monitor failing high will result in a Containment evacuation alarm which requires a mandatory Containment evacuation PRIOR to verifying the validity of the alarm.
B.	Incorrect:	This would be true if greater than 1 FHB monitor exhibits UNEXPECTED rising radiation levels challenging HIGH ALARM setpoints, THEN PERFORM the following: A. SUSPEND any fuel movement or Independent Spent Fuel Storage Installation (ISFSI) cask loading or unloading operations in progress.
C.	Incorrect:	IAW 2-AOP-26.01, 4.2.4 Component Cooling Water Monitors 1. VERIFY all of the following to determine alarm validity
D.	Incorrect:	IAW 2-AOP-26.01, 4.2.7 Cntmt Particulate and Gaseous Monitors 1. VERIFY all of the following to determine alarm validity

Question Number: 62

Tier: 2 Group: 2

K/A: 034 K6.02 / Fuel Handling Equipment / Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System: Radiation monitoring systems

Importance Rating: 2.6 3.3

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how a malfunction of RMS will impact Fuel Handling Operations.

Technical Reference: 2-AOP-26.02, Area Radiation Monitors
2-AOP-26.01, Process Radiation Monitors

Proposed references to be provided: None

Learning Objective: PSL OPS 0702411 Obj. 11.h

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: BANK question from PSL 2010 NRC Exam #61

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.2 Containment Isolation Radiation Monitors HIGH Alarm

NOTE

- The Containment Isolation System consists of 4 radiation monitor inputs, instrumentation is shown in Table 2.
- 1 out of 4 channels in ALERT ALARM will generate a Containment Evacuation Alarm.
- 2 out of 4 channels in HIGH ALARM will generate a CIAS.
- When in Mode 6, alarm setpoints are reset to lower values. CIAS bistables are **NOT** reset to these values except during movement of recently irradiated fuel within containment. This is allowed by Tech Spec 3.3.3.1. to prevent unnecessary CIS actuation.

Table 2

Channel	RMCS	Monitor	Recorder
MA	GAG-003	RC-26-3	RR-26-3
MB	GAG-004	RC-26-4	RR-26-4
MC	GAG 005	RC-26-5	RR-26-5
MD	GAG-006	RC-26-6	RR-26-6

☐ **1.** **VERIFY** Containment Evacuation Alarm has actuated.

1.1 MANUALLY **ACTUATE** Containment Evacuation alarm. (Control Room US Console)

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.4 Fuel Handling Building Radiation Monitor Alarm

NOTE

- The Spent Fuel Pool Radiation Monitor System consists of 6 radiation monitor inputs, divided into 2 groups, SA and SB. Instrumentation is shown in Table 3.
- 2 out of 3 HIGH Alarms on Train A or 2 out of 3 HIGH Alarms on Train B will initiate FHB ventilation transfer to Shield Building Ventilation System (SBVS) on both trains.

Table 3

Channel	Monitor			Recorder
Monitor SA	RC-26-7	RC-26-9	RC-26-11	RR-26-1 (Channels 17,18,19)
RMCS SA	GAG-007	GAG-009	GAG-011	
Monitor SB	RC-26-8	RC-26-10	RC-26-12	RR-26-2 (Channels 17,18,19)
RMCS SB	GAG-008	GAG-010	GAG-012	

☐ **1.** **VERIFY** only one FHB monitor is alarmed.

1.1 **GO TO** Section 4.2.4, Step 4.

2. IF greater than one FHB monitor exhibits UNEXPECTED rising radiation levels challenging HIGH ALARM setpoints,
THEN **PERFORM** the following:

A. **SUSPEND** any fuel movement or Independent Spent Fuel Storage Installation (ISFSI) cask loading or unloading operations in progress.

2.0 ENTRY CONDITIONS

2.1 Indications

Any of the following conditions exists on one or more of the following monitors:

- An ALERT or HIGH radiation monitoring alarm
- A radiation monitor FAIL condition
- Rising radiation trend on a radiation monitor

Instrument Number	Monitored Process	RMCS Channel
RS-26-1	Component Cooling Water	PLP-101
RS-26-2	Component Cooling Water	PLP-102
RS-26-4	Liquid Waste Discharge	ELP-301
RS-26-5	2A S/G Blowdown	PLP-121
RS-26-6	2B S/G Blowdown	PLP-122
RS-26-11	Condenser Air Ejector	EAG-403
RS-26-12	FHB Particulate	EAP-411
	FHB Iodine	EAI-412
	FHB Gas	EAG-413
RS-26-13	Plant Vent Particulate	EAP-421
	Plant Vent Iodine	EAI-422
	Plant Vent Gas	EAG-423
RS-26-14	Plant Vent Particulate	EAP-431
	Plant Vent Iodine	EAI-432
	Plant Vent Gas	EAG-433
RS-26-18	Waste Gas Discharge	PAG-203
RS-26-25	Containment Particulate	EAP-541
	Containment Iodine	EAI-542
	Containment Gas	EAG-543
RS-26-26	Containment Particulate	PAP-551
	Containment Iodine	PAI-552
	Containment Gas	PAG-553

INSTRUCTIONS		CONTINGENCY ACTIONS
4.2.4	**Component Cooling Water Monitors**	

☐	**1.** **VERIFY** all of the following to determine alarm validity
	• RMCS channel display for affected channel is neither blue nor magenta.
	• RMCS channel indication agrees with indication on Control Room monitor for affected channel (i.e. alert, high):
	  • RC-26-1, CCW
	  • RC-26-2, CCW
	• Rising trend for affected channel:
	  • RR-26-1, CH. 20 CCW PROCESS RAD
	  • RR-26-2, CH. 20 CCW PROCESS RAD
		1.1 IF one or more of the following conditions exists,
		• RMCS channel display is blue or magenta.
		• RMCS channel and Control Room indication for affected monitor are inconsistent.
		• **NO** rising trend on affected channel.
		THEN **NOTIFY** I&C and **EXIT** this section.

☐	**2.** **VERIFY** HIGH and FAIL alarms are CLEAR on Channels PLP-101 (RM-26-1) and PLP-102 (RM-26-2).	**2.1** Locally **ENSURE** RCV-14-1, CCW SURGE TANK VENT, is aligned to the Chemical Drain Tank. (RAB/74/S-RA1/E-RAJ)

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.7 Containment Particulate and Gaseous Monitors

NOTE

- Instrument RS-26-25 inputs to channels EAP-541, EAI-542 and EAG-543
- Instrument RS-26-26 inputs to channels PAP-551, PAI-552 and PAG-553

☐ **1.** **VERIFY** all of the following to determine alarm validity:

- RMCS display for affected channel is neither blue nor magenta.
- RMCS indication agrees with Control Room monitor indication for affected channel.
  - RC-26-25, CONTAINMENT ATMOSPHERE
  - RC-26-26, CONTAINMENT ATMOSPHERE
- Rising trend on affected channel:
  - RR-26-1, CH. 10, 11, 12, CNTMT ATMOSPHERE
  - RR-26-2, CH. 10, 11, 12, CNTMT ATMOSPHERE

1.1 IF any of the following conditions exists,

- Monitor has malfunctioned
- RMCS channel and Control Room indications are inconsistent
- **NO** rising trend on affected channel

THEN **PERFORM** the following:

A. **REFER TO** the following Tech Specs for applicable action requirements:

- 3.4.6.1, Reactor Coolant System Leakage Detection Systems
- 3.3.3.1, Radiation Monitoring Instrumentation

B. **NOTIFY** I&C and Chemistry

C. **EXIT** this section.

63.

041 A1.02 / Steam Dump/Turbine Bypass Control / Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SDS controls including: Steam pressure

Given the following conditions:

- Unit 1 is experiencing a Steam Generator Tube Rupture
- 1-EOP-04, Steam Generator Tube Rupture (SGTR) has been entered
- The crew is at step 10, Initiate lowering RCS Temperature

Which ONE of the following completes the statements below?

In accordance with OPS-539, RCS Cooldown Guidance, the DRCO will initiate the cooldown by operating ____(1)____ in manual.

If the Steam Bypass Control System (SBCS) permissive switch remained in “AUTO” during the cooldown, the SBCS valves will CLOSE at a S/G pressure of ____(2)____.

A.	(1)	PIC-8010, Master Controller
	(2)	806 psia
B.	(1)	PIC-8010, Master Controller
	(2)	837 psia
C.	(1)	HIC-8801, PCV-8801 M/A Control Station
	(2)	806 psia
D.	(1)	HIC-8801, PCV-8801 M/A Control Station
	(2)	837 psia

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: plausible, when PIC-8010 is in auto, this controller provides the control signal in pressure modulate control to normally operate PCV-8801. When this controller is placed in manual, this controller ONLY controls PCV-8805. Part 2 correct: see analysis "C"
B.	Incorrect:	Part 1 incorrect: see analysis "A" Part 2 incorrect: plausible. The steam generator low pressure interlock setpoint is 837 psia. When the controllers are operated in auto, AND steam generator pressure drops to <837 psia, the control signal will be interrupted causing the SBCS valves to close.
C.	Correct:	Part 1 correct: In accordance with Ops-539, the SBCS permissive switch is placed in manual and the operator will fully open PCV-8801 to perform the cooldown. This can only be accomplished by utilizing HIC-8801 to open the valve. Part 2 correct: Per the SBCS design, there are 4 automatic permissive inputs to allow SBCS operation; Validated steam pressure >900psia, Validated Steam Pressure post trip of >837 psia, Quick Open – 1 signal (Tave >555F or <3F Tave change), Quick Open – 2 (steam pressure >806 psia). With the SBCS permissive switch in auto, the last remaining system permissive is Quick Open – 2. When steam pressure is <806 psia, the SBCS will lose its permissive and the valves will go closed.
D.	Incorrect:	Part 1 correct: see analysis "C" Part 2 incorrect: see analysis "B"

Question Number: 63

Tier: 2 Group: 2

K/A: 041 A1.02 / Steam Dump/Turbine Bypass Control / Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SDS controls including: Steam pressure

Importance Rating: 3.1 3.2

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how to operate the SBCS system and predict the Steam Pressure at which it will actuate.

Technical Reference: 1-EOP-04, OPS-539

Proposed references to be provided: None

Learning Objective: PSL OPS 0702406 - 6

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

CAUTION

Operation of the 1C AFW Pump should be avoided to minimize direct releases to the environment. If motor driven AFW pumps are **NOT** available, steam from the least affected S/G should be used.

☐ **10.** **INITIATE** lowering RCS T_{hot} to less than 510°F using SBCS.

10.1 IF SBCS is UNAVAILABLE, THEN **COOLDOWN** using ADVs from both S/Gs.

10.2 IF Instrument Air is UNAVAILABLE, THEN **OPERATE** ADVs locally per Appendix U, Local Operation of Unit 1 Atmospheric Dump Valves.

10.3 IF SBCS and ADVs are UNAVAILABLE, THEN **COOLDOWN** using 1C AFW Pump and alternate steaming flow paths on the unisolated S/G.

A. **REFER TO** Table 12, Alternate S/G Heat Removal Paths.

MASTER CONTROLLER (PIC-8010)

PIC-8010 is a software derived image available on either of two SBCS-dedicated controllers or on either of the Flat Panel Displays (FPDs). (Refer to Figure 18). The two controllers are capable of imaging any of the 5 SBCS valves and can also be arranged in a split screen fashion with 2 valves per controller. The controllers are located on the apron section of RTGB 102 [202] outboard of the FWCS Valve M/A Stations.

The steam pressure signal is an average of pressure signals from PT-8010 and PT-8020. There are 'M' and 'A' Buttons for Manual or Auto control and there are Slow and Fast speed Open/Closed Buttons ('Arrow' and 'Double Arrow' indicators) for Manual valve speed control. M/A Stations also have actual valve position indication in addition to valve demand.

Pressure setpoint is shown and is normally 900 psia (940 psia for 4 minutes and then ramped over 5 minutes to 900 psia post reactor trip). There is a XFR MAN Info Button that will become bright Red if an automatic transfer to Manual occurs (loss of VALIDATED steam pressure signal). There is a COM OK (or alternately COM FAIL) Info Button on the display face and a round 'Heartbeat' that flashes on and off. The controllers constantly communicate with the DCS where they receive updated information such as process values and valve demand/position information. Should this communications link be disrupted, the Heartbeat would stop and the COM FAIL/COM OK Info Tag would become a bright Red COM FAIL. If this should occur, the PIC-8010 M/A Station could be brought up on the DCS FPD where current process information would be displayed and Manual system control performed from there, if required.

The FPD is dependent on the Plant Data Network (PDN) for its information routing and if the PDN was lost for some reason, system information and control could be performed solely from the controllers which are independent from the PDN.

Normally the Master Controller (PIC-8010) is maintained in Automatic which sets it up for automatic pressure modulation of all SBCS valves at power (or for PCV-8801 post-trip) and for the transfer to Tavg for PCVs 8802-8805 following a reactor trip.

With PIC-8010 in Manual, the steam low pressure interlock met and all HICs in automatic, the PIC-8010 Manual output will be sent to all SBCS valves in their normal programmed opening sequence. If the pressure permissive/interlock is NOT met with this configuration, the manual output of PIC-8010 will affect only PCV-8805 as this controller also serves as the Manual control station for PCV-8805 (Note that all SBCS valves in 'Manual' bypass the low steam pressure interlock). Caution must be exercised when taking manual control of PCV-8805 ONLY via the PIC-8010. If pressure is above the steam low pressure interlock met (886 psia or 837 [850] psia), all PCVs may open dependent upon the controller output. As shown on Figure 21, the manual output to PCV-8805 from PIC-8010 still goes through the valve program algorithm so PCV-8805 will not start Opening until PIC-8010 output reaches the minimum output required (~30%).

Quick Open signals bypass all M/A Stations that are in Auto and go directly to the Quick Open solenoid at the valve (any M/A Station in Manual defeats the QO signal to its valve).

The loss of either steam pressure signal will automatically Bypass the failed signal and use the remaining GOOD signal for both the Control and Permissive circuits. Loss of both steam pressure signals will result in holding last good value and will cause PIC-8010 to shift to Manual and cause annunciator G-34[26], “SBCS in Manual”.

MANUAL/AUTO (M/A) CONTROL STATIONS

The M/A control stations enable the operator to select MANUAL or AUTOMATIC operation of PCV 8801 through 8804. The control stations are mounted on the feedwater section of RTGB 102 [202]. There are four separate individual valve M/A control stations HIC-8801 through 8804 available. MANUAL control for the fifth valve, PCV 8805, is provided by the master integrated controller (PIC-8010) when it is placed in MANUAL.

On the face of the M/A control station there are M & A Buttons, ARROW Buttons and a 0-100% valve demand and actual valve position indication.

The HICs have software derived images of their M/A Stations on either of two SBCS-dedicated controllers or on either of the Feedwater Flat Panel Displays (FPDs). The two controllers are capable of imaging any of the 5 SBCS valves and can also be arranged in a split screen fashion with 2 valves per controller. The controllers are located on the apron section of RTGB 102 [202] outboard of the FWCS Valve M/A Stations. The M/A Stations also have actual valve position indication in addition to valve demand.

The screen display and touch control functions on the controllers are separate. Touching a controller with a blank screen could cause an unwanted response and should not be performed. Blank screen controllers should be considered active until disconnected.

- M/A stations HIC-8801 through 8804 can individually modulate their respective valves when in Manual provided the Permissive Switch valve permissive and condenser vacuum interlocks are met. The Low Pressure permissive/interlock (Psp2) is Bypassed for any HIC in Manual.

- PIC-8010, when in Manual, bypasses the Low Pressure permissive/interlock (Psp2) for PCV-8805 and directly controls PCV-8805. If the Low Pressure permissive is met, PIC-8010 will also operate any other bypass valve that has its controller [M/A Station] in Automatic.

- While cooling down with the permissive switch in Auto and M/A Station(s) in manual, any open SBCS valve will close when the 806 psia (Auto) permissive is lost. Further cooldown using the SBCS will require placing the permissive switch in Manual.

When cooling down the RCS: (continued)

7. Report lowest Tcold and cooldown rate to the US every 12 minutes (US acknowledges Tcold and cooldown rate by initialing Table 1 every 12 minutes).

8. Inform the US when subcooling is gained, lost, or being challenged. Record the time when subcooling is gained or lost and circle the new cooldown limit in effect on Table 1.

9. If subcooling has been lost and subsequently regained, then the previous (and more limiting) cooldown limit shall be reinstated. If the original cooldown limit is exceeded, RCS temperature should be stabilized until enough time passes to allow recommencement of the RCS cooldown.

If using SBCS for recovery of subcooling or during a Steam Generator Tube Rupture cooldown to Thot less than 510°F:

1. Place the SBCS in manual operation.

2. Fully open PCV-8801. If PCV-8801 is unavailable, use the next available SBCS valve at approximately 50% open.

3. Once T-hot is less than 510°F for a Steam Generator Tube Rupture, adjust the position of SBCS to ensure that the cooldown limit will not be exceeded.

4. Once the affected steam generator is no longer being steamed by closing its MSIV IAW with App R of EOP-99, the US will inform the RCO that the 30 degree in any one hour cooldown limit applies, and the SBCS should be adjusted accordingly.

If using ADVs for recovery of subcooling or during a Steam Generator Tube Rupture cooldown to Thot less than 510°F:

1. Place an ADV on each Steam Generator in service, preferably in Auto-Manual (if available) or Manual-Manual.

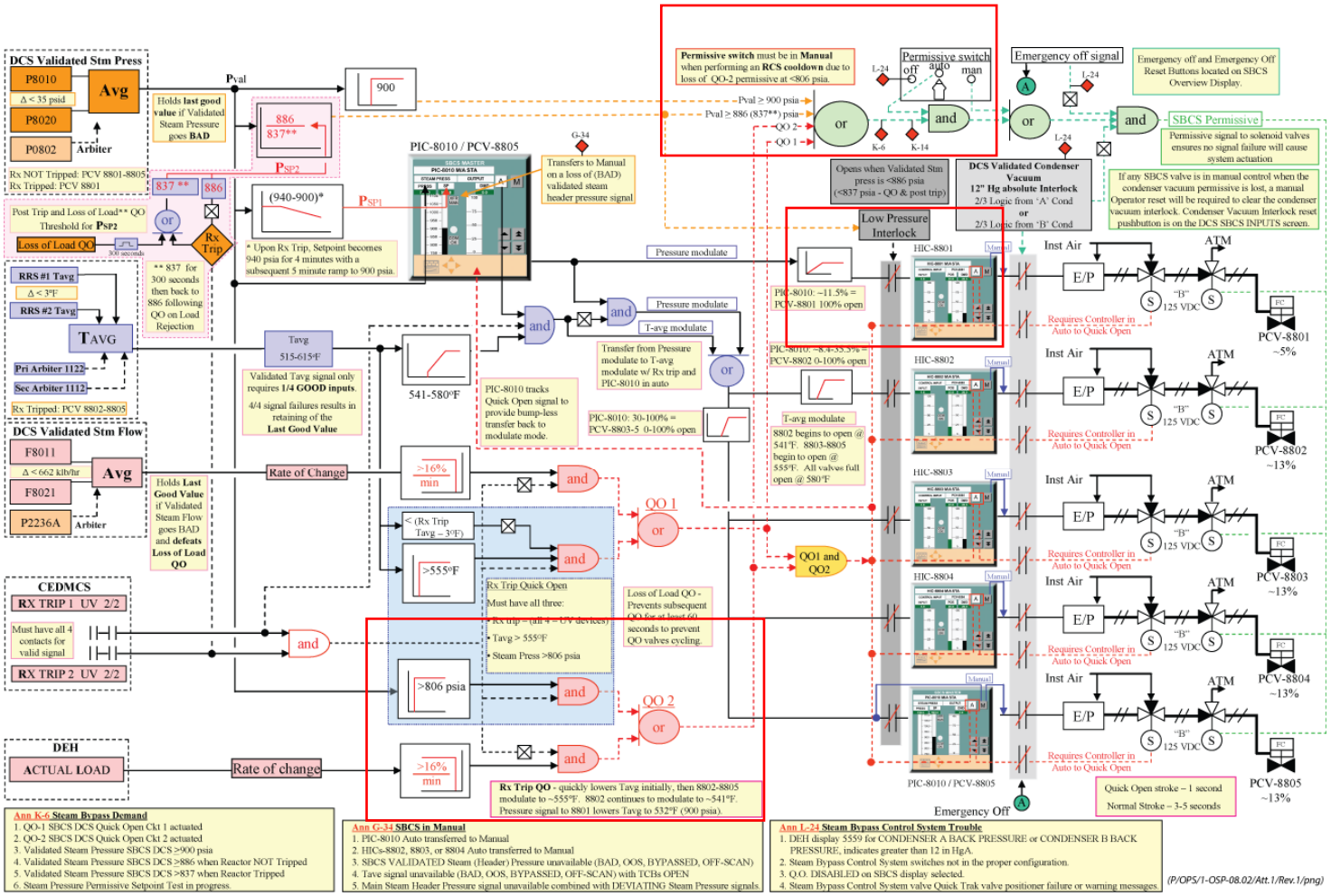
2. For Unit 1, open the ADV on each Steam Generator to 50% open.

3. For Unit 2, fully open one ADV on each Steam Generator.

4. Once Thot is less than 510°F for a Steam Generator Tube Rupture, adjust the position of ADVs to ensure that the cooldown limit will not be exceeded.

5. Once the affected steam generator is no longer being steamed by closing its ADV(s) IAW with App R of EOP-99, the US will inform the RCO that the 30 degree in any one hour cooldown limit applies, and the ADVs should be adjusted accordingly.

ATTACHMENT 8
SBCS Block Diagram
(Page 1 of 1)



64. 071 G2.1.7 / Waste Gas Disposal / Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation

Given the following conditions:

- Unit 2 is at 100% power
- 2C Gas Decay Tank (GDT) is in service

	GDT 2A	GDT 2B	GDT 2C
00:00:00	160 psig	155 psig	37 psig
00:30:00	92 psig	150 psig	39 psig

The Crew is performing a **NORMAL** 2A GDT release in accordance with 2-NOP-06.20, Controlled Gaseous Batch Release to Atmosphere

In accordance with 2-NOP-06.20, which ONE of the following completes the statements below?

The 2A GDT release is required to be terminated when 2A GDT pressure is ____(1)____.

At time 00:30:00, the 2A GDT release ____(2)____ required to be terminated.

A.	(1)	0 – 2 psig
	(2)	is
B.	(1)	0 – 2 psig
	(2)	is NOT
C.	(1)	10 – 12 psig
	(2)	is
D.	(1)	10 – 12 psig
	(2)	is NOT

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: plausible, per 2-NOP-06.20, uring periods for maintenance, the GDT release is terminated at 0-2 psig, then followed up with a nitrogen purge to remove remaining radioactive gases. Part 2 correct: see analysis "C"
B.	Incorrect:	Part 1 incorrect: plausible, see analysis "A" Part 2 incorrect: plausible. The applicant must know the procedure requirements for terminating the release. The 2B GDT dropped by 5 psig, the 2C GDT rose by 2 psig. The applicant may misinterpret that the 2B GDT may be going into the 2C GDT resulting in only a 3 psig drop, less than the procedural limit.
C.	Correct:	Part 1 correct: per 2-NOP-06.20, when performing gas decay tank releases, the release is terminated at 10-12 lbs to ensure a positive pressure is maintained in the decay tank to preclude oxygen introduction. During periods for maintenance, the GDT release is terminated at 0-2 psig, then followed up with a nitrogen purge to remove remaining radioactive gases. Normal GDT releases take ~1.5 to 1.75 hours. Part 2 correct: per 2-NOP-06.20, GDT reading are required to be taken every 30 minutes. If a different GDT pressure lowers by 4 psig or more, the release must be terminated. This threshold has been met in the 2B GDT. The 2C pressure rose due to being the in-service GDT.
D.	Incorrect:	Part 1 correct: see analysis "C" Part 2 incorrect: see analysis "B"

Question Number: 64

Tier: 2 Group: 2

K/A: 071 G2.1.7 / Waste Gas Disposal / Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.

Importance Rating: 4.4 4.7

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know when to terminate WGT releases using operational judgments based on instrument interpretation.

Technical Reference: 2-NOP-06.20

Proposed references to be provided: None

Learning Objective: PSL OPS 0511019-5

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

4.1.1 Release of 2A GDT to Atmosphere (continued)

13. IF any of the following conditions are met during release:

- An unexplained AND increasing count rate on an activity channel.
- High Alarm condition is received on active Plant Vent Channel.
- 2B OR 2C GDT pressure lowers by 4 psig or more.
- Directed by US/SM.

THEN **CLOSE** V6565, WASTE GAS EFF RELEASE VALVE, to terminate release.

14. **PERFORM** the following during GDT release:

- **OBSERVE** plant vent AND containment radiation monitors.
- IF an Alert Alarm is received, THEN **INVESTIGATE** AND **MONITOR** alarming channel.
- **RECORD** GDT pressures in Attachment 4, GDT Pressure Log, every 30 minutes during release OR at direction of US.
- IF pressure in 2B OR 2C GDT is lowering, THEN **PERFORM** the following:
  - **NOTIFY** US to determine cause of problem AND resolution.
  - **NOTIFY** Chemistry to determine whether an unplanned gas release has occurred.
  - IF an unplanned gas release has occurred, THEN **NOTIFY** Senior Plant Management.
- **PERFORM** CHANNEL CHECK on the following radiation monitors:
  - PIG A, RS-26-13 (EAG-423)
  - PIG B, RS-26-14 (EAG-433)
  - WRGM, RS-26-90 (AAE-624)

4.1.1 Release of 2A GDT to Atmosphere (continued)

15. WHEN any of the following conditions are met:

- Performing a normal release AND PI-6650, 2A GAS DECAY TANK PRESS, indicates 10 to 12 psig.
- Performing a maintenance release AND PI-6650, 2A GAS DECAY TANK PRESS, indicates 0 to 2 psig.
- Directed by US/SM.

THEN **PERFORM** the following to terminate release:

A. **CLOSE** V6584, GAS COLL HDR FROM 2A GAS DECAY TANK.

B. WHEN PI-6648, WASTE GAS DISCH PRESS, indicates 0 psig, THEN **CLOSE** V6745, GAS COLL HDR FROM GST & GDTS THROTTLE.

C. **CLOSE** V6565, WASTE GAS EFF RELEASE VALVE.

D. **CLOSE** V7274, GDT TO DISCH HDR ISOL.

16. **RECORD** the following:

- PI-6650, 2A GAS DECAY TANK PRESS _____psig
- Stop Date/Time_____

17. IF GDT release is for maintenance, THEN **GO TO** Section 4.1.1, Step 19.

NOTE

Minimum pressure for a GDT if pressurized with nitrogen is 10 psig.

18. IF 2A GDT pressure is less than 10 psig OR required to be raised to a higher pressure, THEN **PERFORM** the following:

A. **DETERMINE** required 2A GDT Pressure: _____psig

B. **OPEN** V6588, 2A GAS DECAY TANK FROM N2 HDR ISOL, as directed by US to achieve required GDT pressure.

65.

075 K4.01 Circulating Water / Knowledge of circulating water system design feature(s) and interlock(s) which provide for the following: Heat sink

Given the following conditions:

- Unit 1 is at 85% power
- 1A1, 1B1 and1B2 Circulating Water Pumps (CWP) running
- In preparation to raise power to 100%, the crew starts the 1A2 CWP

Three (3) minutes after starting the 1A2 CWP

- 1B2 CWP trips

Which ONE of the following describes ALL the CWPs that will be running?

A.	1A1 and 1B1 CWPs
B.	1A1 and 1A2 CWPs
C.	1A2 and 1B1 CWPs
D.	1A1, 1A2, and 1B1 CWPs

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	1A1 and 1B1 are parallel pumps (both discharge into common discharge tunnel). If parallel pump trips (1B2) during the first 5 minutes of the second pump startup, the second pump will also trip (1A2).
B.	Incorrect:	Plausible if applicant does not know what CWP discharges into what tunnel and does not know the trip logic of the CWPs
C.	Incorrect:	Plausible if applicant does not know what CWP discharges into what tunnel and does not know the trip logic of the CWPs
D.	Incorrect:	This would be true if the 1B2 CWP tripped 6 minutes after starting the 1A2 CWP

Question Number: 65

Tier: 2 Group: 2

K/A: 075 K4.01 Circulating Water / Knowledge of circulating water system design feature(s) and interlock(s) which provide for the following: Heat sink

Importance Rating: 2.5 2.8

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the CWP interlocks

Technical Reference: PSL OPS 0711314

Proposed references to be provided: None

Learning Objective: PSL OPS 07021314 - 4A

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: BANK question from PSL 2010 NRC Exam #65

NOTE: When conditions 1, 2, and 5 are met, the amber permissive light on the RTGB comes on.

However, prior to the pump's discharge valve going to 30% open, additional interlocks must be met, and these interlocks generally assess the situation with the parallel pump and valve, and the position of the vacuum breaker valves. The interlocks that will allow the pump discharge valve to initially begin opening are:

1) The discharge valve must be initially full closed for a minimum of 2 minutes.

2) The waterbox vacuum breaker valves must be fully closed.

3) The parallel pump's discharge valve must be full closed if its pump is not running OR if its pump is running it must be full open. (NOTE: The full open condition must be present for 60 seconds prior to this interlock making up. That is to say that the second pump will not start until at least 60 seconds after the first pump's discharge valve is full open.)

If all of the above conditions are met, then when the operator places the Control Room switch in 'start' (or depresses the local 'start' pushbutton) the respective pump's discharge valve will open to 30% and then the pump breaker will receive a 1 second close signal. (NOTE: The power to the pump discharge valve is interrupted at this time.)

Once the pump has started, restoration of power to the pump's discharge valve depends upon the operating status of the parallel pump's discharge valve. If the parallel pump's discharge valve is full open, then power will be restored to the newly started pumps discharge valve in 5 minutes. It will then open to 100%. If the parallel pump discharge valve is NOT full open, then power will be restored to the newly started pump's discharge valve in 15 minutes, at which time it will go to 100% open.

If for any reason the parallel pump trips during the first 5 minutes of the second pump's startup, the second pump will also trip, and its discharge valve will go closed.

The operator has the ability to manually override the open timing sequence by depressing pushbuttons PB-3 'open' or PB-4 'close'. This action removes the timers from the circuit. If the operator chooses to throttle the valve in the closed direction, he may do so up to the 30% open position, then the valve will fully close.

Pump Stops/Trips

A circulating water pump can be stopped as follows (Reference Figure 5):

Manually

1) From the RTGB – place the control switch to “STOP”
2) Locally – depressing PB-2 “STOP”

Automatically

1) An undervoltage condition on the 4.16 kV bus
2) Overcurrent trip on the pump
3) If during the first 5 minutes of a startup, the parallel pump trips

When a pump trips, its discharge valve will begin to close. Once closed, a restart is not possible for 2 minutes after the valve reaches full closure. If both parallel pumps trip, then both pump discharge valves close and the waterbox vacuum breaker valves open for 5 minutes.

Shutdown of individual pumps should be spaced at intervals of 60 minutes in order to prevent ‘slumping’ in the discharge canal.

Pull to Drain Sequence

The control switch on the RTGB contains a ‘pull to drain’ feature. This feature initiates the following actions:

1. Stops the respective circulating water pump.
2. Circulating water pump discharge valve closes.
3. Condenser discharge valve closes.
4. Inlet and outlet waterbox vacuum breakers open.
5. Circulating water pump discharge valve opens causing the waterbox to drain.

NOTE: Ensure that the circulating water pump cannot be started by removing the pump’s control fuses.

CIRCULATING WATER SYSTEM

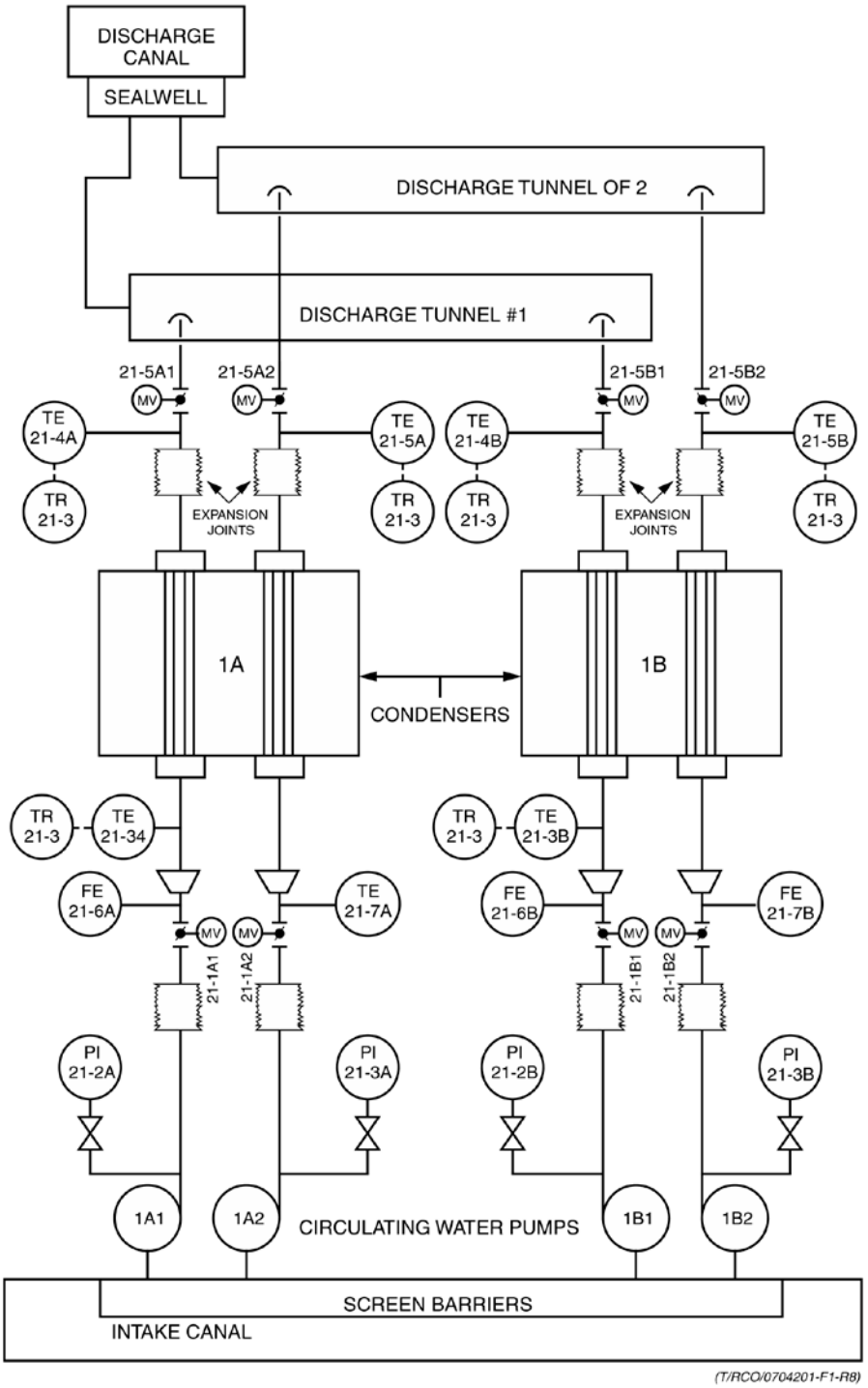


FIGURE 1

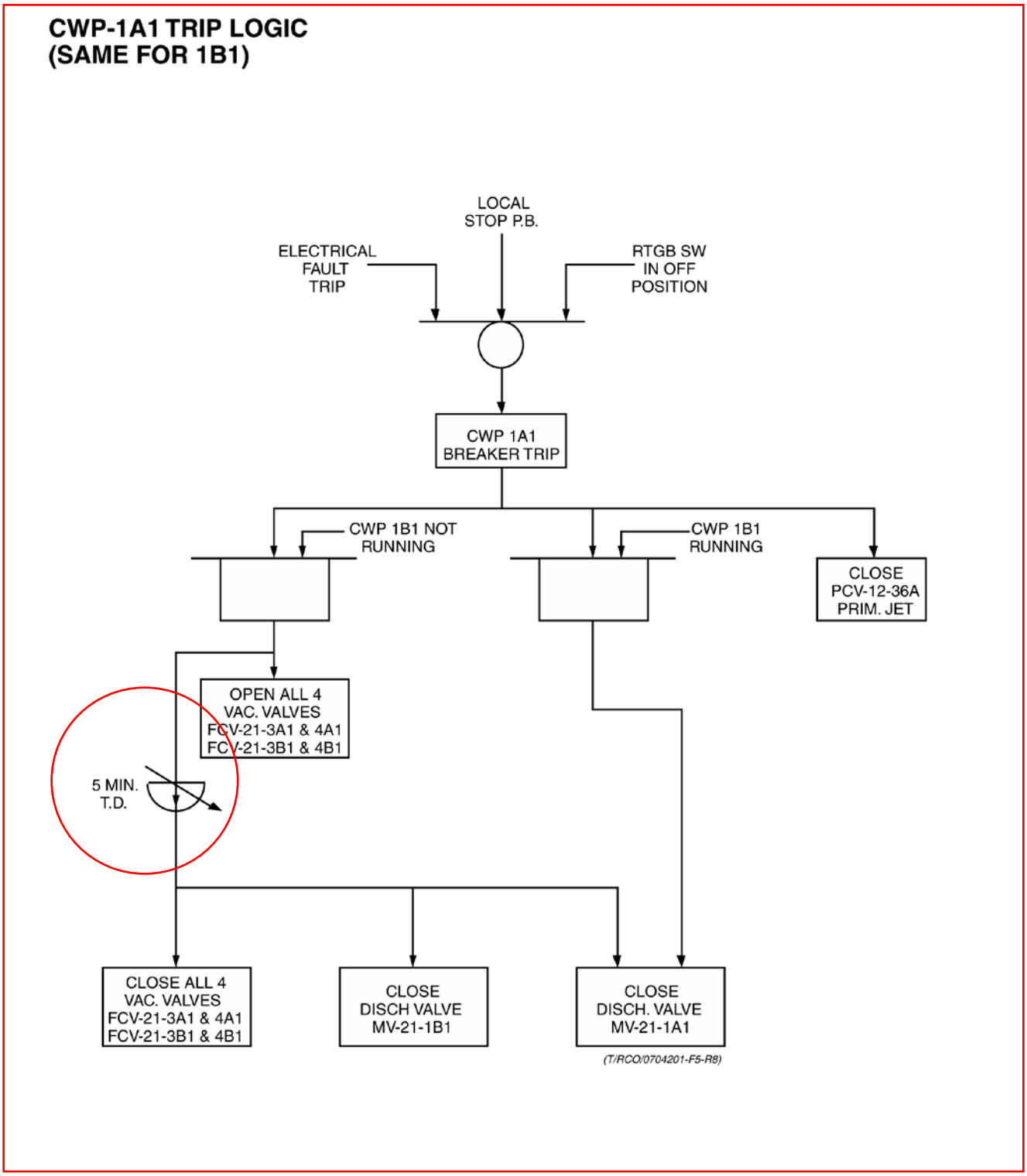

CWP-1A1 TRIP LOGIC
(SAME FOR 1B1)
LOCAL
STOP P.B.
ELECTRICAL
FAULT
TRIP
RTGB SW
IN OFF
POSITION
CWP 1A1
BREAKER TRIP
CWP 1B1 NOT
RUNNING
CWP 1B1
RUNNING
CLOSE
PCV-12-36A
PRIM. JET
OPEN ALL 4
VAC. VALVES
FCV-21-3A1 & 4A1
FCV-21-3B1 & 4B1
5 MIN.
T.D.
CLOSE ALL 4
VAC. VALVES
FCV-21-3A1 & 4A1
FCV-21-3B1 & 4B1
CLOSE
DISCH VALVE
MV-21-1B1
CLOSE
DISCH. VALVE
MV-21-1A1
(T/RCO/0704201-F5-R8)

FIGURE 4

Controls

Pump discharge valve MV 21-1A1 [2A1] can be operated locally at the pump or remotely from RTGB-102 [202]. This valve shares the same switch that is used to start and stop the circulating water pump on the RTGB.

Pump Starts

The general startup logic for the circulating water pump(s) was designed to:

1) Gradually introduce water to the piping system to prevent water hammer and to minimize starting loads on the pump motor.

2) Prevent backflow into the parallel pump should it be inoperable. (Note: The pumps are paired together such that each pair discharges into a common discharge tunnel beyond the outlet waterbox discharge isolation valves.)

3) To minimize the potential for intake canal 'slumping' in which a rapid reduction of intake canal level could cause the saturated banks of the canal to collapse and flow toward the center of the canal.

Therefore, the circulating water pumps are interlocked to several other components. Namely, the pump discharge valve, the condenser waterbox discharge valve, the waterbox vacuum breaker valves, the pump seal lubricating water system, the parallel pump and its discharge valve, and the availability of power to these components.

Referencing Figure 4, it can be observed that several conditions must be met in order to attempt a pump start. A signal to close the pump breaker will be received when the following conditions are met:

1) Pump lubricating water is >8 gpm [(psig)].
2) Condenser discharge valve is open.
3) Control power is available to the pump's discharge valve.
4) The pump discharge valve reaches 30% open.
5) Circ pump breaker racked in and open.

NOTE: When conditions 1, 2, and 5 are met, the amber permissive light on the RTGB comes on.

However, prior to the pump's discharge valve going to 30% open, additional interlocks must be met, and these interlocks generally assess the situation with the parallel pump and valve, and the position of the vacuum breaker valves. The interlocks that will allow the pump discharge valve to initially begin opening are:

1) The discharge valve must be initially full closed for a minimum of 2 minutes.

2) The waterbox vacuum breaker valves must be fully closed.

3) The parallel pump's discharge valve must be full closed if its pump is not running OR if its pump is running it must be full open. (NOTE: The full open condition must be present for 60 seconds prior to this interlock making up. That is to say that the second pump will not start until at least 60 seconds after the first pump's discharge valve is full open.)

If all of the above conditions are met, then when the operator places the Control Room switch in 'start' (or depresses the local 'start' pushbutton) the respective pump's discharge valve will open to 30% and then the pump breaker will receive a 1 second close signal. (NOTE: The power to the pump discharge valve is interrupted at this time.)

Once the pump has started, restoration of power to the pump's discharge valve depends upon the operating status of the parallel pump's discharge valve. If the parallel pump's discharge valve is full open, then power will be restored to the newly started pumps discharge valve in 5 minutes. It will then open to 100%. If the parallel pump discharge valve is NOT full open, then power will be restored to the newly started pump's discharge valve in 15 minutes, at which time it will go to 100% open.

If for any reason the parallel pump trips during the first 5 minutes of the second pump's startup, the second pump will also trip, and its discharge valve will go closed.

The operator has the ability to manually override the open timing sequence by depressing pushbuttons PB-3 'open' or PB-4 'close'. This action removes the timers from the circuit. If the operator chooses to throttle the valve in the closed direction, he may do so up to the 30% open position, then the valve will fully close.

ORIGINAL QUESTION FROM 2010 NRC

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	075K4.01	
	Importance Rating	2.5	

Circulating Water: Knowledge of circulating water system design feature(s) and interlock(s) which provide for the following: Heat sink

Proposed Question: RO 65

Unit 1 is operating at 85% power with 1A1, 1B1 and1B2 Circulating Water Pumps (CWP) running. In preparation to increase power to 100%, the Operator starts the 1A2 CWP.

Three (3) minutes after starting the 1A2 CWP the 1B2 CWP trips.

Which ONE of the following states ALL the CWP's that will be running?

A. 1A1 and 1B1 CWP's

B. 1A1 and 1A2 CWP's

C. 1A2 and 1B1 CWP's

D. 1A1, 1A2, and 1B1, CWP's

Proposed Answer: A

Explanation (Optional):

A. Correct, 1A1 and 1B1 are parallel pumps (both discharge into common discharge tunnel). If parallel pump trips (1B2) during the first 5 minutes of the second pump startup, the second pump will also trip (1A2).
B. Plausible if applicant does not know what CWP discharges into what tunnel and does not know the trip logic of the CWP's.
C. Plausible if applicant does not know what CWP discharges into what tunnel and does not know the trip logic of the CWP's.
D. This would be true if the 1B2 CWP tripped 6 minutes after starting the 1A2 CWP.

Technical Reference(s): Lesson Text 0711314 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: _____

Learning Objective: PSL OPS 0702314 Obj. 4a (As available)

ORIGINAL QUESTION FROM 2010 NRC

Question Source:	Bank #	_____
	Modified Bank #	_____ (Note changes or attach parent)
	New	x _____
Question History:	Last NRC Exam	_____
Question Cognitive Level:	Memory or Fundamental Knowledge	x _____
	Comprehension or Analysis	_____
10 CFR Part 55 Content:	41.7	_____
		_____

Comments:

66.

G2.1.26 Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen).

Given the following conditions:

- Unit 1 is at 100% power
- An equipment clearance order (ECO) is being developed for a system with the following parameters: pressure is 650 psia and temperature is 130°F
- Due to an equipment deficiency, ONLY a SINGLE MANUAL valve is available as an isolation boundary

Which ONE of the following describes the Energy classification and whose APPROVAL is required, at a MINIMUM, for the clearance to allow use of a SINGLE MANUAL valve as an isolation boundary in accordance with OP-AA-101-1000, Clearance and Tagging?

The system is designated as a ____(1)____energy system.

____(2)____ permission is required.

A.	(1)	LOW
	(2)	Shift Manager
B.	(1)	LOW
	(2)	ORG Review and Site Director
C.	(1)	HIGH
	(2)	Shift Manager
D.	(1)	HIGH
	(2)	ORG Review and Site Director

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: This is plausible if the applicant has a misconception that both the pressure and temperature must be above the setpoints or doesn't know the setpoints for determining high or low energy. Part 2 correct: See analysis C
B.	Incorrect:	Part 1 incorrect: See analysis A Part 2 incorrect: ORG Review / Site Director is plausible if a check valve is the only means of boundary isolation, ORG Review / Site Director permission is required on the ECO regardless of high or low energy.
C.	Correct:	Part 1 correct: IAW the ECO admin, systems that contain fluids, steam etc. in excess of 500 psig or 200°F, are classified as high energy and require double isolation. Part 2 correct: SM is the approver for clearances with a high energy system with single valve isolation, he can authorize per the ECO procedure.
D.	Incorrect:	Part 1 correct: See analysis C Part 2 incorrect: See analysis B

Question Number: 66

Tier: 3 Group:

K/A: G2.1.26 Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen).

Importance Rating: 3.4 3.6

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to requirements for high energy ECOs

Technical Reference: OP-AA-101-1000, Clearance and Tagging

Proposed references to be provided: None

Learning Objective: PSL OPS 0702741C-4 ECO Lab Guide

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: PSL LOIT Bank question for the 2019 NRC Exam

Comments:

2.0 TERMS AND DEFINITIONS (continued)

19. (continued)

B. Repacking a manual valve when the isolation boundary is the valve backseat.

20. High Energy Systems - Systems with >3/8 “piping diameter containing fluids, gasses, etc. at energy levels >500 PSI or >200 °F, or any hazardous chemical systems (as determined by the Safety Department or indicated in the MSDS information).

21. Independent Review (by Clearance Reviewer) – A review of a Clearance by a separate individual to verify the Clearance is technically correct, proper isolation practices have been used, and appropriate procedural / administrative requirements have been met. The reviewer may use any references (documents or technical experts including the preparer) necessary to make an informed decision on the adequacy of the isolation independent of that performed by the preparer. It is not the intent for the Independent Review to be an independent recreation of the clearance. It is permissible for the reviewer to communicate with the clearance preparer to understand or clarify the basis of the clearance as written.

22. Information Tag - A white tag with black lettering that indicates off-normal equipment conditions or provides instructions for equipment operation. Should not normally be used to maintain a component in a specified position.

23. Master Clearance - A clearance that is used as a template for subsequent clearances to support maintenance work activities. A master clearance can be derived from an archived clearance or independently developed.

24. Maintenance In Progress (MIP) Tag - A MIP tag is a re usable tag that does not exist within the eSOMS selectable tag types. It is utilized as a flagging tool to indicate a clearance and/or ongoing maintenance and testing is affecting the associated equipment. Attachment 4 further describes the use of a MIP tag.

25. Non Tag - A virtual tag that exists within the eSOMS system but does not physically exist in the plant. Used to provide Status Control or indicate within the eSOMS software that a particular component may be out of position or have an equipment related problem. Examples include but are not limited to:

A. Opening a valve to provide a drain path for system drainage.

B. Identifying a valve that has excessive leak thru, such that system software will identify potential conflicts when attempting to use the valve as an isolation point.

4.6 Performing a Clearance

1. Utilizing OP-AA-101-1000-F01, Operations Shift Supervision SHALL perform the following:

A. **ENSURE** that plant status and conditions can support the requested tagging; including the operational impact on system(s) and equipment and Technical Specification requirements.

B. Clearances that utilize single valve protection for high energy systems shall be authorized by the Operations Shift Manager or Operations Manager.

C. If due to ALARA or safety considerations the placement of tag(s) may be waived by Shift Supervision. The OSM shall approve the waiver of the placement of a Danger Tag. This approval shall only be given in circumstances where the position of the component is not affected by the tag placement and there is NO reasonable opportunity for personnel access to the equipment location during the period of work; examples include:

(1) A Caution tag on a vent valve cannot be placed due to it being removed from the system for replacement.

(2) A Caution tag on a drain valve is not placed due to the valve being in a Locked High Radiation area.

(3) A Danger tag is not placed on an MOV handwheel due to being in a Locked High Radiation area.

D. Status the Clearance as Authorized.

E. If the placement of a tag is waived, subsequent to authorization in eSOMS, the tagger / verifier or Shift Supervision will indicate that the tag was “unable to hang / verify” and update the Tag Verification Note box to indicate why the tag placement was waived.

F. **ENSURE** qualified personnel are briefed in accordance with Attachment 9, Clearance Briefing Cards and assigned to perform the tagging manipulations.

G. **SPECIFY** when concurrent verification / peer check is to be used in lieu of Independent Verification (See Section 2.0 TERMS AND DEFINITIONS: Verification).

H. **DIRECT** the Clearance to be performed.

ATTACHMENT 4
FPL / NEXTERA ENERGY FLEET EQUIPMENT TAGGING PRACTICES
(Page 21 of 38)

8.2.3 Motor Operated Valves (MOV)

1. Motor Operated Valves may be used for isolation provided the following conditions are met:

A. The MOV is placed in the closed position.

B. The MOVs electrical power supply is isolated.

C. The MOV operator and its electrical supply are tagged.

2. MOVs that require their operator removed may be used for isolation provided the following conditions are met:

A. The valve is restrained closed with a gag and is verified to remain closed when the motor operator is removed.

B. The valve gag is tagged

3. The motive and control power breaker(s) SHALL be placed in the OFF position and tagged for MOV maintenance activities that require electrical isolation.

4. Manual seating or backseating of MOVs shall be governed by site specific procedures

8.2.4 Other Valves

1. Pressure operated valves and pressure control valves SHALL NOT be used for isolation purposes for personnel protection.

2. Check valves: If NO other means of isolation exists, Then check valves may be used as a clearance boundary, provided:

A. ORG review and site director approval of the Work Order.

B. The following additional measures SHALL be taken when a check valve is used as boundary isolation:

(1) The check valve SHALL be VERIFIED to be holding pressure prior to commencement of work.

ATTACHMENT 7
FPL/NEXTERA ENERGY ST LUCIE/TURKEY POINT SITE SPECIFIC EQUIPMENT TAGGING PRACTICES
(Page 3 of 24)

2.2 DEFINITIONS: (continued)

2.3 CLEARANCE PREPARATION

1. EXCEPTION (AL) CLEARANCES –the following types of exception (al) clearances may only be used with the specified restrictions in addition to the guidance of Section 4.3, Step 1.E(11):

A. CHECK VALVES - If NO other means of isolation exists, Then check valves may be used as an isolation point of an ECO boundary, provided:

(1) Prior Nuclear Joint Safety Committee approval of the clearance.

(2) ORG review and site director approval of the Work Order.

B. UNISOLABLE CLEARANCES - In cases where isolation boundaries can NOT be established for work affecting the pressure boundary, (e.g., work on the Reactor Vessel head, pressurizer or steam generator primary or secondary sides), a clearance which is controlled by Operations, as well as other departments performing said work, shall be GENERATED.

(1) This clearance shall LIST all such work.

(2) This clearance shall PLACE clearance Caution Tags, on in-service level, pressure, or temperature instruments which would be used to control fill and vent operations.

(3) A vent path shall be established as determined by Operations.

(4) Caution tags should be placed on all valve/component switches that if manipulated could affect the clearance boundary and/or plant parameters that are being administratively controlled. These Caution tags shall warn that manipulation of these components could jeopardize the safety of personnel working under this clearance.

67.

G2.1.38 Conduct of Operations: Knowledge of the stations requirements for verbal communications when implementing procedures.

In accordance with ADM-11.16, Transient Procedure Use and Adherence, during performance of EOPs, when a Control Room Operator initiates a crew update, the remaining crew members are required to acknowledge their awareness for the update by stating ____(1)____.

At the conclusion of the update, the recipients ____(2)____ required to repeat back "End of update."

A.	(1)	ready
	(2)	are
B.	(1)	ready
	(2)	are NOT
C.	(1)	update
	(2)	are
D.	(1)	update
	(2)	are NOT

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: See analysis B Part 2 incorrect: It is plausible that the applicant have the misconception that a repeat back is required as it is a fundamental principle to PSL communications standards.
B.	Correct:	Part 1 correct: **B.** Crew Updates **(1)** Crew Updates SHALL be used by an individual to ensure the entire control room team is aware of critical information. **a.** An individual SHALL announce "Crew Update" or "Update" and once all crewmembers have acknowledged by repeating "Ready" the individual will succinctly state the information and then state "End of Update". Part 2 correct: No repeat-back is required. Some judgment is required for what information requires an update. In general it is information that the entire crew needs to know to help mitigate a condition in progress.
C.	Incorrect:	Part 1 incorrect: It is plausible that the applicant has the misconception that the appropriate response to the update is to acknowledge verbatim with update. Part 2 incorrect: See analysis A
D.	Incorrect:	Part 1 incorrect: See analysis C Part 2 incorrect: See analysis B

Question Number: 67

Tier: 3 Group: ____

K/A: G2.1.38 Conduct of Operations: Knowledge of the stations requirements for verbal communications when implementing procedures.

Importance Rating: 3.7 3.8

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the requirements for verbal communications in the CR

Technical Reference: ADM-11.16

Proposed references to be provided: None

Learning Objective: PSL OPS 0904724 - 3

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

4.3 EOP Use and Adherence

1. The Emergency Operating Procedures have been developed to provide direction to the operating crews during post-trip situations. They provide the means to successfully deal with any scenario while protecting the health and safety of the public.

A. Transition Briefs

(1) During the course of executing an EOP, the need may arise to transfer from one EOP to another. The transition brief should cover the goals of the EOP being transitioned into. This brief should be performed by using Briefing Sheet 3 of OPS-520, EOP Transition.

B. Crew Updates

(1) Crew Updates SHALL be used by an individual to ensure the entire control room team is aware of critical information.

a. An individual SHALL announce "Crew Update" or "Update" and once all crewmembers have acknowledged by repeating "Ready" the individual will succinctly state the information and then state "End of Update". No repeat-back is required. Some judgment is required for what information requires an update. In general it is information that the entire crew needs to know to help mitigate a condition in progress.

b. It is the expectation that all Safeguards signals should be communicated via an update PRIOR to initiation using the following generic structure:

- "Crew Update, we are approaching [safeguards signal] on [parameter], end of update."

4.3 EOP Use and Adherence (continued)

1. B. (1) (continued)

c. All Safeguards signals should be communicated via an update with the following generic structure:

- "Crew Update, we have [safeguards signal], both trains on [parameter] (if multiple inputs), pumps and valves (except MSIS/CIAS), expected flow both trains (except MSIS/CIAS), end of update."

- If a component fails to automatically actuate following receipt of a safeguards signal, the reactor operator shall make one attempt to manual actuate the component prior to making his update to the crew and include in the update what manual action was required.

- Failure of an EFSAS signal to automatically actuate at the required setpoint will require operator action to manually actuate the signal per the EOP contingency action. Following manual actuation, proper response shall be validated by the operator as described in this section and a crew update performed. Where procedurally directed in the EOP following manual ESFAS actuations, the appropriate ESFAS table from EOP-99 shall be performed as resources/time permit, in parallel with subsequent EOP actions, to verify proper actuation of components not included as part of the update.

4.3 EOP Use and Adherence (continued)

1. B. (1) c. (continued)

- When an EOP step directs validation of a specific system or component(s) following an ESFAS signal actuation, validation must be performed by direct observation of the system component(s) on the control boards, including any applicable system parameters to ensure proper operation. For example, when directed to ensure Emergency Boration flow is greater than 40 gpm while performing Safety Function Status Checks, one cannot simply take credit for SIAS actuation, but must validate visually that a flow path exists from a Boric Acid Makeup Tank to a running charging pump flowing at greater than 40 gpm.

(2) If standard post trip actions are in progress, the operator shall wait until the pause between safety functions to perform their crew update.

(3) Some specific examples of conditions warranting an update are:

a. "Crew Update, we have both trains SIAS and CIAS, on low RCS Pressurizer pressure (or high containment pressure), pumps and valves SAT, emergency boration in progress, Main Feed Water is secured, end of update."

b. "Crew Update, we have MSIS actuation, A Train, on 2A Steam Generator low pressure (or high containment pressure), all valves closed, end of update."

c. “Crew Update, boration rate is now 10 gallons per minute, end of update”.

4.3 EOP Use and Adherence (continued)

1. B. (3) (continued)

d. "Crew Update, at time 0820, I am declaring an Unusual Event, SU1, due to loss of offsite power. I am the Emergency Coordinator. Upgrade criteria will be loss of either diesel generator, end of update".

e. "Crew Update, we are no longer meeting RCS Heat Removal Safety Function, end of update".

f. "Crew Update, we have AFAS actuation on AFAS 2, pumps and valves, with expected flow; AFAS 1 is locked out due to Feedwater differential pressure caused by the 2A EDG breaker delayed closure, end of update."

g. "Crew Update, we have containment spray actuation, both trains, pumps and valves, header flows are XX gpm, end of update."

C. Redundancy in Controls and Equipment

(1) The St. Lucie Plant has numerous instruments and redundant equipment to aid in interpreting and coping with casualties. Do **NOT** rely on a single instrument to make a Safety Function related decision. For example, when verifying <u>all</u> CEAs are fully inserted in EOP-01, do **NOT** rely on only the CEA rod bottom light indication as the single instrument to make that determination. In this case, it is appropriate to use the Lower Electrical Limit lights as a confirmatory indication to verify <u>all</u> CEAs are fully inserted in the event that the CEA rod bottom light indication is **NOT** illuminated.

D. Use of References While in an EOP

(1) During the course of executing an EOP, the need may arise to refer to another document, such as an Off-Normal Procedure, to gain some useful information. Referencing other documents is permissible, provided implementation of the EOP is continued until the exit conditions for that EOP are satisfied. The EOP provides the overall success path for the event.

68.

G2.1.40 Knowledge of refueling administrative requirements

Given the following conditions:

- Unit 2 is performing core alterations

Which ONE of the following completes the statements below?

In accordance with Unit 2 TS 3.9.2, Instrumentation, ____(1)____ Startup Range Nuclear Instrument channel(s) is/are required to be OPERABLE to perform core alterations.

In accordance with 0-NOP-67.05, Refueling Operation, Appendix R Nuclear Instrument channels ____(2)____ be substituted for a required Startup Range Nuclear Instrument?

A.	(1)	1
	(2)	can
B.	(1)	1
	(2)	can NOT
C.	(1)	2
	(2)	can
D.	(1)	2
	(2)	can NOT

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: see analysis “B” Part 2 incorrect: see analysis “C”
B.	Incorrect:	Part 1 incorrect: plausible. Per Tech Spec 3.9.2, only one channel is required to be audible in containment. The applicant may have the misconception that only one channel is therefore required to be operable. Part 2 correct: see analysis “D”
C.	Correct:	Part 1 correct: per Unit 2 Tech Spec 3.9.2, two startup range neutron flux monitors shall be operating, each with continuous visual indication in the control room and ONE with audible indication in the containment. Part 2 correct: per 0-NOP-67.05, only on Unit 2 can an Appendix R excore nuclear instrument be substituted for one source range channel.
D.	Incorrect:	Part 1 correct: see C” Part 2 incorrect: plausible. Per 0-NOP-67.05, one Appendix R excore NI channel can be substituted for one source range channel. This is applicable to Unit 2 only.

Question Number: 68

Tier: 3 Group:

K/A: G2.1.40 Knowledge of refueling administrative requirements

Importance Rating: 2.8 3.9

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the administrative requirements for refueling.

Technical Reference: 0-NOP-67.05

Proposed references to be provided: None

Learning Objective: PSL OPS 0702211 - 6

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

REFUELING OPERATIONS

3/4.9.2 INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.9.2 As a minimum, two startup range neutron flux monitors shall be OPERABLE and operating, each with continuous visual indication in the control room and one with audible indication in the containment and control room.

APPLICABILITY: MODE 6.

ACTION:

a. With one of the above required monitors inoperable or not operating, immediately suspend all operations involving CORE ALTERATIONS or operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of Technical Specification 3.9.1.

b. With both of the above required monitors inoperable or not operating, determine the boron concentration of the Reactor Coolant System at least once per 12 hours.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.2 Each startup range neutron flux monitor shall be demonstrated OPERABLE by performance of:

a. A CHANNEL CHECK in accordance with the Surveillance Frequency Control Program,

b. A CHANNEL FUNCTIONAL TEST within 8 hours prior to the initial start of CORE ALTERATIONS, and

c. A CHANNEL FUNCTIONAL TEST in accordance with the Surveillance Frequency Control Program.

REFUELING OPERATIONS

INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.9.2 As a minimum, two wide range logarithmic neutron flux monitors shall be operating, each with continuous visual indication in the control room and one with audible indication in the containment.

APPLICABILITY: MODE 6.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of Technical Specification 3.9.1. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.2 Each wide range logarithmic neutron flux monitor shall be demonstrated OPERABLE by performance of:

a. A CHANNEL FUNCTIONAL TEST in accordance with the Surveillance Frequency Control Program.

b. A CHANNEL FUNCTIONAL TEST within 8 hours prior to the start of CORE ALTERATIONS, and

c. A CHANNEL CHECK in accordance with the Surveillance Frequency Control Program during CORE ALTERATIONS.

2.1.7 Core Alterations (continued)

6. The Reactor Engineering Supervisor shall periodically check the method being used to calculate 1/M. _____

7. After completion of each fuel bundle movement into the core, approval shall be obtained from the Refueling Center, based on the 1/M data, before moving next fuel bundle into the core. _____

8. If mechanical damage to a fuel assembly occurs, fuel movement shall be stopped and 1/2-AOP-67.01, Accidents Involving New or Spent Fuel, entered. Loading shall **NOT** resume without approval of Refueling Supervisor and Reactor Engineering Supervisor. _____

9. Prior to resuming fuel movement following a delay, RE shall assess the signals obtained from the nuclear instruments used for count rate monitoring. This is intended to be a simple qualitative assessment for expected value and response, based on previous count rate data. _____

10. (Unit 2 Only) If one of the two Startup Channels on recorder JR-64-1, Power Range % Power, is out of service, one of the following Appendix R channels can be used in lieu of the Startup Channel: _____

Startup Channel	Display Device Tag Number	Comparable Appendix R Channel	Display Device Tag Number
CH1 S/U Chan 1	RY-005	RE-26-80B	RI-26-80B4
CH2 S/U Chan 2	RY-006	RE-26-80A	RI-26-80A4

69.

G2.2.3 / Equipment Control: (multi-unit license) Knowledge of the design, procedural, and operational differences between units.

Given the following conditions for BOTH Unit 1 and Unit 2:

- A Reactor trip from 100% power has just occurred due to a Loss of Coolant Accident.
- SIAS has actuated

Which ONE of the following describes the response of the Charging pumps for the given conditions?

IF low lube oil pressure is sensed, the Charging pumps will:

A.	Trip on BOTH Units
B.	NOT trip on either Unit
C.	Trip on Unit 1 and NOT trip on Unit 2
D.	Trip on Unit 2 and NOT trip on Unit 1

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	It is plausible for the applicant to believe that Low Lube oil pressure is a trip that will not be bypassed every as is true with the EDGs.
B.	Incorrect:	It is plausible for the applicant to believe that Low Lube oil pressure is a trip that will be bypassed on both units due to its importance in ECCS.
C.	Incorrect:	It is plausible for the applicant to believe that Low Lube oil pressure is a trip that will be bypassed on Unit 2 and not Unit 1 as this is the opposite of correct.
D.	Correct:	There is no low lube oil pressure trip in Unit 1. Unit 2 has a Low lube oil pressure trip but It is not bypassed on SIAS.

Question Number: 69

Tier: 3 Group:

K/A: G2.2.3 / Equipment Control: (multi-unit license) Knowledge of the design, procedural, and operational differences between units.

Importance Rating: 3.8 3.9

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the Unit Difference regarding Charging Pumps

Technical Reference: PSL OPS 0711205, CVCS

Proposed references to be provided: None

Learning Objective: PSL OPS 0711205-6/11 CVCS

Cognitive Level:

Higher	
Lower	X

Question Source:

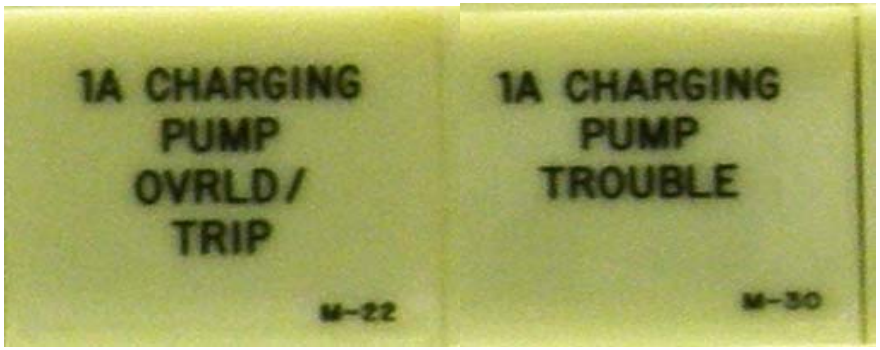
New	
Modified Bank	
Bank	X

Question History: PSL LOIT BANK question for the 2019 NRC Exam

Comments:

Charging Pump Trips EO-6,9,11

- **Unit 1**
  - **Low Suction Press.**
    - **10 psia**
  - **Trip bypassed by SIAS**
- **Unit 2**
  - **Low Suction Press.**
    - **10 psia**
  - **Low Oil Pressure**
    - **4 psig**
  - Neither Trip defeated by SIAS



Charging Pump Response
SIAS EO-6,9,11

- **Unit 1**
- **Three pumps start if switches in auto**
- **Low suction Press trip bypassed**
- **Pumps in Stop remain Off**

- **Unit 2**
- **Only 2 of 3 pumps start if switches in auto "C" pump will auto start if charging pump on electrical side it is tied to control switch is in stop.**
- **Low suction Press trip not bypassed**
- **Low oil Press trip not bypassed**
- **Pumps in Stop remain Off**

70.

G2.2.41 Ability to obtain and interpret station electrical and mechanical drawings.

Which ONE of the following completes the statements below?

In accordance with AD-AA-100-1006, Procedure and Work Instruction Use and Adherence, the ____(1)____ shall be used to verify the current revision.

Given CWD 8770-B-326 Sheet 174, if the 1A Boric Acid Makeup Pump thermal overload actuates, the Green Indicating Light ____(2)____ be LIT.

Note: NAMS – Nuclear Asset Management System

(REFERENCE PROVIDED)

A.	(1)	NAMS Asset Suite
	(2)	will
B.	(1)	NAMS Asset Suite
	(2)	will NOT
C.	(1)	NAMS Documentum Search
	(2)	will
D.	(1)	NAMS Documentum Search
	(2)	will NOT

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: NAMS Asset suite is the approved method for obtaining the current revision of the procedure for use in the plant. Part 2 correct: When the thermal overload trips the contacts will energize the green light to be lit.
B.	Incorrect:	Part 1 correct: See analysis A. Part 2 incorrect: It is plausible that the applicant not interpret the print correctly and not determine that the green light will be lit.
C.	Incorrect:	Part 1 incorrect: Documentum is NOT allowed for controlled document retrieval but it is plausible since it is allowed to research plant documents. Part 2 correct: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 70

Tier: 3 Group:

K/A: G2.2.41 Ability to obtain and interpret station electrical and mechanical drawings.

Importance Rating: 3.5 3.9

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know how to obtain the current revision and interpret the station drawing.

Technical Reference: 8770-B-326 Sheet 174, AD-AA-100-1006

Proposed references to be provided: 8770-B-326 Sheet 174

Learning Objective: PSL OPS 0902813 - 3

Cognitive Level:

Higher	X
Lower	

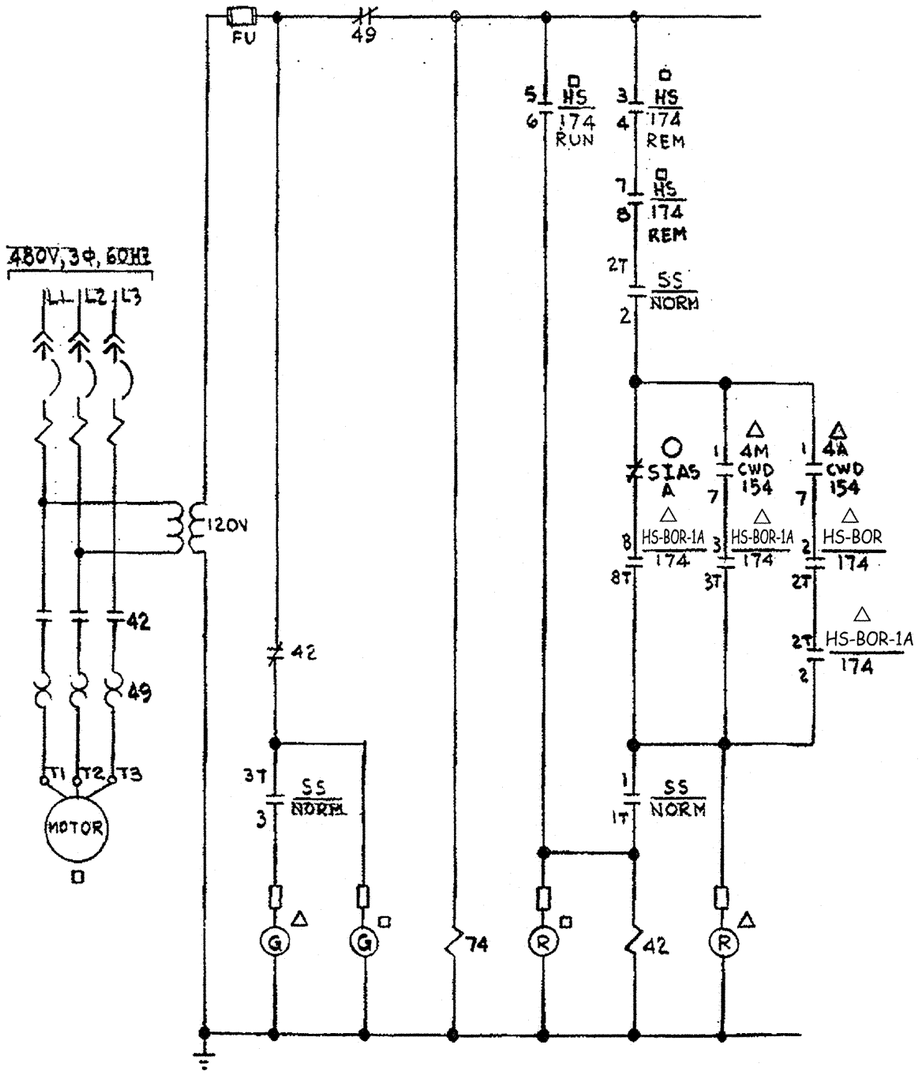
Question Source:

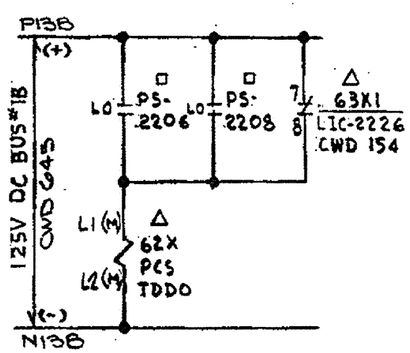
New	X
Modified Bank	
Bank	

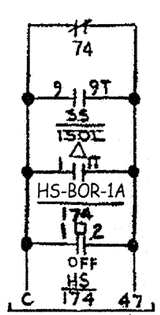
Question History: NEW question for the 2019 NRC Exam

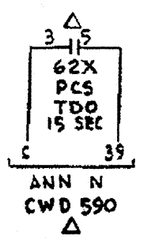
Comments:

70R REFERENCE









HS-174 (LOCAL)

CONTACTS	NO.	POSITIONS OFF	REM	RUN
1a 2a 3 4	1-2	X		
	3-4		X	X
5a 6a 7 8	5-6			X
	7-8	X	X	

MAINTAINED CONTACT

LOCATION SYMBOLS

- ○ - ESC SA
- △ - RTGB-105
- □ - LOCAL

ALL EQUIPMENT NOT DESIGNATED BY A SYMBOL IS LOCATED IN 480V MCC#1A6-EF3

LEGEND

PS-2206 - BORIC ACID PUMP 1A LO DISCH PRESS
PS-2208 - BORIC ACID PUMP 1B LO DISCH PRESS
4A - AUTO MODE OF OPER RELAY
4M - MANUAL MODE OF OPER RELAY

HS- BOR-1A/174

CONTACTS HANDLE END	NO	POSITIONS RUN	AUTO	OFF
1T 1 2 2T	1			X
	2		X	
3T 3 4 4T	3	X		
	4			X
5T 5 6 6T	5		X	
	6	X		
7T 7 8 8T	7		X	
	8	X	X	

MAINTAINED CONTACTS
X - CONTACT CLOSED

HS- BOR/174

CONTACTS HANDLE END	NO	POSITIONS BOR-1B	BOR-1A
1T 1 2 2T	1	X	
	2		X
3T 3 4 4T	3	X	
	4		X
5T 5 6 6T	5	X	
	6		X

} SH 175

MAINTAINED CONTACTS

NOTE:

1 - FOR ISOLATION SWITCH "SS" DEVELOPMENT SEE CWD 1011

R4- EC288131 R3-PCM 22B-192 R2-AS BUILT

REV	DATE	BY	APPROVED
8			
7			
6			
5			
4	2/10/10	RM	JG AG
3	10-29-92	BB ES	WP DW
2	12-2-75	DV	SS
1	8-16-74	RL	MA

EBASCO SERVICES INCORPORATED
NEW YORK
DIV. ELEC. DR. RM
SCALE + CH. RK
DATE SEP 21, 1972
APPROVED RC Hoehler
RL MD MM

FLORIDA POWER & LIGHT CO.
HUTCHINSON ISLAND PLANT-UNIT NO.1
SCHEMATIC DIAGRAM
BORIC ACID MAKE-UP PUMP 1A

8770-B-326
SHEET 174

CAD FILE: R8770-B-326 sh.174_R4.dwg

Ridgway's LOK-1A 12/18/69

4.4 Procedure or Work Instruction Non-Compliance

NOTE

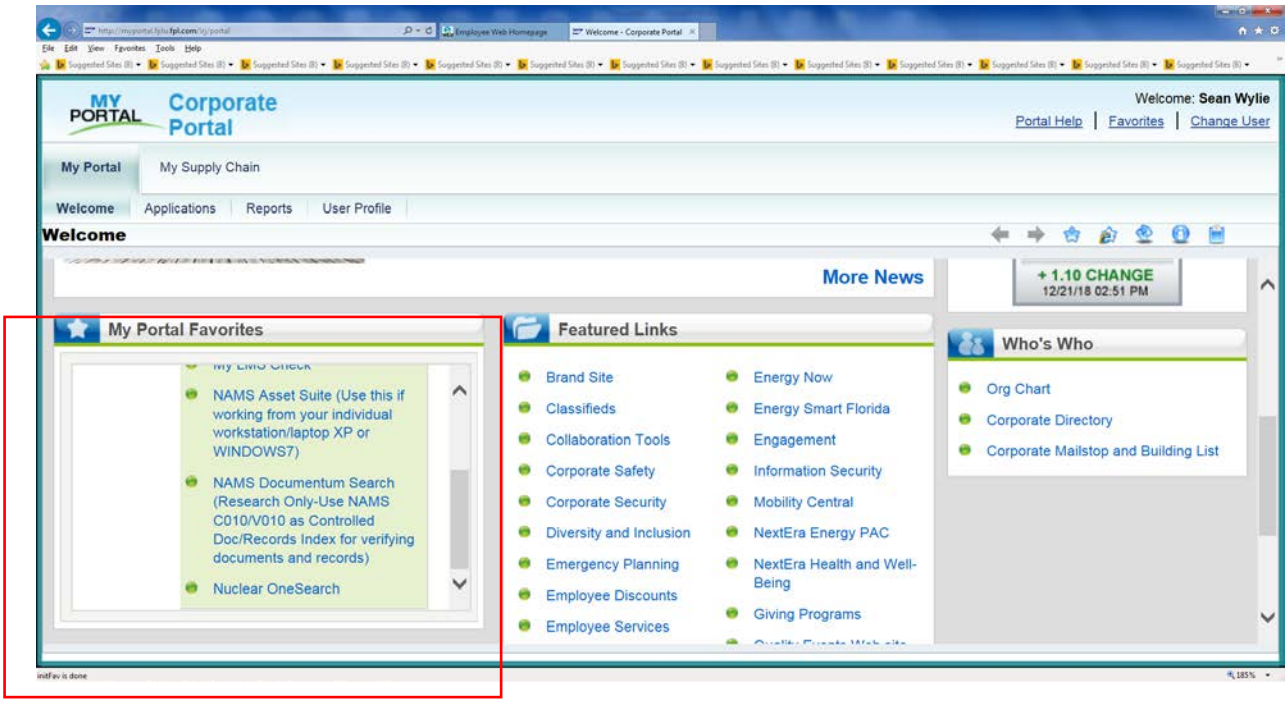
Intentional concealment of mistakes will not be tolerated and anyone involved in such practices will be subject to disciplinary action, up to and including discharge.

1. Upon discovery of a procedure or work instruction noncompliance issue, it shall be promptly reported to cognizant supervision.

4.5 Preparation for Continuous Use and Reference Use Performance

1. The following shall apply to the preparation for procedure and work instruction performance. These steps are intended to ensure that personnel use the current record copy revision and abide by the prescribed level of use during the task.

- Prior to starting the task, verify that the currently approved revision of the procedure and/or work instruction, with approved changes (i.e. temporary changes / temporary revisions), is being used.
- When a task has been delayed, verify that the procedure or work instruction is still the current approved revision with approved changes (i.e. temporary changes / temporary revisions), prior to resuming work.
- Review the procedure or work instructions for applicability, adequacy, and completeness.
- Identify the level of use.
- Identify the sections of the procedure or work instruction to be performed.
- Review the precautions and limitations.
- Review the prerequisites and potential plant impact of incorrect performance.
- Identify and discuss critical steps.


MY PORTAL
Corporate Portal
Welcome: Sean Wylie
Portal Help | Favorites | Change User
My Portal
My Supply Chain
Welcome
Applications
Reports
User Profile
Welcome
More News
+ 1.10 CHANGE
12/21/18 02:51 PM
My Portal Favorites
NAMS Asset Suite (Use this if working from your individual workstation/laptop XP or WINDOWS7)
NAMS Documentum Search (Research Only-Use NAMS C010/V010 as Controlled Doc/Records Index for verifying documents and records)
Nuclear OneSearch
Featured Links
Brand Site
Classifieds
Collaboration Tools
Corporate Safety
Corporate Security
Diversity and Inclusion
Emergency Planning
Employee Discounts
Employee Services
Energy Now
Energy Smart Florida
Engagement
Information Security
Mobility Central
NextEra Energy PAC
NextEra Health and Well-Being
Giving Programs
Who's Who
Org Chart
Corporate Directory
Corporate Mailstop and Building List

Procedure Use and Placekeeping

NLO Training

one fleet • one team • one goal • excellence

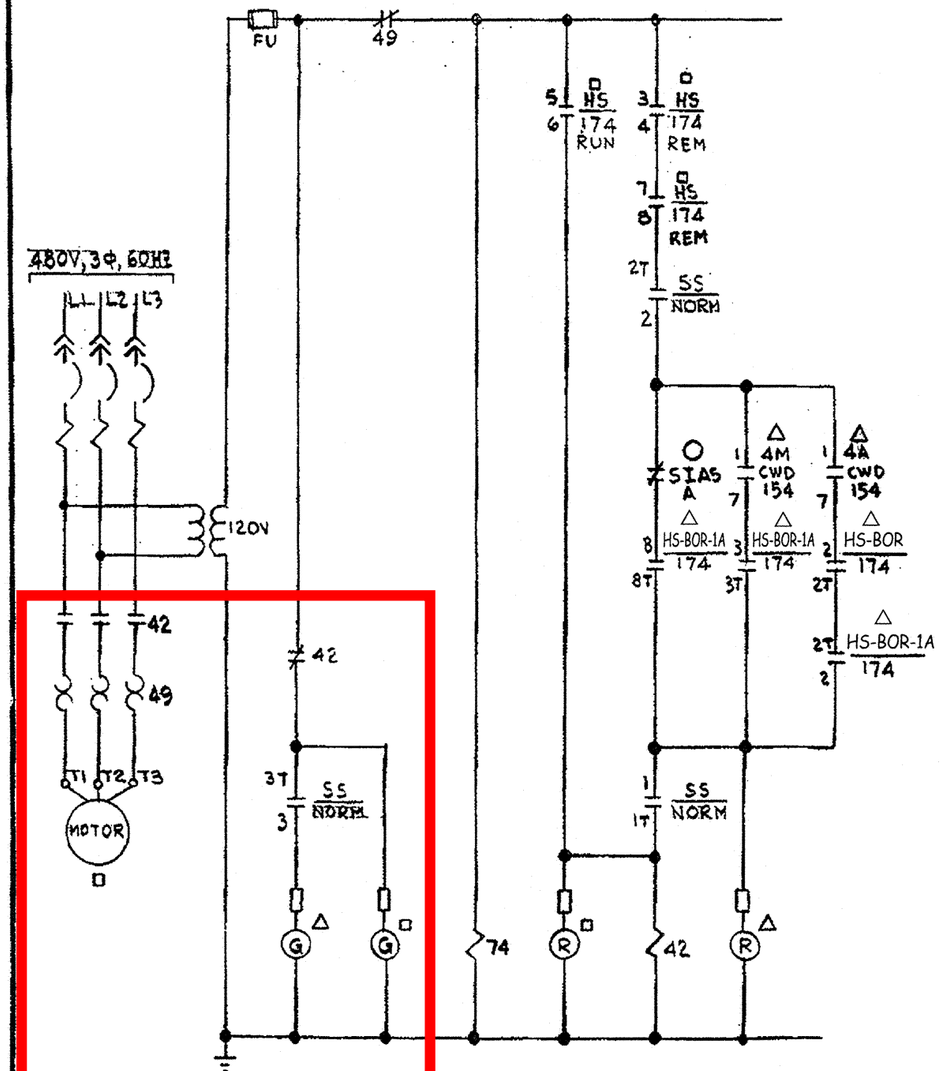
Question:

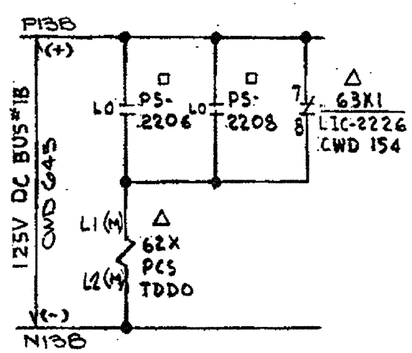
How can you find a controlled copy of a PSL Procedure?

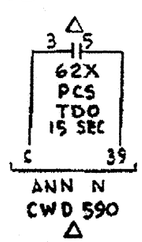
By using the "Asset Suites" component of the NAMS software.

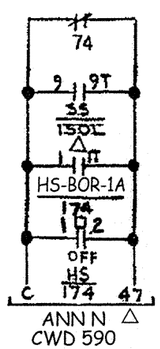
DO NOT USE DOCUMENTUM to get controlled procedures.

NEXTera ENERGY NUCLEAR FLEET









HS-174 (LOCAL)

CONTACTS	NO.	POSITIONS		
		OFF	REM	RUN
1 2 3 4	1-2	X		
	3-4		X	X
5 6 7 8	5-6			X
	7-8	X	X	

MAINTAINED CONTACT

LOCATION SYMBOLS

- ○ - ESC SA
- △ - RTGB-105
- □ - LOCAL

ALL EQUIPMENT NOT DESIGNATED BY A SYMBOL IS LOCATED IN 480V MCC#1A6-EF3

LEGEND

PS-2206 - BORIC ACID PUMP 1A LO DISCH PRESS
PS-2208 - BORIC ACID PUMP 1B LO DISCH PRESS
4A - AUTO MODE OF OPER RELAY
4M - MANUAL MODE OF OPER RELAY

HS- BOR-1A/174

CONTACTS HANDLE END	NO	POSITIONS RUN	AUTO	OFF
1T 1 2 2T	1			X
	2		X	
3T 3 4 4T	3	X		
	4			X
5T 5 6 6T	5		X	
	6	X		
7T 7 8 8T	7		X	
	8	X	X	

MAINTAINED CONTACTS
X - CONTACT CLOSED

HS- BOR/174

CONTACTS HANDLE END	NO	POSITIONS BOR-1B	BOR-1A
1T 1 2 2T	1	X	
	2		X
3T 3 4 4T	3	X	
	4		X
5T 5 6 6T	5	X	
	6		X

} SH 175

MAINTAINED CONTACTS

NOTE:

1 - FOR ISOLATION SWITCH "SS" DEVELOPMENT SEE CWD 1011

R4- EC288131 R3-PCM 22B-192 R2-AS BUILT

REV	DATE	BY	APPROVED
8			
7			
6			
5			
4	2/10/77	RM	JG
3	10-29-92	BS	WP
2	12-2-75	DV	BS
1	8-16-74	RL	MA

EBASCO SERVICES INCORPORATED
NEW YORK
DIV. ELEC. DR. RM
SCALE + CH. RK
DATE SEP 21, 1972
APPROVED RC Hoechler
RL MD MM

FLORIDA POWER & LIGHT CO.
HUTCHINSON ISLAND PLANT-UNIT NO.1
SCHEMATIC DIAGRAM
BORIC ACID MAKE-UP PUMP 1A

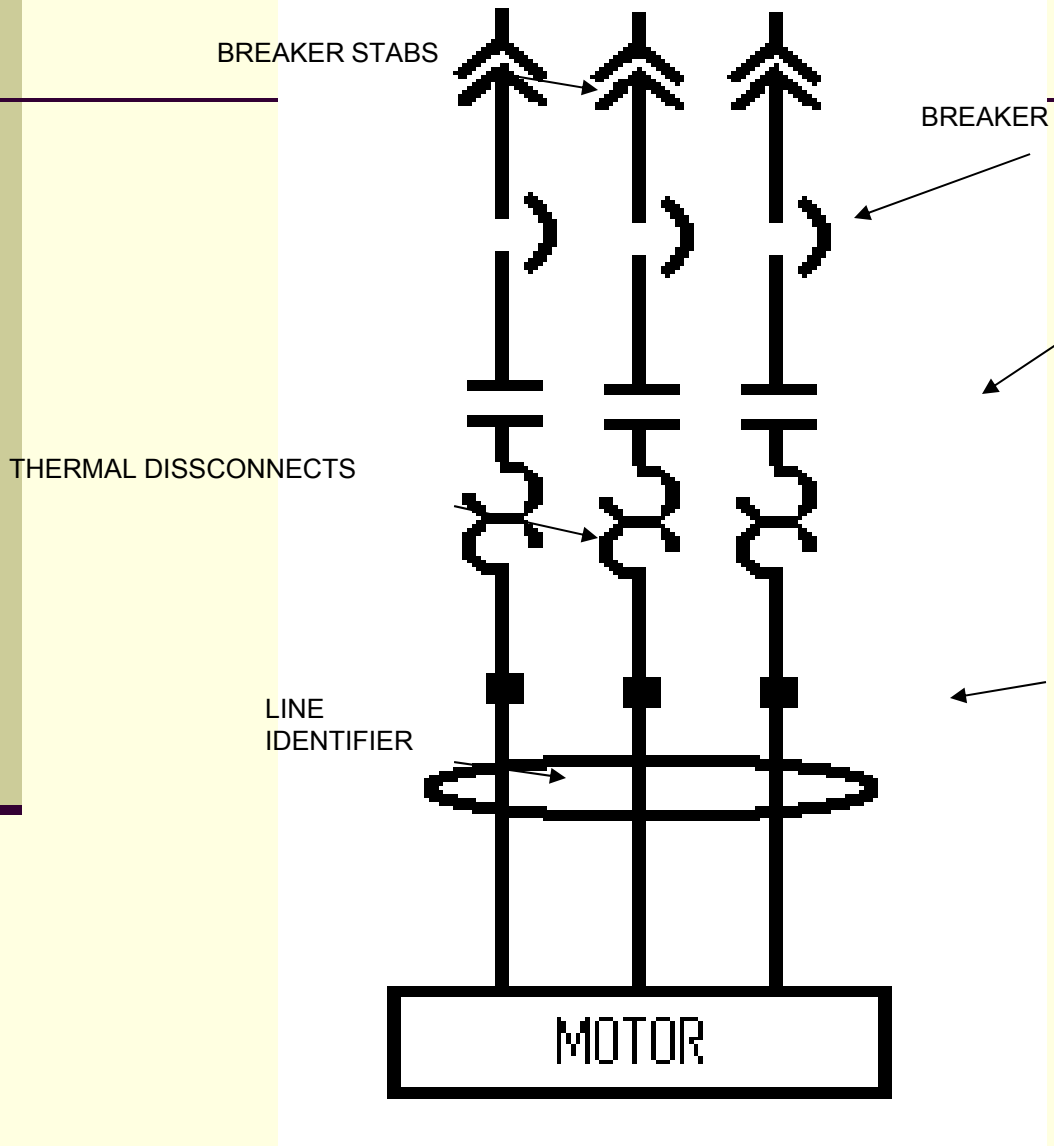
8770-B-326
SHEET 174

CAD FILE: R8770-B-326 sh.174_R4.dwg

Ridgway's LOK-1A 12/18/69

480 VOLT M.O.V.

Thermal Overload

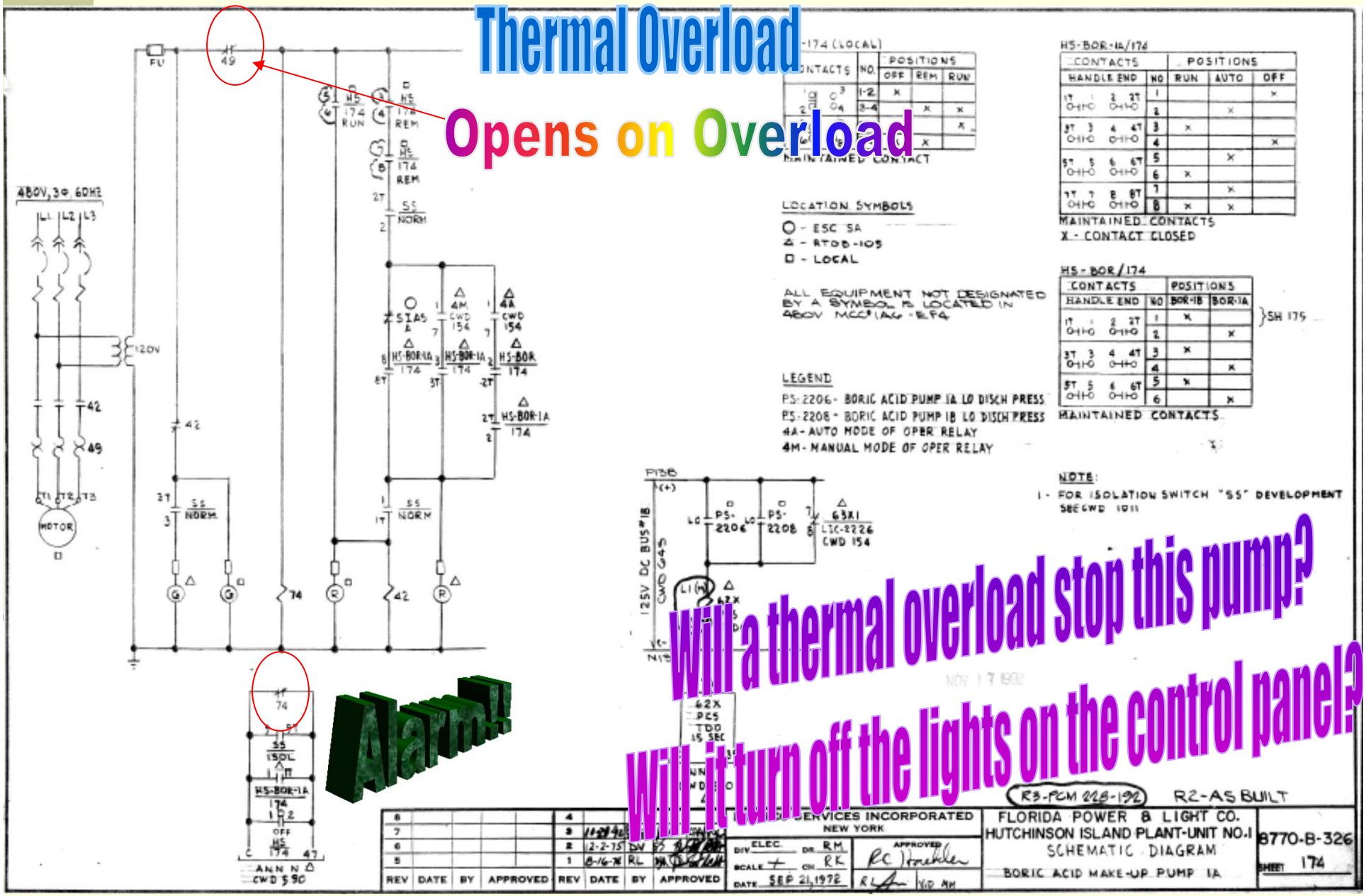


Causes breaker to open due to high current on any phase, high current equals heat. The heat produced is used to activate the device which opens contacts in the control circuitry, or the contacts can be bypassed, which is what we do on Unit-2 for our safety related components.

Thermal the Overlord

EO-5

Thermal Overload



71.

G2.2.6 Knowledge of the process for making changes to procedures

A Reactor Operator is performing a Safety Related operations procedure step (Non-Conditional) that can NOT be performed due to known plant conditions

Which ONE of the following describes the required approval (if any) to N/A the step in accordance with AD-AA-100-1006, Procedure and Work Instruction Use and Adherence?

A.	Reactor Operator ONLY
B.	Reactor Operator and a Senior Reactor Operator
C.	2 Senior Reactor Operators
D.	Shift Manager

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Plausible; per AD-AA-100-1006, for conditional steps contained with the procedure, the performer can N/A the step without supervisor approval. See step 4.8.2
B.	Incorrect:	Plausible; per AD-AA-100-1006, for non-ops procedures, only the functional area supervisor is required to approve the N/A of a step. See step 4.8.5.D
C.	Correct:	Per AD-AA-100-1006, for safety related Operations procedures, the N/A shall be reviewed, approved, and initialed by two senior reactor operators. See Note preceding step 4.8.5.D
D.	Incorrect:	Plausible. The shift manager is an SRO, but two SROs are required. See analysis “C”

Question Number: 71

Tier: 3 Group:

K/A: G2.2.6 Knowledge of the process for making changes to procedures

Importance Rating: 3.0 3.6

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required. This is a K/A match due to the process on NOT performing a step and effectively deleting it through the process of making the step NOT APPLICABLE, has resulted in a change to the procedure. Therefore, AD-AA-100-1006, requires the minimum of two SROs to approve the N/A with a basis. Additionally, other criteria must be met as outlined in the administrative procedure.

Technical Reference: AD-AA-100-1006

Proposed references to be provided: None

Learning Objective: PSL OPS 0904724-02

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

4.8 Use of Not Applicable (N/A)

NOTE

- N/A shall NOT be used to bypass steps that are inadequately or improperly written and shall NOT be used in lieu of an approved change.

1. At times, the performer needs to modify limited aspects of a Continuous Use or Reference Use procedure or work instruction with respect to the fact that a specific section or step does not apply to the activity being performed. Typical methods of modifying such aspects are as follows:

- identifying not applicable (N/A) steps
- performing parts of procedures
- changing the sequence of steps

NOTE

Exercising the use of *N/A* on non-conditional steps is the exception, NOT the normal practice.

2. The following rules apply to the use of N/A when identifying steps that <u>will not be performed</u>:

- Procedure or work instruction steps that contain conditional statements or provide specific conditions for being marked as Not Applicable may be marked N/A without additional written justification or supervisory approval.
- IF no steps of an entire section of a procedure or work instruction are performed, THEN the use of N/A, as described in this procedure, is not required.

3. N/A shall NOT be used:

- To bypass steps that are inadequately or improperly written and is NOT to be used in lieu of an approved change.
- To bypass unanticipated plant conditions (i.e. equipment issues, etc.).
- In lieu of processing a procedure or work instruction change.

4.8 Use of Not Applicable (N/A) (continued)

NOTE

Initial Conditions, Precautions and Prerequisites shall not be marked N/A unless written as conditional statements where the specified conditions are met.

4. Procedure or work instruction steps without conditional statements or specified conditions may be marked N/A, if ALL the following criteria are satisfied:

- Step is not needed to support current plant mode, condition, or configuration.
- Intent (method of operation or the results) of the step(s) or section(s) does (or will) not change.
- An unsafe condition is not created.
- Initial Conditions, Precautions, or Prerequisites will not be violated.
- The method by which processes are performed that may affect quality structures, systems, and components is not changed.

5. The use of N/A with respect to non-conditional steps shall be executed in the following manner prior to performing the applicable portion of the procedure or work instruction:

A. Write N/A

OR

B. To indicate that a consecutive group of steps is not applicable, place N/A in the first step and last step and draw a vertical line through the remaining steps involved. Careful attention to drawing this line is necessary to minimize the potential for inadvertently lining out a necessary step. Not applicable for PB only (Section 6.2, Commitment 1).

C. Document the reason for the step or steps being marked N/A.

4.8 Use of Not Applicable (N/A) (continued)

5. (continued)

NOTE

The use of N/A in procedures or work instructions that are for safety-related equipment or equipment that supports technical specifications:

- Non-Operations procedures shall be reviewed, approved, and initialed by a functional area supervisor and licensed Senior Reactor Operator (SRO).
- Operations procedures shall be reviewed, approved, and initialed by two Senior Reactor Operators.

D. When N/A is utilized, the applicable Supervisor shall execute the following steps:

- Be technically cognizant of the task, or obtain concurrence from an individual who is technically cognizant.
- Ensure the explanation for marking the step as N/A is documented and appropriate.
- Document approval by initialing the explanation for the step being marked N/A.
- Obtain review and initial by a Senior Reactor Operator for procedures or work instructions that are for safety related equipment or equipment that supports technical specifications.
- For operation procedures, obtain a second review and approval from a second Senior Reactor Operator.

72.

G2.3.5 Radiation Control: Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc

While performing Standard Post Trip actions on Unit 2 you notice the following on the Radiation Monitoring and Control System (RMCS):

- Main Steam Line Monitor indicates MAGENTA
- SJAE Monitor indicates YELLOW

Which ONE of the following states the status of the above monitors?

Main Steam Line Monitor has experienced a(n) ____(1)____failure.

SJAE Monitor is in the ____(2)____ range for activity.

A.	(1)	equipment
	(2)	ALERT
B.	(1)	equipment
	(2)	HIGH
C.	(1)	communications
	(2)	ALERT
D.	(1)	communications
	(2)	HIGH

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
		IAW 2-AOP-26.02, Attachment 1, RMCS Status Summary the following alarms are indicated by the following colors. Monitor Offline: White Alarms Disabled: Gray RMCS Communications: Magenta Channel High Alarm: Red Channel Alert Alarm: Yellow System Failure: Dark Blue Equipment Failure: Light Blue It is plausible that the applicant has misconceptions about which colors indicate which alarms therefore the choices are plausible.
A.	Incorrect:	Part 1 incorrect: LIGHT BLUE indicates an equipment failure Part 2 correct: YELLOW indicates channel in alert
B.	Incorrect:	Part 1 incorrect: LIGHT BLUE indicates an equipment failure Part 2 incorrect: RED indicates channel in High Alarm
C.	Correct:	Part 1 correct: MAGENTA indicates communication failure Part 2 correct: YELLOW indicates channel in alert
D.	Incorrect:	Part 1 correct: MAGENTA indicates communication failure Part 2 incorrect: RED indicates channel in High Alarm

Question Number: 72

Tier: 3 Group: _____

K/A: G2.3.5 Radiation Control: Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc

Importance Rating: 2.9 2.9

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required status of RMCS alarms.

Technical Reference: 2-AOP-26.01, Process Radiation Monitors
PSL OPS 0711411

Proposed references to be provided: None

Learning Objective: PSL OPS 0702411-13

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: BANK question from 2011 PSL NRC exam #73

ATTACHMENT 1
RMCS Alarm Status Summary
(Page 1 of 2)

NOTE

Alarm priority by color ranked from highest to lowest:

1. Blink / Red
2. Blink / Yellow
3. Solid Magenta
4. Blink / Dark Blue
5. Blink / Light Blue
6. Solid / Dark Blue
7. Solid / Red
8. Solid / Yellow
9. Solid / Light Blue
10. Solid / White
11. Solid / Gray
12. Blink / Half Intensity Light Blue
13. Solid / Green

ALARM DESCRIPTION	COLOR	STATUS INDICATOR
MONITOR LINE STATUS		
Monitor Offline/ Not Being Polled	WHITE	IOF
ALARMS DISABLED		
RM-80 (RM-23P) Disable Alarming	GRAY	DSAB
Disabled Alarming (Still polling, alarms hidden)	GRAY	DSAB
RMCS COMMUNICATIONS		
Channel Not Responding to Poll	MAGENTA	COMM
Monitor Communications Failure	MAGENTA	COMM
System Login Attempts Exceeds Maximum	MAGENTA	COMM
CHANNEL HIGH ALARM		
Channel in High Alarm	RED	HI
CHANNEL ALERT ALARM		
Channel in Alert Alarm	YELLOW	
SYSTEM FAILURE		
Monitor Status Unknown	DARK BLUE	DEV
Channel Out Of Service	DARK BLUE	DEV
Monitor Loss Of Sample Flow	DARK BLUE	DEV
Channel Filter Not Moving	DARK BLUE	DEV
No Pulses Received On Channel	DARK BLUE	DEV
Checksource Test Failed	DARK BLUE	DEV
Checksource Test Failed Assc Channel	DARK BLUE	DEV
No Pulses Received By Assc Channel	DARK BLUE	DEV
EQUIPMENT FAILURE		
Monitor Loss of Process Flow	LIGHT BLUE	CFN
Monitor in Scan Overload	LIGHT BLUE	CFN
Channel Filter Clogged	LIGHT BLUE	CFN
Channel Excessive Negative Deltas	LIGHT BLUE	CFN
Monitor Loss of Flow Control	LIGHT BLUE	CFN
Monitor Loss of Isokinetic Control	LIGHT BLUE	CFN
Monitor Loss of RM-23 Communications	LIGHT BLUE	CFN
Monitor Instrument Failure	LIGHT BLUE	CFN
Monitor Low Vacuum Alarm	LIGHT BLUE	CFN
Monitor High Vacuum Alarm	LIGHT BLUE	CFN

ORIGINAL QUESTION FROM 2010 NRC

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	3	
	K/A #	2.3.5	
	Importance Rating	2.9	

Radiation Control: Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.

Proposed Question: RO 73

While performing Standard Post Trip actions on Unit 2 you notice the following on the PC-11:

- Main Steam Line Monitor indicates MAGENTA
- SJAE Monitor indicates YELLOW

Which ONE of the following states the status of the above monitors?

A. Main Steam Line Monitor has experienced a communications failure.
SJAE Monitor is in the ALERT range for activity.

B. Main Steam Line Monitor has experienced an equipment failure.
SJAE Monitor is in the ALERT range for activity.

C. Main Steam Line Monitor has experienced an equipment failure.
SJAE Monitor is in the HIGH range for activity.

D. Main Steam Line Monitor has experienced a communication failure.
SJAE Monitor is in the HIGH range for activity.

Proposed Answer: A

Explanation (Optional):
MAGENTA indicates communication failure
YELLOW indicates channel in alert
LIGHT BLUE indicates an equipment failure

Technical Reference(s): Lesson Text 0711411 (Attach if not previously provided)
2-AOP-26.01, 'Process Radiation Monitors'

Proposed references to be provided to applicants during examination: _____

Learning Objective: _____ (As available)

ORIGINAL QUESTION FROM 2010 NRC

Question Source:	Bank #	
	Modified Bank #	(Note changes or attach parent)
	New	x
Question History:	Last NRC Exam	
Question Cognitive Level:	Memory or Fundamental Knowledge	x
	Comprehension or Analysis	
10 CFR Part 55 Content:	41.11 41.12 43.4 45.9	

Comments:

73.

G2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.

Given the following conditions:

- Unit 1 AUTOMATICALLY tripped
- Pressurizer Pressure = 2050 psia
- Containment Pressure = 3.0 psig
- 1A S/G NR Level = 34%
- 1B S/G NR Level = 38%
- 1A S/G Pressure = 830 psia
- 1B S/G Pressure = 940 psia

Which ONE of the following describes the parameter that caused the Automatic Reactor Trip?

A.	1A S/G NR Level
B.	Pressurizer Pressure
C.	Containment Pressure
D.	S/G Differential Pressure (ASGT)

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	The RPS trip setpoint for S/G NR level is < 35%, the ESFAS setpoint is < 19% and the administrative limit per procedure is 50%.
B.	Incorrect:	It is plausible that the applicant not know that Pressurizer Pressure does not have a low pressure trip, since it does have a high pressure trip at 2400 psia and SIAS at < 1600 pisa.
C.	Incorrect:	It is plausible that the applicant not know that Containment Pressure high trip setpoint is 3.3 psig. The current value of the stem is 3.0 psig which is < 3.3 psig,
D.	Incorrect:	It is plausible that the applicant not know that S/G Differential Pressure (ASGT) trip setpoint is 135 psid, the current D/P value of the stem is 110 psig which is < 135 psid.

Question Number: 73

Tier: 3 Group: _____

K/A: G2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.

Importance Rating: 4.5 4.6

10 CFR Part 55: (CFR: 41.7 / 45.7 / 45.8)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the setpoints associated with automatic actions for EOP entry

Technical Reference: 1-AOP-99.01

Proposed references to be provided: None

Learning Objective: PSL OPS 0702404-5

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

ATTACHMENT 5
Channel Failure Impact Table
(Page 1 of 3)

NOTE

- HI RATE trip (2/4 trips) and HI RATE CWP (2/4 pretrips) protection is active only between 10^{-4}% and 15% power.
- LIN 1 bistable used for LOSS LOAD and HI RATE trip bypass functions.
- LOG and LIN 1 bistable status lights are ON when above their setpoints. If power is less than reset setpoint, then reset pushbutton should be pushed to turn off the light.
- ZPMB and CPS bistable status lights are OFF when below their setpoints.

Channel Indicator (source device)	RPS Trip	ESFAS Trip	Other Functions	Tech Specs	AOP Section
Wide Range NI MA/MB/MC/MD	HI RATE ≥ 2.49 dpm	N/A	Audio count rate CPS $1x10^3$ cps LOG 10^{-4}% ZPMB 1.0% HI RATE CWP > 1.3 dpm Input to HI RATE trip block Input to CEAPDS PDIL	3.3.1.1 3.9.2	Section 4.2.2
Linear Power Range Control NI (RRS 9 and 10)	N/A	N/A	Input to RRS Input to Pwr Ratio Calculator	N/A	Section 4.2.3

ATTACHMENT 5
Channel Failure Impact Table
(Page 2 of 3)

Channel Indicator (source device)	RPS Trip	ESFAS Trip	Other Functions	Tech Specs	AOP Section
Linear Power Range Safety NI MA/MB/MC/MD	HI POWER >107%/+9.61% (VHP) LOC PWR DEN (variable) (LPD) TM/LO PRES	N/A	VHP, LPD, TM/LP CWPs LIN 1 15% Input to TM/LP setpt (ASI) Input to HI RATE/LOSS LOAD trip blocks	3.3.1 3.2.4	Section 4.2.4
Pressurizer Pressure PI-1102A/B/C/D	Pzr Press > 2400 psia TM/LO PRES (TM/LP)	SIAS < 1600 psia	DSS > 2450 psia (ATWS)	3.3.1 3.3.2	Section 4.2.5
T-cold TI-1102A/B/C/D (TT-1112CA/CB/CC/CD TT-1122CA/CB/CC/CD)	N/A	N/A	Input to ΔT Power Input to TM/LP setpt (Q Pwr) Input to LPD CWP	3.3.1	Section 4.2.6
T-hot TI-1102A/B/C/D (TT-1112HA/HB/HC/HD TT-1122HA/HB/HC/HD)	N/A	N/A	Input to ΔT Power Input to TM/LP setpt (Q Pwr) Input to LPD CWP	3.3.1	Section 4.2.7
TM/LP Setpoint Generator PR-1102A/B/C/D	N/A	N/A	Variable 1887 to 2350 psia. Set to 2500 psia for ASGT	3.3.1	Section 4.2.8
S/G Pressure PI-8013A/B/C/D PI-8023A/B/C/D	S/G Press ≤ 600 psia (auct low) TM/LO PRES (ASGT>135 psid)	MSIS < 600 psia	Input to AFAS	3.3.1 3.3.2	Section 4.2.9
S/G Level LIC-9013A/B/C/D LIC-9023A/B/C/D	S/G Level < 35.0% (admin limit < 50%)	Level < 19% NR	Hi Level Override >82% NR	3.3.1 3.3.2	Section 4.2.10

ATTACHMENT 5
Channel Failure Impact Table
(Page 3 of 3)

Channel Indicator (source device)	RPS Trip	ESFAS Trip	Other Functions	Tech Specs	AOP Section
Feedwater Pressure PI-09-9A/B/C/D PI-09-10A/B/C/D	N/A	N/A	Input to AFAS	3.3.2	Section 4.2.11
Turbine EH Fluid Pressure PS-22-101, 102, 103, 104	Loss of Load ≤ 800 psig AND reactor power > 15%	N/A	N/A	3.3.1	Section 4.2.12
Containment Pressure PIS-07-2A/B/C/D	Cntmt Press > 3.3 psig	SIAS > 5.0 psig CIS > 5.0 psig CSAS > 10 psig w/SIAS	N/A	3.3.1 3.3.2	Section 4.2.13
Containment Radiation RIS-26-3-2 thru -6-2 (CHAN 3, 4, 5, 6)	N/A	CIS > 10 R/hr (refueling > 90 mr/hr)	N/A	3.3.2	Section 4.2.14
RCS flow PDI-1101A/B/C/D (PDI-1111A/B/C/D PDI-1121A/B/C/D)	RCS flow < 95%	N/A	N/A	3.3.1	Section 4.2.15
RWT Level LIS-07-2A/B/C/D	N/A	RAS < 4 feet in RWT	N/A	3.3.2	Section 4.2.16
DV/UV Relays A3/B3 Buses: 27-1 thru 27-6 A2/B2 LCs: 27-1, 27-4	N/A	LOOP on Degraded Voltage (DV)/ Undervoltage (UV)	N/A	3.3.2	Section 4.2.17

74.

G2.4.27 Emergency Procedures / Plan: Knowledge of “fire in the plant procedures

Given the following conditions:

- A Fire has occurred in the Unit 1 RAB
- 1-AOP-100.01, Response to Fire is in progress

Which ONE of the following completes the statements below?

A Reactor Trip is required for a Fire in classification Zone Mode ____(1)____.

If the Reactor is tripped, the ____(2)____ Desk RCO will **DIRECT** the implementation of 1-AOP-100.01.

A.	(1)	M1
	(2)	Unit 1
B.	(1)	M1
	(2)	Unit 2
C.	(1)	M3
	(2)	Unit 1
D.	(1)	M3
	(2)	Unit 2

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: It is plausible that the applicant think that M1 fires require the Unit 2 Desk RCO to be summoned to the Unit 1 control room, since M1 contains portions of the RAB that could be understood to required additional support. Part 2 correct: See analysis C.
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 incorrect: It is plausible that the Unit 2 Desk RCO implement 1-AOP-100.01, so the Unit 1 Desk RCO can perform Unit 1 operations.
C.	Correct:	Part 1 correct: IAW 1-AOP-100.01, Step 4.2.13, IF Zone Mode is M3 as identified in Section 4.2, Step 11, THEN ANNOUNCE and REPEAT the following using Gai-tronics and boost function: The following are to report to Unit 1 Control Room immediately: ☐ Unit 2 Desk RCO ☐ CRI SNPO ☐ EP SNPO ☐ All SNPOs that are NOT on the Fire Brigade Part 2 correct: IAW 1-AOP-100.01, Step 4.2.20, NOTE: The Unit 1 desk RCO shall direct the implementation of this procedure while the US directs implementation of the EOPs.
D.	Incorrect:	Part 1 correct: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 74

Tier: 3 Group: _____

K/A: G2.4.27 Emergency Procedures / Plan: Knowledge of “fire in the plant procedures

Importance Rating: 3.4 3.9

10 CFR Part 55: (CFR: 41.10 / 43.5 / 45.13)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the fire in the plant AOP actions.

Technical Reference: 1-AOP-100.01

Proposed references to be provided: None

Learning Objective: PSL OPS 0802830 - 1

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2 Subsequent Operator Actions (continued)

☐ **20.** IF affected Zone Mode is M3 as identified in Section 4.2, Step 11, THEN **PERFORM** the following:

NOTE

The Unit 1 desk RCO shall direct the implementation of this procedure while the US directs implementation of the EOPs.

A. **VERIFY** both of the following conditions are met:

- More than one fire zone is affected
- Affected Fire Area is C, E or O

A.1 **NOTIFY** Desk RCO fire zone attachment(s) identified in Section 4.2, Step 11 will be implemented following reactor trip.

A.2 **GO TO** Section 4.2, Step 20.C.

B. **NOTIFY** Desk RCO integrated fire area attachment identified in Section 4.2, Step 11 will be implemented following reactor trip.

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2 Subsequent Operator Actions (continued)

20. (continued)

C. **TRIP** reactor.

D. **IMPLEMENT** 1-EOP-01, Standard Post Trip Actions, while continuing with this procedure.

E. **IMPLEMENT** fire attachment identified in Section 4.2, Step 11.

F. **GO TO** Section 4.2, Step 25.

*	**21.** **VERIFY** only Zone Mode M1 fire zones are affected as identified in Section 4.2, Step 11.	**21.1** **ANNOUNCE** and **REPEAT** the following using Gai-tronics and boost function: The following are to report to Unit 1 Control Room immediately: • Unit 2 Desk RCO • CRI SNPO • EP SNPO • All SNPOs that are **NOT** on the Fire Brigade **21.2** **GO TO** Section 4.2, Step 20.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2 Subsequent Operator Actions (continued)

☐ **13.** IF Zone Mode is M3 as identified in Section 4.2, Step 11, THEN **ANNOUNCE** and **REPEAT** the following using Gai-tronics and boost function:

The following are to report to Unit 1 Control Room immediately:

- Unit 2 Desk RCO
- CRI SNPO
- EP SNPO
- All SNPOs that are **NOT** on the Fire Brigade

ATTACHMENT 1
Fire Area, Zone, and Protected Train
(Page 1 of 4)

EL	ZONE NAME	FIRE AREA	FIRE ZONE	PROTECTED TRAIN	ZONE MODE *
Reactor Auxiliary Building (RAB)					
-0.5	Aerated Waste Storage Tank Area	O	27	A	M1
	Boric Acid Condensate Room	O	37	A	M1
	Boric Acid Make-up Tank Room	O	40	A	M1
	Charging Pump Access Hallway	N	36A	None **	M1
	Charging Pump Cubicle 1C	N	38	B	M1
	Charging Pump Cubicle 1B	N	75	A	M1
	Charging Pump Cubicle 1A	N	76	B	M1
	Chemical Drain Tank Area	O	29	A	M1
	ECCS Pump Room 1A	M	34	B	M1
	ECCS Pump Room 1B	M	35	A	M1
	Gas Decay Tank Area	O	39	A	M3
	Main Hallway	O	36	A	M3
	Shutdown Heat Exchanger Room 1A	L	32	B	M1
	Shutdown Heat Exchanger Room 1B	L	31	A	M1
	Spent Resin Tank Room	O	74	A	M1
	Pipe Tunnel	J	33	B	M1
19.5	Boric Acid and Waste Conc Cubicles	E	52	B	M1
	Containment Purge Plenum Room	E	46	B	M1
	Ion Exchanger Rooms and Hallways	E	50	B	M1
	Drumming Station	E	51	B	M1
	Electrical Penetration Room (East)	A	77	B	M3
	Electrical Penetration Room (West)	D	78	A	M3
	Health Physics Offices	C	43	A	M1
	Hold-up Tank Enclosures	E	41	B	M1
	Hot Machine Shop	C	43	A	M1
	Hot / Cold Locker Room	C	43	A	M1
	I&C / E/M Hot Shop	A	44B	B	M1
Note *	M0: There are **NO** SSD attachment actions M1: SSD attachment actions may be completed in any MODE M3: SSD attachment actions require Unit be in MODE 3 or below				
Note **	**NO** specific train is protected in this area. The US / SM shall utilize Fire Brigade Leader's feedback and monitor plant response to determine which train to use for safe shutdown.				

ATTACHMENT 1
Fire Area, Zone, and Protected Train
(Page 2 of 4)

EL	ZONE NAME	FIRE AREA	FIRE ZONE	PROTECTED TRAIN	ZONE MODE *
Reactor Auxiliary Building (RAB) Continued					
19.5	Laundry and Decontamination Area	C	54	A	M1
	Letdown Heat Exchanger Room	E	48	B	M1
	Main Hallway, West	C	55W	A	M3
	Main Hallway, East	E	55E	B	M1
	Piping Penetration Room	J	45	B	M3
	RAB West Stairwell	Z	83	B	M3
	Radio Chemistry Lab	C	44	A	M1
	S/G Blowdown Tank Room	E	80	B	M3
	Switchgear Room AB	E	47	B	M3
	VCT Room	E	49	B	M1
19.5; 28.67	Main Hallway (West End and Cable Loft Area)	C	55W	A	M3
28.67	Cable Loft Enclosure	A	44A	B	M3
43	Battery Room 1A	A	59	B	M3
	Battery Room 1B	C	58	A	M3
	Boric Acid Batching Tank Area	E	62	B	M1
	Cable Spread Room	B	57	B **	M3
	Closed Blowdown HX Area	Y-Y	63	B	M1
	HVAC Equipment Room	E	61	B	M1
	HVE-9B Fan Room	J	62B	B	M1
	RAB West Stairwell	Z	83	B	M3
	Static Inverter Room (B Elec Equip)	C	57B	A	M3
	Switchgear Room 1A	A	60	B	M3
	Switchgear Room 1B	C	56	A	M3
62	Aux Building Roof	Y-Y	72	B	M1
	CCW Surge Tank Room	F	82	B **	M3
	Control Room	F	70	B **	M3
	Control Room HVAC Area	F	71	B **	M3
	Technical Support Center and Offices	F	73	B **	M3
Note *	M0: There are **NO** SSD attachment actions M1: SSD attachment actions may be completed in any MODE M3: SSD attachment actions require Unit be in MODE 3 or below				
Note **:	CONSIDER going to 1-ONP-100.02, Control Room Inaccessibility.				

75.

G 2.4.39 Emergency Procedures / Plan: Knowledge of the ROs responsibilities in emergency plan implementation.

Given the following conditions:

- The plant has just declared an Emergency Classification of an ALERT
- NO radioactive release has occurred

Which ONE of the following completes the statements below?

The extra LICENSED operators will report to the ____(1)____.

The extra NON-LICENSED operators will report to the ____(2)____.

A.	(1)	Control Room
	(2)	OSC
B.	(1)	Control Room
	(2)	TSC
C.	(1)	TSC
	(2)	OSC
D.	(1)	TSC
	(2)	TSC

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: In accordance with ADM-11.16, the Reactor Operators report to the affected units control room. Part 2 correct: In accordance with ADM-11.16, the Non-licensed operators report to the Operations Support Center.
B.	Incorrect:	Part 1 correct: see analysis "A" Part 2 incorrect: but plausible. The emergency response organization mans the Technical Support Center adjacent to the Unit 1 control room. This would provide close proximity for control room response and where the Emergency Coordinator is stationed
C.	Incorrect:	Part 1 incorrect: TSC is plausible because it is located next to the Unit 1 control room and is where the EC. This would provide timely assistance due to the proximity of the control room and location of the Emergency Coordinator. Part 2 correct: see analysis "A"
D.	Incorrect:	Part 1 incorrect: see analysis "C" Part 2 incorrect: see analysis "B"

Question Number: 75

Tier: 3 Group: _____

K/A: G 2.4.39 Emergency Procedures / Plan: Knowledge of the ROs responsibilities in emergency plan implementation.

Importance Rating: 3.9 3.8

10 CFR Part 55: (CFR: 41.10 / 45.11)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required to know the ROs responsibilities during EP implementation

Technical Reference: ADM-11.16

Proposed references to be provided: None

Learning Objective: PSL OPS 0702833-10

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

4.3 EOP Use and Adherence (continued)

2. Implementation of Emergency Plan Implementing Procedures (EPIPs)

A. During a declared emergency at the ALERT level or above Operations department personnel within the fenced area shall respond as follows:

(1) The members of the minimum shift crew complement report to their respective control room. If EOP actions prevent immediately reporting to the control room they should notify the control room as soon as practical for personnel accountability.

(2) Extra qualified operators in the NLO classifications report to the OSC.

(3) Extra licensed operators report to the affected Unit's control room.

NOTE

The Shift Communicator notebook is maintained in the Unit Control Room, and is controlled and updated by the US on shift.

B. The following items are required to be included in the notebook:

(1) St. Lucie Plant Emergency Response Directory (ERD) (provided by Information Services)

(2) Availability Roster (provided by Business Systems)

(3) Nuclear Division Duty Officer (NDDO) Schedule (provided by Licensing, Juno Beach)

(4) The following sections of EPIP-03, Emergency Response Organization Notification / Staff Augmentation (provided by Information Services):

a. Attachment 1, Emergency Recall System (ERS) Desktop Activation Instructions FPL Emergency Recall System (ERS) Activation Checklist

b. Attachment 2, Microsoft Outlook Paging Instructions

5.1 General Overview (continued)

7. ¶14 Early Activation of Emergency Response Facilities

It may be useful to have technical and/or operational support available early in an emergency prior to when the Technical Support Center (TSC), Operational Support Center (OSC), or Emergency Operations Facility (EOF) is required to be operational. Activation of any of these facilities does not require declaration of an emergency class or entry into a specific emergency classification. If early activation of one or more of the facilities is desired, then follow these guidelines:

A. This is an option during normal working hours only.

B. A page announcement should be made to request that appropriate Emergency Response Organization personnel to report to the [identify what facility / facilities is / are to be activated early].

C. Turnover of EC responsibilities is done in accordance with Step 5.1.1, above.

D. The E-Plan Activation Alarm is used only when the Emergency Response Facilities (ERFs) are to be activated in accordance with the requirements of the Emergency Plan (i.e., at the Alert or higher emergency level) and is provided for in the checklist included in this procedure.

E. Staff augmentation due to actual facility activation is to be done in accordance with the Alert Declaration Checklist, Site Area Emergency Declaration Checklist or the General Emergency Declaration Checklist which are part of this procedure.

8. Severe Weather Considerations

If hurricane force winds are projected on-site, and either one or both Unit(s) is/are in Mode 1, 2 or 3, Then use the following criteria for unit shutdown:

NOTE
Sustained hurricane force winds are sustained winds of 74 mph (64 kt or 119 kph) or greater.

A. For storms projected to reach on-site as a Category 1, 2 or 3 Hurricane, the Unit(s) shall be placed in HOT STANDBY (Mode 3) or below at least two (2) hours before the projected onset of sustained hurricane force winds within the Owner Controlled Area and both Units shall remain off-line for the duration of the hurricane force winds (or restoration of reliable offsite power).

5.8 Alert Declaration Checklist – **Tech Support Center** (continued) INITIAL

7. **Activate** onsite ERO Response: **(Contact Control Room to Complete if not already prior completed)**

A. ¶13 **Sound** the Emergency Plan (E-Plan) Activation Alarm. _____

B. Notify plant ERO personnel using Gai-tronics and boost function:

1. If a radioactive release is in progress, Then announce:

"Attention all Plant personnel, Unit 1 / 2 has declared a ALERT due to (event name)

_____

A radioactive release is in progress. All emergency response personnel report to the OSC.

All non-emergency response personnel report to your normal work location and contact your supervisor."

OR

2. If a radioactive release is not in progress, Then announce:

¶19 "Attention all plant personnel, Unit 1 / 2 has declared a ALERT due to (event name)

_____

All emergency response personnel report at once to your assigned emergency response facility.

All non-emergency response personnel report to your normal work location and contact your supervisor."

3. **Repeat** the announcement. _____

5.9 Site Area Emergency Declaration Checklist – **TSC** (continued) INITIAL

8. **Evacuate the Site** of Non-Essential Personnel: (**Contact Control Room to Complete the step if not previously done**)

A. **Sound** the Site Evacuation Alarm. _____

B. Notify plant personnel using GAI-tronics and boost function: (**IF No Release** send evacuees Home) _____

"Attention all non-emergency response plant personnel, you are directed to commence evacuation of the Owner Controlled Area, report to your vehicles and (Choose one):

____ (**Home**) Proceed to your homes".

OR

____ (**North**) Proceed North away from the plant to Jaycee Park for contamination check, accountability and further instructions."

OR

____ (**South**) Proceed South away from the plant to Jensen Beach Parking Area for contamination check, accountability and further instructions."

C. **Repeat** the announcement. _____

D. **Record** time of Site Evacuation Start _____ _____

9. Contact Radiation Protection and If a release of radioactive material is in progress, Then review personnel access with Health Physics personnel and notify Security personnel with any special instructions. _____

10. If a release of radioactive material has occurred or is in progress, Then notify Chemistry to promptly implement EPIP-14, Dose Assessment Using the Unified RASCAL Interface, and report the results to the Emergency Coordinator (EC).

11. If the EC determines evacuation of an area is necessary (refer to Attachment 2, Criteria for Evacuation), Then ensure announcements have been made to conduct a local evacuation. _____

12. Complete required NRC event notifications in accordance with EPIP-08 Appendix B, Notifications from the Technical Support Center, Off site Notifications and Protective Action Recommendations. _____

76.

007 EA2.03 Reactor Trip ï Stabilization ï Recovery / Ability to determine or interpret the following as they apply to a reactor trip: Reactor trip breaker position

Given the following conditions:

- Unit 1 is at 100% power
- Engineering reports that Trip Circuit Breaker (TCB) #1 Trip Coil is NON ï Qualified / Inoperable

Subsequently:

- An Automatic Rx Trip occurs

Which ONE of the following describes the MINIMUM required actions in accordance with ADM-11.16, Transient Procedure Use and Adherence and TS 3.3.1, Reactor Protective Instrumentation PRIOR to the trip and how the TCB positions are verified AFTER the trip?

The crew is required to OPEN ____(1)____.

TCB Breaker Position is verified by observing ALL ___(2)____ Lights LIT.

A.	(1)	TCB # 1 ONLY
	(2)	GREEN Lights LIT
B.	(1)	TCB # 1 ONLY
	(2)	WHITE Lights LIT
C.	(1)	TCB # 1 and TCB # 5
	(2)	GREEN Lights LIT
D.	(1)	TCB # 1 and TCB # 5
	(2)	WHITE Lights LIT

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: It is plausible that the applicant believe that only the inoperable TCB be required as a minimum. Part 2 is correct. See analysis C.
B.	Incorrect:	Part 1 incorrect: It is plausible that the applicant believe that only the inoperable TCB be required as a minimum. Part 2 is incorrect. It is plausible that with the available Unit 1 indications the applicant believes that only the white light will be lit.
C.	Correct:	Reactor Trip Breakers **(1)** Reactor trip switchgear Trip Circuit Breakers (TCBs) are set up in 4 channels. Each channel consists of two TCBs operated in a set controlled by a common control (K) relay. As such, any one inoperable TCB is considered to make the entire set inoperable. If only one TCB in a set is in the tripped condition (or its associated trip leg is otherwise open circuited) a vulnerability is created such that a subsequent K-relay failure in another trip path could cause a single CEA bus to deenergize and result in a half-trip condition. To reduce the chance of a half-trip condition occurring due to a K-relay failure, OPEN both TCBs in a set whenever TCBs are removed from service for maintenance. This is **NOT** applicable during breaker cycling for testing. The TCBs are paired as follows: ☐TCB 1&5 ☐TCB 2&6 ☐TCB 3&7 ☐TCB 4&8 If a TCB is deemed inoperable for any reason, trip / open the inoperable TCB and its associated TCB in the same trip path. If both TCBs in the trip path are open, their design function and the intent of the Tech Spec are met. With the trip path open the Tech Spec Action / LCO is satisfied and the 6 hour time limit on Unit 1 no longer applies. Although **NOT** explicitly described by Unit 1 Tech Specs, these actions are consistent with the Unit 2 Technical Specifications and CE Standard Tech Specs (NUREG-1432). This action to remove TCBs as a set is applicable to Unit 1 and Unit 2 Unit 1 Trip Status Panel includes the following indications: • White Ground indication lights (NO Grounds ON) • White K relay lights (Trip path tripped light OFF) • White UV relay lights (Trip signal light OFF) • White Shunt relay lights (Trip signal light ON) • White/Green TCB lights (Closed White light ON, Open Green light ON) • White Phase current lights (Trip light ON) • Red Trip Swgr UV lights (Trip light ON)
D.	Incorrect:	Part 1 correct see analysis C. Part 2 incorrect see analysis B.

Question Number: 76

Tier: 1 Group: 1

K/A: 007 EA2.03 Reactor Trip ï Stabilization ï Recovery / Ability to determine or interpret the following as they apply to a reactor trip: Reactor trip breaker position

Importance Rating: 4.2 4.4

10 CFR Part 55: (CFR 41.7 / 45.5 / 45.6)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to determine the TCB position and the ADM TCB trip requirements

Technical Reference: ADM-11.16, TS 3.3.1

Proposed references to be provided: None

Learning Objective: PSL OPS 0702404-5

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

4.5.5 Operational Guidance for Section 3/4.3 (continued)

1. (continued)

D. Reactor Trip Breakers

(1) Reactor trip switchgear Trip Circuit Breakers (TCBs) are set up in 4 channels. Each channel consists of two TCBs operated in a set controlled by a common control (K) relay. As such, any one inoperable TCB is considered to make the entire set inoperable. If only one TCB in a set is in the tripped condition (or its associated trip leg is otherwise open circuited) a vulnerability is created such that a subsequent K-relay failure in another trip path could cause a single CEA bus to deenergize and result in a half-trip condition.

To reduce the chance of a half-trip condition occurring due to a K-relay failure, OPEN both TCBs in a set whenever TCBs are removed from service for maintenance. This is **NOT** applicable during breaker cycling for testing. The TCBs are paired as follows:

- TCB 1&5
- TCB 2&6
- TCB 3&7
- TCB 4&8

If a TCB is deemed inoperable for any reason, trip / open the inoperable TCB and its associated TCB in the same trip path. If both TCBs in the trip path are open, their design function and the intent of the Tech Spec are met. With the trip path open the Tech Spec Action / LCO is satisfied and the 6 hour time limit on Unit 1 no longer applies.

Although **NOT** explicitly described by Unit 1 Tech Specs, these actions are consistent with the Unit 2 Technical Specifications and CE Standard Tech Specs (NUREG-1432). This action to remove TCBs as a set is applicable to Unit 1 and Unit 2.

3/4.3 INSTRUMENTATION

3/4.3.1 REACTOR PROTECTIVE INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.1.1 As a minimum, the reactor protective instrumentation channels and bypasses of Table 3.3-1 shall be OPERABLE.

APPLICABILITY: As shown in Table 3.3-1.

ACTION:

As shown in Table 3.3-1.

SURVEILLANCE REQUIREMENTS

4.3.1.1.1 Each reactor protective instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations during the modes and at the frequencies shown in Table 4.3-1.

4.3.1.1.2 The logic for the bypasses shall be demonstrated OPERABLE during the at power CHANNEL FUNCTIONAL TEST of channels affected by bypass operation. The total bypass function shall be demonstrated OPERABLE in accordance with the Surveillance Frequency Control Program during CHANNEL CALIBRATION testing of each channel affected by bypass operation.

4.3.1.1.3 The REACTOR TRIP SYSTEM RESPONSE TIME of each reactor trip function shall be demonstrated to be within its limit in accordance with the Surveillance Frequency Control Program. Neutron detectors are exempt from response time testing. Each test shall include at least one channel per function.

TABLE 3.3-1

REACTOR PROTECTIVE INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
1. Manual Reactor Trip	2	1	2	1, 2 and *	1
2. Power Level ï High	4	2(a)	3(f)	1, 2	2
3. Reactor Coolant Flow ï Low	4/SG	2(a)/SG	3/SG	1, 2 (e)	2
4. Pressurizer Pressure ï High	4	2	3	1, 2	2
5. Containment Pressure ï High	4	2	3	1, 2	2
6. Steam Generator Pressure ï Low	4/SG	2(b)/SG	3/SG	1, 2	2
7. Steam Generator Water Level ï Low	4/SG	2/SG	3/SG	1, 2	2
8. Local Power Density ï High	4	2(c)	3	1	2
9. Thermal Margin/Low Pressure	4	2(a)	3	1, 2 (e)	2
9a. Steam Generator Pressure Difference ï High	4	2(a)	3	1, 2 (e)	2
10. Loss of Turbine ï Hydraulic Fluid Pressure - Low	4	2(c)	3	1	2

TABLE 3.3-1 (Continued)

REACTOR PROTECTIVE INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
11. Wide Range Logarithmic Neutron Flux Monitor					
a. Startup and Operating -- Rate of Change of Power ï High	4	2(d)	3	1, 2 and *	2
b. Shutdown	4	0	2	3, 4, 5	3
12. Reactor Protection System Logic	4	2	4	1, 2*	4
13. Reactor Trip Breakers	4	2	4	1, 2*	4

TABLE 3.3-1 (Continued)

TABLE NOTATION

* With the protective system trip breakers in the closed position and the CEA drive system capable of CEA withdrawal.

(a) Trip may be bypassed below 1% of RATED THERMAL POWER; bypass shall be automatically removed when Wide Range Logarithmic Neutron Flux power is $\geq$ 1% of RATED THERMAL POWER.

(b) Trip may be manually bypassed below 685 psig; bypass shall be automatically removed at or above 685 psig.

(c) Trip may be bypassed below 15% of RATED THERMAL POWER; bypass shall be automatically removed when Power Range Neutron Flux power is $\geq$ 15% of RATED THERMAL POWER.

(d) Trip may be bypassed below 10^{-4}% and above 15% of RATED THERMAL POWER; bypass shall be automatically removed when Wide Range Logarithmic Neutron Flux power is $\geq 10^{-4}$% and Power Range Neutron Flux power $\leq$ 15% of RATED THERMAL POWER.

(e) Deleted.

(f) There shall be at least two decades of overlap between the Wide Range Logarithmic Neutron Flux Monitoring Channels and the Power Range Neutron Flux Monitoring Channels.

ACTION STATEMENTS

ACTION 1 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or be in HOT STANDBY within the next 6 hours and/or open the protective system trip breakers.

ACTION 2 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in either the bypassed or tripped condition within 1 hour. For the purposes of testing and maintenance, the inoperable channel may be bypassed for up to 48 hours from time of initial loss of OPERABILITY; however, the inoperable channel shall then be either restored to OPERABLE status or placed in the tripped condition.

TABLE 3.3-1 (Continued)

ACTION STATEMENTS

b. Within one hour, all functional units receiving an input from the inoperable channel are also bypassed or tripped.

c. The Minimum Channels OPERABLE requirement is met; however, one additional channel may be bypassed for up to 48 hours while performing tests and maintenance on than channel provided the other inoperable channel is placed in the tripped condition.

ACTION 3 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, verify compliance with the SHUTDOWN MARGIN requirements of Specification 3.1.1.1 or 3.1.1.2, as applicable, within 1 hour and at least once per 12 hours thereafter.

ACTION 4 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, be in HOT STANDBY within 6 hours; however, one channel may be bypassed for up to 1 hour for surveillance testing per Specification 4.3.1.1.1.

DELETED

TABLE 4.3-1

REACTOR PROTECTIVE INSTRUMENTATION SURVEILLANCE REQUIREMENTS

FUNCTIONAL UNIT	CHANNEL CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST	MODES IN WHICH SURVEILLANCE REQUIRED
1. Manual Reactor Trip	N/A	N.A.	S/U(1)	N/A
2. Power Level ï High				
a. Nuclear Power	SFCP	SFCP(2), SFCP(3), SFCP(5)	SFCP	1,2
b. ΔT Power	SFCP	SFCP(4), SFCP	SFCP	1
3. Reactor Coolant Flow ï Low	SFCP	SFCP	SFCP	1, 2
4. Pressurizer Pressure ï High	SFCP	SFCP	SFCP	1, 2
5. Containment Pressure ï High	SFCP	SFCP	SFCP	1, 2
6. Steam Generator Pressure ï Low	SFCP	SFCP	SFCP	1, 2
7. Steam Generator Water Level ï Low	SFCP	SFCP	SFCP(6, 7)	1, 2
8. Local Power Density ï High	SFCP	SFCP	SFCP	1
9. Thermal Margin/Low Pressure	SFCP	SFCP	SFCP	1, 2
9a. Steam Generator Pressure Difference ï High	SFCP	SFCP	SFCP	1, 2
10. Loss of Turbine -- Hydraulic Fluid Pressure ï Low	N.A.	N.A.	S/U(1)	N.A.
11. Wide Range Logarithmic Neutron Flux Monitor	SFCP	N.A.	S/U(1)	1, 2, 3, 4, 5 and *
12. Reactor Protection System Logic	N.A.	N.A.	SFCP and S/U(1)	1, 2 and *
13. Reactor Trip Breakers	N.A.	N.A.	SFCP	1, 2 and *

77.

022 G2.2.12 Loss of Rx Coolant Makeup / Knowledge of surveillance procedures

Given the following conditions:

- Unit 1 is at 100% power
- V2504, RWT to Charging Pump Suction is out of service for maintenance
- The crew is performing a blended makeup to the VCT per 1-NOP-02.24, Boron Concentration Control

Subsequently:

- FCV-2210Y, Boric Acid Flow Control Valve fails closed
- The crew enters 1-AOP-02.01, Boron Concentration Control System Abnormal Operations

Which ONE of the following completes the statements below?

1-OSP-02.07, Boration Flowpath Sources surveillance ____(1)____ MET.

If the crew was required to perform a downpower, in accordance with 1-AOP-02.01, the crew would borate via ____(2)____.

A.	(1)	is
	(2)	V2514, Emergency Borate
B.	(1)	is
	(2)	V2174, Emergency Boration from BAM Pump Discharge
C.	(1)	is NOT
	(2)	V2514, Emergency Borate
D.	(1)	is NOT
	(2)	V2174, Emergency Boration from BAM Pump Discharge

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 is correct: IAW 1-OSP-02.07, 4.1.2.3, V2504 is not in the required flowpath to take credit for this option. Applicant must know that FCV-2210Y is NOT in the TS credited flowpath. Part 2 is correct: IAW 1-AOP-02.01, 4.2.1.3, IF FCV-2210Y fails to open then start boric acid pump and open V2514.
B.	Incorrect:	Part 1 is correct see explanation A. Part 2 is incorrect: 1-AOP-02.01, has steps to manually blend and makeup to the VCT using Attachment 2 which has V2174 as the valve used to throttle to make the blend ratio. This is plausible if the applicant thinks that the boration will be performed using Att 2.
C.	Incorrect:	Part 1 is incorrect but plausible. 2 paths are required to be credited for the surveillance which 4.1.2.3 is MET along with the gravity feed flowpath but if the applicant thinks that the path in 4.1.2.4 is being credited then V2504 is in the surveillance for this path therefore plausible. Applicant must know that FCV-2210Y is NOT in the TS credited flowpath. Part 2 is correct.
D.	Incorrect:	Part 1 is incorrect see explanation C. Part 2 is incorrect see explanation B.

Question Number: 77

Tier: 1 Group: 1

K/A: 022 G2.2.12 Loss of Rx Coolant Makeup / Knowledge of surveillance procedures

Importance Rating: 3.7 4.1

10 CFR Part 55: (CFR 41.10 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(2)

K/A Match: K/A is matched because the applicant is required to know surveillance procedures associated with loss of makeup

Technical Reference: 1-OSP-02.07, 1-AOP-02.01

Proposed references to be provided: None

Learning Objective: PSL OPS 0702205-15

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

4.1.2 Boration Flow Paths (continued)

NOTE

To be used as a source, at least one of the following must be OPERABLE:

- 1A BAMT
- 1B BAMT
- Combined volume of 1A and 1B BAMT

3. IF crediting the following flow path:

- BAMT
- BAMP(s)
- Charging Pump(s)

THEN **VERIFY** the following:

Component	Description	Required Position	OPERABLE (✓)
V2509	BAM GRAVITY 1A (RTGB-105)	CLOSED	☐ SAT ☐ UNSAT
V2508	BAM GRAVITY 1B (RTGB-105)	CLOSED	☐ SAT ☐ UNSAT
V2510	BA TANK 1A RECIRC VALVE (RTGB-105)	OPEN	☐ SAT ☐ UNSAT
V2511	BA TANK 1B RECIRC VALVE (RTGB-105)	OPEN	☐ SAT ☐ UNSAT
MV-02-2	RCP SEAL INJECTION (THROTTLE) (RTGB-103)	OPEN Note 1, Note 2	☐ SAT ☐ UNSAT
V2514	EMERGENCY BORATE (RTGB-105)	CLOSED Note 3	☐ SAT ☐ UNSAT
SE-02-2	LOOP 1A2 CHARGING ISOL (RTGB-105)	OPEN Note 2	☐ SAT ☐ UNSAT
SE-02-1	LOOP 1B1 CHARGING ISOL (RTGB-105)	OPEN Note 2	☐ SAT ☐ UNSAT

Note 1 Normally de-energized OPEN.

Note 2 These valves may be in different positions during PZR cooldown, when the Charging System is shutdown, and other plant evolutions at the discretion of the US/SM.

Note 3 Valve is capable of being operated.

4.1.2 Boration Flow Paths (continued)

4. IF crediting the following flow path:

- RWT
- Charging Pumps(s)

THEN **VERIFY** the following:

Component	Description	Required Position	OPERABLE (✓)
V2504	REFUEL WATER TO CHARGING PUMP (RTGB-105)	CLOSED Note 2, Note 3	☐ SAT ☐ UNSAT
MV-02-2	RCP SEAL INJECTION (THROTTLE) (RTGB-103)	OPEN Note 1, Note 2	☐ SAT ☐ UNSAT
SE-02-1	LOOP 1B1 CHARGING ISOL (RTGB-105)	OPEN Note 2	☐ SAT ☐ UNSAT
SE-02-2	LOOP 1A2 CHARGING ISOL (RTGB-105)	OPEN Note 2	☐ SAT ☐ UNSAT
Switch (Key 73)	PRESSURIZER LVL CONTROL BYPASS (RTGB-105)	NORMAL Note 2	☐ SAT ☐ UNSAT

Note 1 Normally de-energized OPEN.

Note 2 These valves may be in different positions during PZR cooldown, when the Charging System is shutdown, and other plant evolutions at the discretion of the US/SM.

Note 3 Valve is capable of being operated.

5. **VERIFY** the following Acceptance Criteria are met:

Acceptance Criteria	Results (√)
Two Boration Flow Paths meet requirements of T.S. 3.1.2.2	☐ SAT ☐ UNSAT

Performed By: _____ _____

Print/Sign Date

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.1 General Actions (continued)

2. (continued)

C. IF VCT level continues to rise,
THEN **STOP** the following:

- Primary water pumps
- Boric acid makeup pumps

D. **ADJUST** RCS boron concentration to maintain steady state RCS conditions.

CAUTION

Prolonged use of V2514, EMERGENCY BORATE, can lead to uncontrolled power reduction rates. Boric acid flow rate is equal to the charging pump flow rate when using the emergency borate valve.

☐ **3.** IF FCV-2210Y, BORIC ACID VALVE, fails to OPEN AND boration is required,
THEN **PERFORM** the following:

A. **START** boric acid pump.

B. **OPEN** V2514, EMERGENCY BORATE.

INSTRUCTIONS		CONTINGENCY ACTIONS	
4.2.3	**Manual Makeup to VCT (continued)**		
3.	**(continued)**		
E.	**VERIFY** BAMT recirc valves are OPEN as follows: • V2510, BA TANK 1A RECIRC VALVE • V2511, BA TANK 1B RECIRC VALVE	**E.1**	**OPEN** valve(s).
F.	**START** Blending BAMT boric acid pump.		
G.	**OPEN** FCV-2161, BORIC ACID MAKEUP ISOL.	**G.1**	IF normal lineup can **NOT** be used**,** THEN **USE** local control per Attachment 2, Local Operation of Boron Concentration Control.
H.	**VERIFY** FCV-2210Y, BORIC ACID VALVE, is in AUTO.	**H.1**	**PLACE** in AUTO.
I.	**VERIFY** FCV-2210X, REACTOR MAKEUP, is in AUTO.	**I.1**	**PLACE** in AUTO.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.3 Manual Makeup to VCT (continued)

3. (continued)

J. **OPEN** V2512, REACTOR MAKEUP WATER STOP VLV.

NOTE

The boric acid addition should be completed while keeping at least 30 gallons of primary water left to flush out any remaining boric acid from the lines.

K. **ADJUST** the following per blend ratio:

- FIC-2210X, MAKEUP WATER FLOW
- FIC-2210Y, BORIC ACID FLOW

K.1 IF flow rates cannot be achieved using auto or soft manual control, THEN **PERFORM** either of the following alternate methods:

- M (manual) mode using arrow buttons on either side of SHIFT button
- Attachment 2, Local Operation of Boron Concentration Control

L. **MONITOR** VCT level for proper level change.

M. **MAINTAIN** VCT pressure less than or equal to 30 psig by cycling V2513, VCT VENT, as required.

ATTACHMENT 2
Local Operation of Boron Concentration Control
(Page 1 of 1)

1. **STATION** operator at boric acid station and **ESTABLISH** communications between operator and Control Room.

2. **PLACE** MAKEUP MODE SELECTOR switch in MANUAL.
(Section 6.1.3 Management Directive 1)

3. **START** 1A or 1B Boric Acid Pump.

4. **OPEN** FCV-2161, BORIC ACID MAKEUP ISOL.

5. IF FCV-2161, BORIC ACID MAKEUP ISOL, fails to open, THEN **DIRECT** operator to open V2164, BAM PUMP STRAINER BYPASS ISOL. (RAB/3/N-RA3Z/W-RAE)

6. **ENSURE** V2514, EMERGENCY BORATE, is CLOSED.

7. **ENSURE** FCV-2210X, REACTOR MAKEUP, is CLOSED.

8. **ENSURE** FCV-2210Y, BORIC ACID VALVE, is CLOSED.

NOTE

- V2174, EMERG BORATION FROM BAM PUMPS DISCH ISOL, provides a direct boric acid flowpath to the charging pump suction at 20 gpm.
- V2180 provides a direct primary water flowpath to the charging pump suction.

9. **DIRECT** operator at boric acid station to throttle V2174, EMERG BORATION FROM BAM PUMPS DISCH ISOL, per blend ratio. (RAB/6/N-RA3Z/E-RAE)

10. **MONITOR** FR-2210, MAKEUP FLOW, for boric acid flow rate and **ADJUST** V2174, EMERG BORATION FROM BAM PUMPS DISCH ISOL, as required.

11. **DIRECT** operator at boric acid station to throttle V2180, PMW TO CHARGING PUMPS SUCT MANUAL ISOL, per blend ratio. (RAB/5/N-RA3/E-RAE)

12. **MONITOR** FR-2210, MAKEUP FLOW, for reactor makeup water flow rate and **ADJUST** V2180, PMW TO CHARGING PUMPS SUCT MANUAL ISOL, as required.

13. **MONITOR** T-avg and RCS boron concentration for abnormal changes.

14. **DIRECT** operator to adjust V2174 and V2180 as necessary to maintain VCT level 40% to 55% and plant conditions stable.

78. 025 AA2.06 Loss of RHR System / Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: Existence of proper RHR overpressure protection

Given the following conditions:

- Unit 2 is in Mode 5
- RCS is solid
- RCS Pressure is 150 psia
- RCS temperature is 130 ÁF
- A cooldown is in progress
- Shutdown Cooling Trains A and B are in service

Subsequently:

- PIC-2201, Letdown Pressure Controller output fails LOW
- RCS Pressure is RISING
- The RCS Hot Leg Suction Isolation Valves have automatically CLOSED

Which ONE of the following describes the PORV lift setpoint for this condition and the status of TS 3.4.9.3, Overpressure Protection Systems?

The PORVs will lift at ____(1)____ psia.

TS 3.4.9.3 ____(2)____ MET.

(REFERENCE PROVIDED)

A.	(1)	350
	(2)	is
B.	(1)	350
	(2)	is NOT
C.	(1)	490
	(2)	is
D.	(1)	490
	(2)	is NOT

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is incorrect: 350 psia is the lift setpoint for the PORV lift setpoint on Unit 1 and also the shutdown cooling relief valves therefore plausible. Part 2 is incorrect: TS 3.4.9.3 is NOT met but the applicant may think that it is met by the SDCRVs but this is not true because they are isolated by the Hot Leg suction valves being closed at 500 psia.
B.	Incorrect:	Part 1 is incorrect see explanation A. Part 2 is correct. TS 3.4.9.3 is NOT met since the SDCRVs are isolated by the Hot Leg suction valves being closed at 500 psia. The PORVs cannot be used due to the MINIMUM Cold Leg Temperature is < 132 ÁF outlined in Table 3.4.4 during a cooldown.
C.	Incorrect:	Part 1 is correct. 490 psia is the PORV lift setpoint per TS 3.4.9.3 for Unit 2. Part 2 is incorrect see explanation A.
D.	Correct:	Part 1 is correct: See explanation C Part 2 is correct: See explanation B

Question Number: 78

Tier: 1 Group: 1

K/A: 025 AA2.06 Loss of RHR System / Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: Existence of proper RHR overpressure protection

Importance Rating: 3.2 3.4

10 CFR Part 55: (CFR 43.5 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required determine the existence of proper overpressure protection for RHR

Technical Reference: TS 3.4.9.3

Proposed references to be provided: REDACTED U2 TS 3.4.9.3 AND TABLES 3.4-3 / 4

Learning Objective: PSL OPS 0702217 - 16

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

REACTOR COOLANT SYSTEM

OVERPRESSURE PROTECTION SYSTEMS

LIMITING CONDITION FOR OPERATION

3.4.9.3 Unless the RCS is depressurized and vented by at least 3.58 square inches, at least one of the following overpressure protection systems shall be OPERABLE:

a. Two power-operated relief valves (PORVs) with a lift setting of less than or equal to [redacted] and with their associated block valves open. These valves may only be used to satisfy low temperature overpressure protection (LTOP) when the RCS cold leg temperature is greater than the temperature listed in Table 3.4-4.

b. Two shutdown cooling relief valves (SDCRVs) with a lift setting of less than or equal to [redacted].

c. One PORV with a lift setting of less than or equal to [redacted] and with its associated block valve open in conjunction with the use of one SDCRV with a lift setting of less than or equal to [redacted]. This combination may only be used to satisfy LTOP when the RCS cold leg temperature is greater than the temperature listed in Table 3.4-4.

APPLICABILITY: MODES 4#, 5 and 6.

ACTION:

a. With either a PORV or an SDCRV being used for LTOP inoperable, restore at least two overpressure protection devices to OPERABLE status within 7 days or:

1. Depressurize and vent the RCS with a minimum vent area of 3.58 square inches within the next 8 hours; OR

2. Be at a temperature above the LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE of Table 3.4-3 within the next 8 hours.

b. With none of the overpressure protection devices being used for LTOP OPERABLE, within the next eight hours either:

1. Restore at least one overpressure protection device to OPERABLE status or vent the RCS; OR

2. Be at a temperature above the LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE of Table 3.4-3.

With cold leg temperature within the LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE of Table 3.4-3.

REACTOR COOLANT SYSTEM

OVERPRESSURE PROTECTION SYSTEMS

LIMITING CONDITION FOR OPERATION

ACTION: (Continued)

c. In the event either the PORVs, SDCRVs or the RCS vent(s) are used to mitigate a RCS pressure transient, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 30 days. The report shall describe the circumstances initiating the transient, the effect of the PORVs, SDCRVs or vent(s) on the transient and any corrective action necessary to prevent recurrence.

d. LCO 3.0.4.b is not applicable to PORVs when entering MODE 4.

SURVEILLANCE REQUIREMENTS

4.4.9.3.1 Each PORV shall be demonstrated OPERABLE by:

a. In addition to the requirements of the INSERVICE TESTING PROGRAM, operating the PORV through one complete cycle of full travel in accordance with the Surveillance Frequency Control Program.

SURVEILLANCE REQUIREMENTS (Continued)

b. Performance of a CHANNEL FUNCTIONAL TEST on the PORV actuation channel, but excluding valve operation, within 31 days prior to entering a condition in which the PORV is required OPERABLE and in accordance with the Surveillance Frequency Control Program thereafter when the PORV is required OPERABLE.

c. Performance of a CHANNEL CALIBRATION on the PORV actuation channel in accordance with the Surveillance Frequency Control Program.

d. Verifying the PORV isolation valve is open in accordance with the Surveillance Frequency Control Program when the PORV is being used for overpressure protection.

4.4.9.3.2 The RCS vent(s) shall be verified to be open in accordance with the Surveillance Frequency Control Program* when the vent(s) is being used for overpressure protection.

* Except when the vent pathway is provided with a valve which is locked, sealed, or otherwise secured in the open position, then verify these valves open in accordance with the Surveillance Frequency Control Program.

TABLE 3.4-3

LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE

Operating Period, EFPY	Cold Leg Temperature, °F During Heatup	Cold Leg Temperature, °F During Cooldown
≤ 47	≤ 246	≤ 224

TABLE 3.4-4

MINIMUM COLD LEG TEMPERATURE FOR PORV USE FOR LTOP

Operating Period EFPY	Cold Leg Temperature, °F During Heatup	Cold Leg Temperature, °F During Cooldown
≤ 47	80	132

REACTOR COOLANT SYSTEM

OVERPRESSURE PROTECTION SYSTEMS

LIMITING CONDITION FOR OPERATION

3.4.9.3 Unless the RCS is depressurized and vented by at least 3.58 square inches, at least one of the following overpressure protection systems shall be OPERABLE:

a. Two power-operated relief valves (PORVs) with a lift setting of less than or equal to 490 psia and with their associated block valves open. These valves may only be used to satisfy low temperature overpressure protection (LTOP) when the RCS cold leg temperature is greater than the temperature listed in Table 3.4-4.

b. Two shutdown cooling relief valves (SDCRVs) with a lift setting of less than or equal to 350 psia.

c. One PORV with a lift setting of less than or equal to 490 psia and with its associated block valve open in conjunction with the use of one SDCRV with a lift setting of less than or equal to 350 psia. This combination may only be used to satisfy LTOP when the RCS cold leg temperature is greater than the temperature listed in Table 3.4-4.

APPLICABILITY: MODES 4[#], 5 and 6.

ACTION:

a. With either a PORV or an SDCRV being used for LTOP inoperable, restore at least two overpressure protection devices to OPERABLE status within 7 days or:

1. Depressurize and vent the RCS with a minimum vent area of 3.58 square inches within the next 8 hours; OR

2. Be at a temperature above the LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE of Table 3.4-3 within the next 8 hours.

b. With none of the overpressure protection devices being used for LTOP OPERABLE, within the next eight hours either:

1. Restore at least one overpressure protection device to OPERABLE status or vent the RCS; OR

2. Be at a temperature above the LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE of Table 3.4-3.

With cold leg temperature within the LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE of Table 3.4-3.

LIMITING CONDITION FOR OPERATION

ACTION: (Continued)

c. In the event either the PORVs, SDCRVs or the RCS vent(s) are used to mitigate a RCS pressure transient, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 30 days. The report shall describe the circumstances initiating the transient, the effect of the PORVs, SDCRVs or vent(s) on the transient and any corrective action necessary to prevent recurrence.

d. LCO 3.0.4.b is not applicable to PORVs when entering MODE 4.

SURVEILLANCE REQUIREMENTS

4.4.9.3.1 Each PORV shall be demonstrated OPERABLE by:

a. In addition to the requirements of the INSERVICE TESTING PROGRAM, operating the PORV through one complete cycle of full travel in accordance with the Surveillance Frequency Control Program.

SURVEILLANCE REQUIREMENTS (Continued)

b. Performance of a CHANNEL FUNCTIONAL TEST on the PORV actuation channel, but excluding valve operation, within 31 days prior to entering a condition in which the PORV is required OPERABLE and in accordance with the Surveillance Frequency Control Program thereafter when the PORV is required OPERABLE.

c. Performance of a CHANNEL CALIBRATION on the PORV actuation channel in accordance with the Surveillance Frequency Control Program.

d. Verifying the PORV isolation valve is open in accordance with the Surveillance Frequency Control Program when the PORV is being used for overpressure protection.

4.4.9.3.2 The RCS vent(s) shall be verified to be open in accordance with the Surveillance Frequency Control Program* when the vent(s) is being used for overpressure protection.

* Except when the vent pathway is provided with a valve which is locked, sealed, or otherwise secured in the open position, then verify these valves open in accordance with the Surveillance Frequency Control Program.

TABLE 3.4-3

LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE

Operating Period, EFPY	Cold Leg Temperature, °F	
	During Heatup	During Cooldown
≤ 47	≤ 246	≤ 224

TABLE 3.4-4

MINIMUM COLD LEG TEMPERATURE FOR PORV USE FOR LTOP

Operating Period EFPY	Cold Leg Temperature, °F	
	During Heatup	During Cooldown
≤ 47	80	132

REACTOR COOLANT SYSTEM

POWER OPERATED RELIEF VALVES

LIMITING CONDITION FOR OPERATION

3.4.13 Two power operated relief valves (PORVs) shall be OPERABLE, with their setpoints selected to the low temperature mode of operation as follows:

a. A setpoint of less than or equal to 350 psia shall be selected during heatup, cooldown and isothermal conditions when the temperature of any RCS cold leg is less than or equal to 200°F.

b. A setpoint of less than or equal to 530 psia shall be selected during heatup, cooldown and isothermal conditions when the temperature of any RCS cold leg is greater than 200°F and less than or equal to 300°F.

APPLICABILITY: MODE 4 when the temperature of any RCS cold leg is less than or equal to 300°F, MODE 5, and MODE 6 when the head is on the reactor vessel; and the RCS is not vented through greater than a 1.75 square inch vent.

ACTION:

a. With one PORV inoperable in MODE 4, restore the inoperable PORV to OPERABLE status within 7 days; or depressurize and vent the RCS through greater than a 1.75 square inch vent within the next 8 hours.

b. With one PORV inoperable in MODES 5 or 6, either (1) restore the inoperable PORV to OPERABLE status within 24 hours, or (2) complete depressurization and venting of the RCS through greater than a 1.75 square inch vent within a total of 32 hours.

c. With both PORVs inoperable, restore at least one PORV to operable status or complete depressurization and venting of the RCS through greater than a 1.75 square inch vent within 24 hours.

d. With the RCS vented per ACTIONS a, b, or c, verify the vent pathway at least once per 31 days when the pathway is provided by a valve(s) that is locked, sealed, or otherwise secured in the open position; otherwise, verify the vent pathway every 12 hours.

e. In the event either the PORVs or the RCS vent(s) are used to mitigate an RCS pressure transient, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 30 days. The report shall describe the circumstances initiating the transient, the effect of the PORVs or RCS vent(s) on the transient, and any corrective action necessary to prevent recurrence.

f. LCO 3.0.4.b is not applicable to PORVs when entering MODE 4.

SURVEILLANCE REQUIREMENTS

4.4.13 Each PORV shall be demonstrated OPERABLE by:

a. Verifying the PORV isolation valve is open in accordance with the Surveillance Frequency Control Program; and

b. Performance of a CHANNEL FUNCTION TEST, but excluding valve operation, in accordance with the Surveillance Frequency Control Program; and

c. Performance of a CHANNEL CALIBRATION in accordance with the Surveillance Frequency Control Program.

Unit 2 SDC

Hot leg suction valves: (EO-9, EO-10b, EO-22i)

Train A: V3480 (2B5) & V3481 (2A5)

Train B: V3651 (2B6) & V3652 (2A5)

RCS pressure interlock, <276 psia (permissive) By procedure, valves are not opened until 275 psia (EO-22c)

PT-1103 supplies V3652

PT-1104 supplies V3481

PT-1105 supplies V3480

PT-1106 supplies V3651

Auto closure of hot leg suction valve if RCS pressure rises to 500 psia. (EO-22c)

79. 038 G2.1.19 Steam Generator Tube Rupture / Ability to use plant computer to evaluate system or component status

Given the following conditions:

- Unit 2 has tripped from 100% power
- SBCS failed to operate
- The crew is performing 2-EOP-01, SPTAs, step 8, Containment Conditions

Given the plant indications from the Safety Parameter Display System (SPDS), Distributed Control System (DCS), and Radiation Monitoring Control System (RMCS), complete the following.

In accordance with EPIP-01, Classification of Emergencies, a(n) ____(1)____ is the highest emergency level threshold met.

In accordance with EPIP-08, Off-Site Notifications and Protective Action Recommendations, a release ____(2)____ occurring?

(REFERENCE PROVIDED)

A.	(1)	ALERT
	(2)	is
B.	(1)	ALERT
	(2)	is NOT
C.	(1)	SITE AREA EMERGENCY
	(2)	is
D.	(1)	SITE AREA EMERGENCY
	(2)	is NOT

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 is correct. Based upon the indications provided, there is a potential loss of the RCS barrier due to an RCS leak greater than 50 gpm with letdown isolated. These indications can be confirmed by the charging indication of max charging, no letdown and pressurizer level. The RCS leak can be determined to be in progress due to the secondary radiation alarms indicated on the DCS display. Based upon the secondary pressures being 900 psia, controlled by ADVs which would have been completed on the previous step of 2-EOP-01. Primary Containment Barrier failure is not met, though steaming out the S/G ADVís. The ADV is NOT considered unisolable unless it can NOT be closed when performing 2-EOP-99 Appendix R, isolation of the steam generator. Therefore FA-1 is met, Alert EAL classification. Part 2 is correct. Based upon ADVs being open, can be deduced by the crew performing step 8 of 2-EOP-01 and steam generator pressures indication 900 psia on the SPDS display. This would result in marking a release is in progress on the state notification form per EPIP-08.
B.	Incorrect:	Part 1 is correct. See Analysis ñAò Part 2 is incorrect but plausible. The applicant can misinterpret the DCS display indications that Main Steam Line radiation monitors lowered on the plant trip that there would be no release in progress. The main steam line rad monitors are considered radioactive gaseous effluent monitor instrumentation as documented in C-200, Off-site Dose Calculation Manual (ODCM)
C.	Incorrect:	Part 1 is incorrect but plausible. The applicant can have the misconception that the ruptured steam generator is unisolable when the S/G ADVs are in service and therefore there is a loss of the containment barrier, which would meet the EAL threshold of site area emergency. Part 2 is correct, see analysis ñAò
D.	Incorrect:	Part 1 is incorrect but plausible. See analysis ñCò Part 2 is incorrect, but plausible. See analysis ñBò

Question Number: 79

Tier: 1 Group: 1

K/A: 038 G2.1.19 Steam Generator Tube Rupture / Ability to use plant computer to evaluate system or component status

Importance Rating: 3.9 3.8

10 CFR Part 55: (CFR 41.10 / 45.12)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to use the PC to determine the status of the plant during a SGTR

Technical Reference: 2-EOP-04

Proposed references to be provided: SCREENSHOTS of Plant Computers
SPDS, DCS, RMCS (3)
EPIP Fission Product Barrier Table

Learning Objective: PSL OPS 0702825 - 4

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

EAL – FISSION PRODUCT BARRIERS
EMERGENCY ACTION LEVELS

FISSION PRODUCT BARRIER TABLE
(RCS > 200°F)

FISSION PRODUCT BARRIER TABLE
(RCS > 200°F)

FISSION PRODUCT BARRIER LIST OF EFFECTIVE PAGES

Evaluate each barrier for Loss or Potential Loss and circle the applicable condition

FISSION PRODUCT BARRIER DEGRADATION TABLE (APPLICABILITY: Modes 1, 2, 3, & 4 ONLY)

FUEL CLAD BARRIER		REACTOR COOLANT SYSTEM BARRIER		PRIMARY CONTAINMENT BARRIER	
LOSS	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**
1. Safety Function Status					
1. Core Heat Removal Safety function **NOT** met **AND** entry into procedure 1/2 EOP-15	**1.** RCS Heat Removal Safety function **NOT** met **AND** entry into procedure 1/2 EOP-15	Not Applicable **GUIDANCE BOX FOR SAFETY FUNCTION STATUS IN ALL THREE BARRIERS** If directed to perform any step in 1/2 EOP-15, Then entry into 1/2 EOP-15 has been met.	**1.** RCS Pressure Control Safety function **NOT** met **AND** entry into procedure 1/2 EOP-15 **----- OR -----** **2.** RCS Heat Removal Safety function **NOT** met and entry into procedure 1/2 EOP-15	Not Applicable **GUIDANCE BOX FOR SAFETY FUNCTION STATUS IN ALL THREE BARRIERS** If safety function cannot be restored within 15 minutes, then that safety function is NOT met for purposes of classification.	**1.** Containment Temperature and Pressure Safety function **NOT** met **AND** entry into procedure 1/2 EOP-15
OR		**OR**		**OR**	
2. Primary Coolant Activity Level		**2. RCS Leak Rate**		**2. Containment Pressure**	
1. Coolant Activity greater than 300 uCi/gm Dose Equivalent I-131 (as determined by procedure CY-SL-108-0004, Guidelines for Collecting Post Accident Samples) **GUIDANCE BOX** See also SU4, Fuel Clad Degradation.	Not Applicable	**1.** RCS leak rate greater than available makeup capacity as indicated by a loss of RCS minimum subcooling **GUIDANCE BOX** • **MINIMUM SUBCOOLING** Determination is made using Figure 1A / 1B in 1/2-EOP-99. • See also SU5, RCS Leakage.	**1.** RCS leak rate indicated greater than 50 gpm with Letdown isolated **GUIDANCE BOX** Isolation of Letdown is to distinguish between RCS leakage and CVCS leakage and is performed when procedurally required.	**1.** A containment pressure rise followed by a rapid unexplained drop in containment pressure. **----- OR -----** **2.** Containment pressure **OR** sump level response **NOT** consistent with LOCA conditions	**1.** Containment pressure greater than 44- PSIG and rising **----- OR -----** **2.** Containment Hydrogen greater than 4% **----- OR -----** **3.** Pressure greater than 10 [5.4] psig **AND** **a.** Less than one FULL TRAIN OF DEPRESSURIZATION EQUIPMENT operating
OR		**OR**		**OR**	
3. Core Exit Thermocouple Readings		**3. Not Applicable**		**3. Core Exit Thermocouple Reading**	
1. Core Exit Thermocouples reading greater than 1200ÁF **GUIDANCE BOX** At least two (2) Core Exit Thermocouples must exceed the threshold.	**1.** Core Exit Thermocouples reading greater than 700ÁF **GUIDANCE BOX** At least two (2) Core Exit Thermocouples must exceed the threshold.	Not applicable	Not applicable	**GUIDANCE BOX** • At least two (2) Core Exit Thermocouples must exceed the threshold. • Sensors 4 through 8 **NOT** covered means sensors 4 through 8 inclusive (all). Not applicable	**1.** Core Exit Thermocouples reading greater than 1200ÁF **AND** **a.** Functional Recovery (1/2 EOP-15) for RCS and Core Heat Removal **NOT** effective within 15 minutes **----- OR -----** **2.** Core Exit Thermocouples reading greater than 700ÁF **AND** **BOTH** of the following apply: • RVLMS indicates Sensors 4 through 8 **NOT** covered **----- OR -----** T_{HOT} **AND** REP CET difference greater than 20ÁF (LOCA **NOT** in progress) **----- OR -----** Greater than 22ÁF superheated on REP CET (LOCA in progress) **AND** • Functional Recovery (1/2 EOP-15) for RCS and Core Heat Removal **NOT** effective within 15 minutes
OR		**OR**		**OR**	
4. Reactor Vessel Water Level		**4. SG Tube Rupture**		**4. SG Secondary Side Release with P-to-S Leakage**	
GUIDANCE BOX Sensors 4 through 8 **NOT** covered means sensors 4 through 8 inclusive (all). Not Applicable	**1.** RVLMS indicates Sensors 4 through 8 **NOT** covered **----- OR -----** **2.** T_{HOT} **AND** REP CET difference greater than 20°F (LOCA **NOT** in progress) **----- OR -----** **3.** Greater than 22ÁF superheated on REP CET (LOCA in progress)	**1.** RUPTURED S/G results in a Safety Injection Actuation Signal (SIAS)	Not Applicable	**1.** RUPTURED S/G is also FAULTED outside of containment **----- OR -----** **2.** Primary-to-Secondary leakrate greater than 10 gpm **AND** **a.** UNISOLABLE steam release from affected S/G to the environment	Not applicable
OR		**OR**		**OR**	
5. Not Applicable		**5. Not Applicable**		**5. CNTMT Isolation Failure or Bypass**	
Not Applicable	Not Applicable	Not Applicable	Not Applicable	**1.** Failure of all valves in **ANY** one line to close **AND** **a.** Direct downstream pathway to the environment exists after CIS/CIAS	Not Applicable
OR		**OR**		**OR**	
6. Containment Radiation Monitoring		**6. Containment Radiation Monitoring**		**6. Containment Radiation Monitoring**	
1. CHRRM reading greater than 1.4 E+02 R/hr	Not Applicable	**1. ANY** CIS monitor reading greater than 1.5 E+03 mR/hr	Not Applicable	Not Applicable	**1.** CHRRM reading greater than 2.7 E+03 R/hr
OR		**OR**		**OR**	
7. Emergency Coordinator Judgment		**7. Emergency Coordinator Judgment**		**7. Emergency Coordinator Judgment**	
1. ANY condition in the opinion of the Emergency Coordinator that indicates Loss of the Fuel Clad Barrier	**1. ANY** condition in the opinion of the Emergency Coordinator that indicates Potential Loss of the Fuel Clad Barrier	**1. ANY** condition in the opinion of the Emergency Coordinator that indicate Loss of the RCS Barrier	**1. ANY** condition in the opinion of the Emergency Coordinator that indicate Potential Loss of the RCS Barrier	**1. ANY** condition in the opinion of the Emergency Coordinator that indicates Loss of the Containment Barrier	**1. ANY** condition in the opinion of the Emergency Coordinator that indicates Potential Loss of the Containment Barrier

Determine Emergency Classification based on Barrier Status

ANY Loss or **ANY** Potential Loss of **EITHER** Fuel Clad **OR** RCS. **ALERT: FA1**	**ANY** Loss or **ANY** Potential Loss of Containment **UNUSUAL EVENT: FU1**
Loss or Potential Loss of **ANY** Two Barriers. **SITE AREA EMERGENCY: FS1**	
Loss of **ANY** Two Barriers **AND** Loss or Potential Loss of the Third Barrier. **GENERAL EMERGENCY: FG1**	

FISSION PRODUCT BARRIER DEGRADATION TABLE (APPLICABILITY: Modes 1, 2, 3, & 4 ONLY)

BASIS

FUEL CLAD BARRIER

The Fuel Clad Barrier is the zircalloy or stainless steel tubes that contain the fuel pellets.

1. Safety Function Status

Loss threshold ï Core Heat Removal Safety Function not met indicates significant superheating and core uncovery and is considered to indicate loss of the Fuel Clad Barrier.

Potential Loss threshold - RCS Heat Removal Safety Function not met indicates the ultimate heat sink function is under extreme challenge.

2. Primary Coolant Activity Level

The value is 300µCi/gm I131 equivalent. Assessment by the EAL Task Force indicates that this amount of coolant activity is well above that expected for iodine spikes and corresponds to less than 5% fuel clad damage. This amount of radioactivity indicates significant clad damage and thus the Fuel Clad Barrier is considered lost.

There is no Potential Loss threshold associated with this item.

3. Core Exit Thermocouple Readings

The Loss threshold corresponds to significant superheating of the coolant.

The Potential Loss threshold corresponds to loss of subcooling.

4. Reactor Vessel Water Level

There is no Loss threshold associated with this item.

The indication for the Potential Loss threshold represents a level near the top of the active fuel ï Reactor Vessel level sensors not covered or THOT and REP CET difference greater than 20 ÁF (LOCA NOT in progress) or greater than 22ÁF superheated on REP CET (LOCA in progress) indicates subcooling has been lost and that some clad damage may occur.

5. Not Applicable

Not Applicable *[Added to keep barrier numbering consistent]*

6. Containment Radiation Monitoring

The reading is a value which indicates the release of reactor coolant, with elevated activity indicative of fuel damage, into the containment calculated assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with a 5% clad failure into the containment atmosphere.

Reactor coolant concentrations of this magnitude are several times larger than the maximum concentrations (including iodine spiking) allowed within technical specifications and are therefore indicative of fuel damage.

This value is higher than that specified for RCS barrier Loss threshold #6. Thus, this threshold indicates a loss of both the Fuel Clad barrier and a loss of RCS barrier that appropriately escalates the emergency classification level to a Site Area Emergency.

There is no Potential Loss threshold associated with this item.

7. Emergency Coordinator Judgment

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the Fuel Clad barrier is lost or potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered lost or potentially lost.

REACTOR COOLANT SYSTEM BARRIER

The RCS Barrier includes the RCS primary side and its connections up to and including the pressurizer safety and relief valves, and other connections up to and including the primary isolation valves.

1. Safety Function Status

There is no Loss threshold associated with this item.

Potential Loss threshold 1 - RCS Pressure and Control Safety Function not met indicates an extreme challenge to the safety function derived from appropriate instrument readings.

Potential Loss threshold 2 - Heat Removal Safety Function not met indicates the ultimate heat sink function is under extreme challenge.

2. RCS Leak Rate

The Loss threshold addresses conditions where leakage from the RCS is greater than available inventory control capacity such that a loss of subcooling has occurred. The loss of subcooling is the fundamental indication that the inventory control systems are inadequate in maintaining RCS pressure and inventory against the mass loss through the leak.

The Potential Loss threshold is based on the inability to maintain normal liquid inventory within the Reactor Coolant System (RCS) by normal operation of the Charging System which is considered to be the flow rate equivalent to one charging pump discharging to the charging header. Isolating letdown is a standard abnormal operating procedure action and may prevent unnecessary classifications when a non-RCS leakage path such as a Charging/Letdown leak exists. The intent of this condition is met if attempts to isolate Letdown are NOT successful. Additional charging pumps being required is indicative of a substantial RCS leak.

3. Not Applicable

Not Applicable *[Added to keep barrier numbering consistent]*

4. SG Tube Rupture

This threshold addresses the full spectrum of Steam Generator (SG) tube rupture events in conjunction with Containment Barrier Loss thresholds. It addresses RUPTURED SG(s) for which the leakage is large enough to cause actuation of ECCS (SI). [U1-1600 psia and U2 1736 psia]. This is consistent to the RCS leak rate barrier Potential Loss threshold 2. By itself, this threshold will result in the declaration of an Alert. However, if the SG is also FAULTED (i.e., two barriers failed), the declaration escalates to a Site Area Emergency per Containment barrier Loss thresholds.

There is no Potential Loss threshold associated with this item.

Reactor Coolant System Barrier
Continued in next column

REACTOR COOLANT SYSTEM BARRIER

5. Not Applicable

Not Applicable *[Added to keep barrier numbering consistent]*

6. Containment Radiation Monitoring

The reading is a value which indicates the release of reactor coolant to the containment. This reading will be less than that specified for Fuel Clad Barrier threshold 6. Thus, this threshold would be indicative of a RCS leak only. If the radiation monitor reading increased to that specified by Fuel Clad Barrier threshold, fuel damage would also be indicated.

There is no Potential Loss threshold associated with this item.

7. Emergency Coordinator Judgment

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the RCS barrier is lost or potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered lost or potentially lost.

PRIMARY CONTAINMENT BARRIER

The Containment Barrier includes the containment building and connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve.

1. Safety Function Status

There is no Loss threshold associated with this item.

Containment Temperature and Pressure Safety function not met indicates an extreme challenge to the safety function derived from appropriate instrument readings and/or sampling results and thus represents a potential loss of containment.

Conditions leading to a potential loss of containment barrier result from RCS barrier and/or fuel Clad barrier loss. Thus, this threshold is primarily a discriminator between Site Area Emergency and General Emergency representing a potential loss of the third barrier.

2. Containment Pressure

Loss thresholds 1 and 2 - Rapid unexplained loss of pressure (i.e., not attributable to containment spray or condensation effects) following an initial pressure increase from a primary or secondary high energy line break indicates a loss of containment integrity. Containment pressure and sump levels should increase as a result of the mass and energy release into containment from a LOCA. Thus, sump level or pressure not increasing indicates containment bypass and a loss of containment integrity.

This indicator relies on operator recognition of an unexpected response for the condition and therefore does not have a specific value associated with it. The unexpected response is important because it is the indicator of a containment bypass condition.

Existence of an explosive mixture means a hydrogen and oxygen concentration of at least the lower deflagration limit curve exists.

The third Potential Loss threshold represents a potential loss of containment in that the containment heat removal/depressurization system are either lost or performing in a degraded manner, as indicated by containment pressure greater than the setpoint at which the equipment was supposed to have actuated.

3. Core Exit Thermocouple Reading

There is no Loss threshold associated with this item.

The conditions in these thresholds represent an IMMINENT core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. In conjunction with the Core Cooling and RCS Leakage criteria in the Fuel and RCS barrier columns, this threshold would result in the declaration of a General Emergency -- loss of two barriers and the potential loss of a third. If the function restoration procedures are ineffective, there is no "success" path.

The function restoration procedures are those emergency operating procedures that address the recovery of the core cooling critical safety functions. The procedure is considered effective if the temperature is lowering or if the vessel water level is rising.

Whether or not the procedures will be effective should be apparent within 15 minutes. The Emergency Coordinator should make the declaration as soon as it is determined that the procedures have been, or will be ineffective.

Primary Containment Barrier
Continued in next column

DEFINITION BOX

FAULTED – In a steam generator, the existence of secondary side leakage that results in an uncontrolled drop in steam generator pressure or the steam generator being completely depressurized.

FULL TRAIN OF DEPRESSURIZATION EQUIPMENT [1/2-EOP-03] ï

- Two Containment Spray Headers ï Flow in each header is at least 2550 [2700] gpm

––––– OR –––––

- Four Containment Coolers - Running

––––– OR –––––

- Two Containment Coolers - Running

AND

- One Containment Spray Header ï Flow in the header is at least 2550 [2700] gpm

IMMINENT – Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur. Where IMMINENT timeframes are specified, they shall apply.

PROMPTLY ISOLATED ï A steam release to the environment, from a leaking or ruptured S/G, that is stopped at the completion of the S/G isolation procedure Control Room steps, has been PR**O**MTLY ISOLATED.

RUPTURED – In a steam generator, existence of primary-to-secondary leakage of a magnitude sufficient to require or cause a reactor trip and safety injection.

UNISOLABLE – A breach or leak that cannot be PROMPTLY ISOLATED.

Definition Box
Continued in next column

PRIMARY CONTAINMENT BARRIER

4. SG Secondary Side Release with P-to-S Leakage

This Loss threshold recognizes that SG tube leakage can represent a bypass of the containment barrier as well as a loss of the RCS barrier.

The two Loss thresholds described could be considered redundant. The inclusion of a threshold that uses Emergency Procedure commonly used terms like ñRUPTURED and FAULTEDò adds to the ease of the classification process and has been included based on this human factor concern.

This threshold results in a NOUE for smaller breaks that; (1) do not exceed the normal charging capacity threshold in RCS leak rate barrier Potential Loss threshold, or (2) do not result in ECCS actuation in RCS SG tube rupture barrier Loss threshold. For larger breaks, RCS barrier threshold criteria would result in an Alert. For SG tube ruptures which may involve multiple steam generators or UNISOLABLE secondary line breaks, this threshold would exist in conjunction with RCS barrier thresholds and would result in a Site Area Emergency. Escalation to General Emergency would be based on "Potential Loss" of the Fuel Clad Barrier.

The first Loss threshold addresses the condition in which a RUPTURED steam generator is also FAULTED. This condition represents a bypass of the RCS and containment barriers and is a subset of the second threshold. In conjunction with RCS barrier loss threshold, this would always result in the declaration of a Site Area Emergency.

The second Loss threshold addresses SG tube leaks that exceed 10 gpm in conjunction with an UNISOLABLE release path to the environment from the affected steam generator. The threshold for establishing the UNISOLABLE secondary side release is intended to be a prolonged release of radioactivity from the RUPTURED steam generator directly to the environment (i.e., SG tube rupture with concurrent loss of off-site power and the RUPTURED steam generator is required for plant cooldown or a stuck open relief valve). This could be expected to occur when the main condenser is unavailable to accept the contaminated steam. If the main condenser is available, there may be releases via air ejectors, gland seal exhausters, and other similar controlled, and often monitored, pathways.

These pathways do not meet the intent of an UNISOLABLE release path to the environment. These minor releases are assessed using Abnormal Rad Levels / Radiological Effluent ICs.

5. CNTMT Isolation Failure or Bypass

This Threshold addresses incomplete containment isolation that allows direct release to the environment. It represents a loss of the containment barrier.

The use of the modifier ñdirectò in defining the release path discriminates against release paths through interfacing liquid systems. The existence of an inï line charcoal filter does not make a release path indirect since the filter is not effective at removing fission product noble gases. Typical filters have an efficiency of 95-99% removal of iodine. Given the magnitude of the core inventory of iodine, significant releases could still occur. In addition, since the fission product release would be driven by boiling in the reactor vessel, the high humidity in the release stream can be expected to render the filters ineffective in a short period.

There is no Potential Loss threshold associated with this item.

6. Containment Radiation Monitoring

There is no Loss threshold associated with this item.

The reading is a value which indicates significant fuel damage well in excess of the thresholds associated with both loss of Fuel Clad and loss of RCS Barriers. A major release of radioactivity requiring off-site protective actions from core damage is not possible unless a major failure of fuel cladding allows radioactive material to be released from the core into the reactor coolant.

Regardless of whether containment is challenged, this amount of activity in containment, if released, could have such severe consequences that it is prudent to treat this as a potential loss of containment, such that a General Emergency declaration is warranted.

7. Emergency Coordinator Judgment

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the Containment barrier is lost or potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered lost or potentially lost.

The Containment Barrier should not be declared lost or potentially lost based on exceeding Technical Specification action statement criteria, unless there is an event in progress requiring mitigation by the Containment barrier. When no event is in progress (Loss or Potential Loss of either Fuel Clad and/or RCS) the Containment Barrier status is addressed by Technical Specifications.

DEFINITION BOX (CONTINUED)

RCS LEAK RATE ï Comprised of IDENTIFIED and UNIDENTIFIED leakage as defined by Technical Specifications.

UNIDENTIFIED LEAKAGE ï Leakage which is not IDENTIFIED LEAKAGE or CONTROLLED LEAKAGE.

CONTROLLED LEAKAGE – Seal water flow supplied from the reactor coolant pump seals.

IDENTIFIED LEAKAGE:

a. Leakage (except **CONTROLLED LEAKAGE**) into closed systems, such as pump seal or valve packing leaks that are captured, and conducted to a sump or collecting tank, or

b. Leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be PRESSURE BOUNDARY LEAKAGE, or

c. Reactor Coolant System leakage through a steam generator to the secondary system (Primary-to-secondary leakage).

MAIN MENU

RCS

RCP

CEA GROUPS

2A S/G FW

2B S/G FW

POWER

SGE GROUPS

LEGEND

ALARMS

CHANGE ENV

PRINT SCREEN

PREV DISPLAY

PSL

UNIT 2

CSFM TOP LEVEL SUMMARY

CSFM MENU

RC | MVA | IC | PC | HR | CI | CTPC

RX TRIP 11:54:31

MODE

3 MODE

NR T-COLD AVERAGE

535.3 DEG F

POWER

0.0 %

WR POWER

8.33e-003 %

SR POWER

1.0 CPS

RCS AVG TEMP

535.3 DEG F

STARTUP RATE

-0.36 DPM

CORE EXIT TEMP

539 DEG F

RCP'S RUNNING

4

PRESSURIZER

PRESS	LEVEL
1783.3 PSIA	9.1 %

RCS LOOP TEMPERATURES

HOT A	COLD A1	COLD A2	HOT B	COLD B1	COLD B2
537.3 DEG F	535.3 DEG F	535.3 DEG F	537.2 DEG F	537.2 DEG F	535.4 DEG F

CHARGING FLOW	LETDOWN FLOW	S/G WR LEVEL A	S/G WR LEVEL B	S/G PRESSURE A	S/G PRESSURE B	ECCS FLOW
139.7 GPM	0.0 GPM	56.9 %	57.4 %	900 PSIA	900 PSIA	0 GPM

PSL

UNIT 2

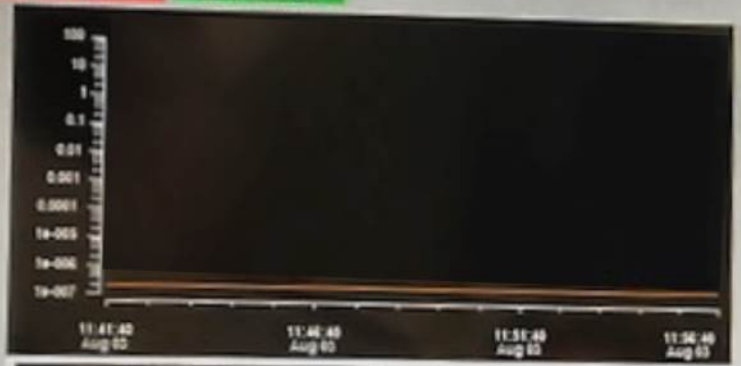
CONTAINMENT ISOLATION SECONDARY RAD TRENDS

RELATED DISPLAYS

RC | MVA | IC | PC | HR | CI | CTPC

RX TRIP

11 : 54 : 31



00:00:15:00 3S ◄ Pause ►

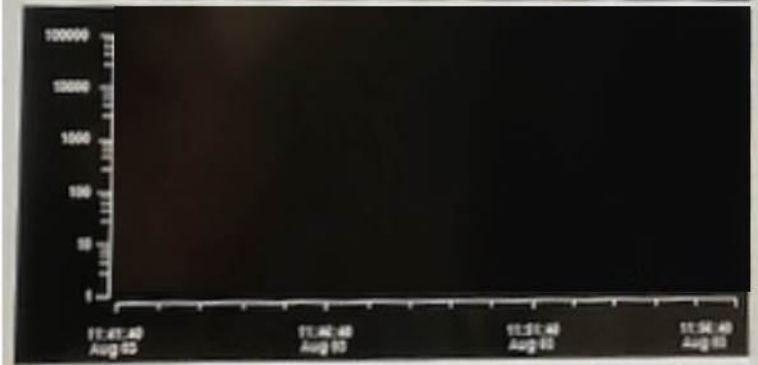
HIGHEST S/G BLOWDOWN RAD

2.17e-007 UCI/CC 0.0000

00:00:15:00 3S ◄ Pause ►

CONDENSER AIR EJECTOR RAD

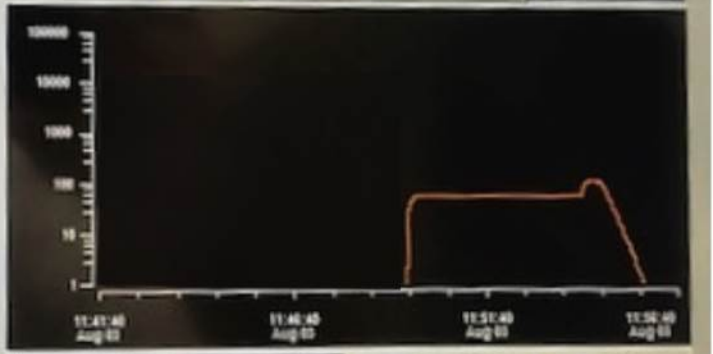
1.39e-002 UCI/CC 0.0139



00:00:15:00 3S ◄ Pause ►

MAIN STEAM LINE A RAD

0.3 MR/HR 0.2940



00:00:15:00 3S ◄ Pause ►

MAIN STEAM LINE B RAD

0.4 MR/HR 0.4125

◆11:52:56.8 EAG403 5.93E-04 HIGH

[ALARMS]

08/03	11:55:25.4	[SCADA-A]		AS2632	NORM	RETURN	FROM ALERT		
08/03	11:55:25.4	[SCADA-A]	LV	AS2632	ALERT	ALARM	LMT: 1.00E+01	VAL:	5.70E+00
08/03	11:55:24.3	[SCADA-A]	ACK	AS2632	ALERT	STATUS	ACKNOWLEDGED by	OPS	
08/03	11:55:11.4	[SCADA-A]	ALM	AS2632	ALERT	ALARM	LMT: 1.00E+01	VAL:	1.56E+01
08/03	11:55:11.4	[SCADA-A]	LV	AS2632	HIGH	ALARM	LMT: 2.00E+01	VAL:	1.56E+01
08/03	11:52:56.8	[SCADA-A]	ACK	EAG403	HIGH	STATUS	ACKNOWLEDGED by	OPS	
08/03	11:52:50.7	[SCADA-A]	ALM	EAG403	HIGH	ALARM	LMT: 7.50E-06	VAL:	5.93E-04
08/03	11:52:50.7	[SCADA-A]	ENT	EAG403	HIGH	ALARM	LMT: 7.50E-06	VAL:	5.93E-04
08/03	11:52:50.7	[SCADA-A]	ENT	EAG403	ALERT	ALARM	LMT: 5.00E-06	VAL:	5.93E-04
08/03	11:49:46.6	[SCADA-A]	ACK	AS2632	HIGH	STATUS	ACKNOWLEDGED by	OPS	
08/03	11:49:42.6	[SCADA-A]	ALM	AS2632	HIGH	ALARM	LMT: 2.00E+01	VAL:	3.84E+01
08/03	11:49:42.6	[SCADA-A]	ENT	AS2632	HIGH	ALARM	LMT: 2.00E+01	VAL:	3.84E+01
08/03	11:49:42.6	[SCADA-A]	ENT	AS2632	ALERT	ALARM	LMT: 1.00E+01	VAL:	3.84E+01
08/03	11:47:27.2	[SCADA-A]		GAG015:CI009		CURRENT from 1.00E+01 to			1.50E+01

4.10 Release

1. If, as a result of **accident conditions**, ANY of the following is true:

- A rise of (approximately) 10 times or one decade above pre-transient values is seen on one of the following monitors used for accident assessment:
  - A/B Main Steam Line: RE 26-62/63 (RIM 26-71/72) - ONLY if a steam release is in progress
  - A/B ECCS: RSC 26-2/3 (RS 26-69/70)
  - Plant Vent: RSC 26-1 (RS 26-90)
  - Fuel Building: RSC 26-4 (RS 26-12)
- Health Physics detects unplanned elevated airborne radiation levels outside of plant buildings due to accident conditions
- A Steam Generator, with primary-to-secondary leakage, due to a tube leak or rupture, is vented to atmosphere
- Operating the C AFW pump from an affected Steam Generator

Then a RELEASE is in progress.

4.11 Control Room Shift Communicator (CRSC) ï A specific shiftly designated individual trained and qualified to assist the Shift Manager/Emergency Coordinator in the control room in making emergency off-site notifications, and performing other activities as directed.

4.12 State Notification Form (SNF) ï Less formal, more concise expression used in lieu of Florida Nuclear plant Emergency Notification Form.

Evaluate each barrier for Loss or Potential Loss and circle the applicable condition

FISSION PRODUCT BARRIER DEGRADATION TABLE (APPLICABILITY: Modes 1, 2, 3, & 4 ONLY)

FUEL CLAD BARRIER		REACTOR COOLANT SYSTEM BARRIER		PRIMARY CONTAINMENT BARRIER	
LOSS	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**	**LOSS**	**POTENTIAL LOSS**
1. Safety Function Status		**1. Safety Function Status**		**1. Safety Function Status**	
1. Core Heat Removal Safety function **NOT** met **AND** entry into procedure 1/2 EOP-15	**1.** RCS Heat Removal Safety function **NOT** met **AND** entry into procedure 1/2 EOP-15	Not Applicable **GUIDANCE BOX FOR SAFETY FUNCTION STATUS IN ALL THREE BARRIERS** If directed to perform any step in 1/2 EOP-15, Then entry into 1/2 EOP-15 has been met.	**1.** RCS Pressure Control Safety function **NOT** met **AND** entry into procedure 1/2 EOP-15 ----- **OR** ----- **2.** RCS Heat Removal Safety function **NOT** met and entry into procedure 1/2 EOP-15	Not Applicable **GUIDANCE BOX FOR SAFETY FUNCTION STATUS IN ALL THREE BARRIERS** If safety function cannot be restored within 15 minutes, then that safety function is NOT met for purposes of classification.	**1.** Containment Temperature and Pressure Safety function **NOT** met **AND** entry into procedure 1/2 EOP-15
OR		**OR**		**OR**	
2. Primary Coolant Activity Level		**2. RCS Leak Rate**		**2. Containment Pressure**	
1. Coolant Activity greater than 300 uCi/gm Dose Equivalent I-131 (as determined by procedure CY-SL-108-0004, Guidelines for Collecting Post Accident Samples) **GUIDANCE BOX** See also SU4, Fuel Clad Degradation.	Not Applicable	**1.** RCS leak rate greater than available makeup capacity as indicated by a loss of RCS minimum subcooling **GUIDANCE BOX** • **MINIMUM SUBCOOLING** Determination is made using Figure 1A / 1B in 1/2-EOP-99. • See also SU5, RCS Leakage.	**1.** RCS leak rate indicated greater than 50 gpm with Letdown isolated **GUIDANCE BOX** Isolation of Letdown is to distinguish between RCS leakage and CVCS leakage and is performed when procedurally required.	**1.** A containment pressure rise followed by a rapid unexplained drop in containment pressure. ----- **OR** ----- **2.** Containment pressure **OR** sump level response **NOT** consistent with LOCA conditions	**1.** Containment pressure greater than 44- PSIG and rising ----- **OR** ----- **2.** Containment Hydrogen greater than 4% ----- **OR** ----- **3.** Pressure greater than 10 [5.4] psig **AND** **a.** Less than one FULL TRAIN OF DEPRESSURIZATION EQUIPMENT operating
OR		**OR**		**OR**	
3. Core Exit Thermocouple Readings		**3. Not Applicable**		**3. Core Exit Thermocouple Reading**	
1. Core Exit Thermocouples reading greater than 1200ÁF **GUIDANCE BOX** At least two (2) Core Exit Thermocouples must exceed the threshold.	**1.** Core Exit Thermocouples reading greater than 700ÁF **GUIDANCE BOX** At least two (2) Core Exit Thermocouples must exceed the threshold.	Not applicable	Not applicable	**GUIDANCE BOX** • At least two (2) Core Exit Thermocouples must exceed the threshold. • Sensors 4 through 8 **NOT** covered means sensors 4 through 8 inclusive (all). Not applicable	**1.** Core Exit Thermocouples reading greater than 1200ÁF **AND** **a.** Functional Recovery (1/2 EOP-15) for RCS and Core Heat Removal **NOT** effective within 15 minutes ----- **OR** ----- **2.** Core Exit Thermocouples reading greater than 700ÁF **AND** **BOTH** of the following apply: • RVLMS indicates Sensors 4 through 8 **NOT** covered ----- **OR** ----- T_{HOT} **AND** REP CET difference greater than 20ÁF (LOCA **NOT** in progress) ----- **OR** ----- Greater than 22ÁF superheated on REP CET (LOCA in progress) **AND** • Functional Recovery (1/2 EOP-15) for RCS and Core Heat Removal **NOT** effective within 15 minutes
OR		**OR**		**OR**	
4. Reactor Vessel Water Level		**4. SG Tube Rupture**		**4. SG Secondary Side Release with P-to-S Leakage**	
GUIDANCE BOX Sensors 4 through 8 **NOT** covered means sensors 4 through 8 inclusive (all). Not Applicable	**1.** RVLMS indicates Sensors 4 through 8 **NOT** covered ----- **OR** ----- **2.** T_{HOT} **AND** REP CET difference greater than 20°F (LOCA **NOT** in progress) ----- **OR** ----- **3.** Greater than 22ÁF superheated on REP CET (LOCA in progress)	**1.** RUPTURED S/G results in a Safety Injection Actuation Signal (SIAS)	Not Applicable	**1.** RUPTURED S/G is also FAULTED outside of containment ----- **OR** ----- **2.** Primary-to-Secondary leakrate greater than 10 gpm **AND** **a.** UNISOLABLE steam release from affected S/G to the environment	Not applicable
OR		**OR**		**OR**	
5. Not Applicable		**5. Not Applicable**		**5. CNTMT Isolation Failure or Bypass**	
Not Applicable	Not Applicable	Not Applicable	Not Applicable	**1.** Failure of all valves in **ANY** one line to close **AND** **a.** Direct downstream pathway to the environment exists after CIS/CIAS	Not Applicable
OR		**OR**		**OR**	
6. Containment Radiation Monitoring		**6. Containment Radiation Monitoring**		**6. Containment Radiation Monitoring**	
1. CHRRM reading greater than 1.4 E+02 R/hr	Not Applicable	**1. ANY** CIS monitor reading greater than 1.5 E+03 mR/hr	Not Applicable	Not Applicable	**1.** CHRRM reading greater than 2.7 E+03 R/hr
OR		**OR**		**OR**	
7. Emergency Coordinator Judgment		**7. Emergency Coordinator Judgment**		**7. Emergency Coordinator Judgment**	
1. ANY condition in the opinion of the Emergency Coordinator that indicates Loss of the Fuel Clad Barrier	**1. ANY** condition in the opinion of the Emergency Coordinator that indicates Potential Loss of the Fuel Clad Barrier	**1. ANY** condition in the opinion of the Emergency Coordinator that indicate Loss of the RCS Barrier	**1. ANY** condition in the opinion of the Emergency Coordinator that indicate Potential Loss of the RCS Barrier	**1. ANY** condition in the opinion of the Emergency Coordinator that indicates Loss of the Containment Barrier	**1. ANY** condition in the opinion of the Emergency Coordinator that indicates Potential Loss of the Containment Barrier

Determine Emergency Classification based on Barrier Status

ANY Loss or **ANY** Potential Loss of **EITHER** Fuel Clad **OR** RCS. **ALERT: FA1**	**ANY** Loss or **ANY** Potential Loss of Containment **UNUSUAL EVENT: FU1**
Loss or Potential Loss of **ANY** Two Barriers. **SITE AREA EMERGENCY: FS1**	
Loss of **ANY** Two Barriers **AND** Loss or Potential Loss of the Third Barrier. **GENERAL EMERGENCY: FG1**	

FISSION PRODUCT BARRIER DEGRADATION TABLE (APPLICABILITY: Modes 1, 2, 3, & 4 ONLY)

BASIS

FUEL CLAD BARRIER

The Fuel Clad Barrier is the zircalloy or stainless steel tubes that contain the fuel pellets.

1. Safety Function Status

Loss threshold ï Core Heat Removal Safety Function not met indicates significant superheating and core uncovery and is considered to indicate loss of the Fuel Clad Barrier.

Potential Loss threshold - RCS Heat Removal Safety Function not met indicates the ultimate heat sink function is under extreme challenge.

2. Primary Coolant Activity Level

The value is 300µCi/gm I131 equivalent. Assessment by the EAL Task Force indicates that this amount of coolant activity is well above that expected for iodine spikes and corresponds to less than 5% fuel clad damage. This amount of radioactivity indicates significant clad damage and thus the Fuel Clad Barrier is considered lost.

There is no Potential Loss threshold associated with this item.

3. Core Exit Thermocouple Readings

The Loss threshold corresponds to significant superheating of the coolant.

The Potential Loss threshold corresponds to loss of subcooling.

4. Reactor Vessel Water Level

There is no Loss threshold associated with this item.

The indication for the Potential Loss threshold represents a level near the top of the active fuel ï Reactor Vessel level sensors not covered or THOT and REP CET difference greater than 20 ÁF (LOCA NOT in progress) or greater than 22ÁF superheated on REP CET (LOCA in progress) indicates subcooling has been lost and that some clad damage may occur.

5. Not Applicable

Not Applicable *[Added to keep barrier numbering consistent]*

6. Containment Radiation Monitoring

The reading is a value which indicates the release of reactor coolant, with elevated activity indicative of fuel damage, into the containment calculated assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with a 5% clad failure into the containment atmosphere.

Reactor coolant concentrations of this magnitude are several times larger than the maximum concentrations (including iodine spiking) allowed within technical specifications and are therefore indicative of fuel damage.

This value is higher than that specified for RCS barrier Loss threshold #6. Thus, this threshold indicates a loss of both the Fuel Clad barrier and a loss of RCS barrier that appropriately escalates the emergency classification level to a Site Area Emergency.

There is no Potential Loss threshold associated with this item.

7. Emergency Coordinator Judgment

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the Fuel Clad barrier is lost or potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered lost or potentially lost.

REACTOR COOLANT SYSTEM BARRIER

The RCS Barrier includes the RCS primary side and its connections up to and including the pressurizer safety and relief valves, and other connections up to and including the primary isolation valves.

1. Safety Function Status

There is no Loss threshold associated with this item.

Potential Loss threshold 1 - RCS Pressure and Control Safety Function not met indicates an extreme challenge to the safety function derived from appropriate instrument readings.

Potential Loss threshold 2 - Heat Removal Safety Function not met indicates the ultimate heat sink function is under extreme challenge.

2. RCS Leak Rate

The Loss threshold addresses conditions where leakage from the RCS is greater than available inventory control capacity such that a loss of subcooling has occurred. The loss of subcooling is the fundamental indication that the inventory control systems are inadequate in maintaining RCS pressure and inventory against the mass loss through the leak.

The Potential Loss threshold is based on the inability to maintain normal liquid inventory within the Reactor Coolant System (RCS) by normal operation of the Charging System which is considered to be the flow rate equivalent to one charging pump discharging to the charging header. Isolating letdown is a standard abnormal operating procedure action and may prevent unnecessary classifications when a non-RCS leakage path such as a Charging/Letdown leak exists. The intent of this condition is met if attempts to isolate Letdown are NOT successful. Additional charging pumps being required is indicative of a substantial RCS leak.

3. Not Applicable

Not Applicable *[Added to keep barrier numbering consistent]*

4. SG Tube Rupture

This threshold addresses the full spectrum of Steam Generator (SG) tube rupture events in conjunction with Containment Barrier Loss thresholds. It addresses RUPTURED SG(s) for which the leakage is large enough to cause actuation of ECCS (SI). [U1-1600 psia and U2 1736 psia]. This is consistent to the RCS leak rate barrier Potential Loss threshold 2. By itself, this threshold will result in the declaration of an Alert. However, if the SG is also FAULTED (i.e., two barriers failed), the declaration escalates to a Site Area Emergency per Containment barrier Loss thresholds.

There is no Potential Loss threshold associated with this item.

Reactor Coolant System Barrier
Continued in next column

REACTOR COOLANT SYSTEM BARRIER

5. Not Applicable

Not Applicable *[Added to keep barrier numbering consistent]*

6. Containment Radiation Monitoring

The reading is a value which indicates the release of reactor coolant to the containment. This reading will be less than that specified for Fuel Clad Barrier threshold 6. Thus, this threshold would be indicative of a RCS leak only. If the radiation monitor reading increased to that specified by Fuel Clad Barrier threshold, fuel damage would also be indicated.

There is no Potential Loss threshold associated with this item.

7. Emergency Coordinator Judgment

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the RCS barrier is lost or potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered lost or potentially lost.

PRIMARY CONTAINMENT BARRIER

The Containment Barrier includes the containment building and connections up to and including the outermost containment isolation valves. This barrier also includes the main steam, feedwater, and blowdown line extensions outside the containment building up to and including the outermost secondary side isolation valve.

1. Safety Function Status

There is no Loss threshold associated with this item.

Containment Temperature and Pressure Safety function not met indicates an extreme challenge to the safety function derived from appropriate instrument readings and/or sampling results and thus represents a potential loss of containment.

Conditions leading to a potential loss of containment barrier result from RCS barrier and/or fuel Clad barrier loss. Thus, this threshold is primarily a discriminator between Site Area Emergency and General Emergency representing a potential loss of the third barrier.

2. Containment Pressure

Loss thresholds 1 and 2 - Rapid unexplained loss of pressure (i.e., not attributable to containment spray or condensation effects) following an initial pressure increase from a primary or secondary high energy line break indicates a loss of containment integrity. Containment pressure and sump levels should increase as a result of the mass and energy release into containment from a LOCA. Thus, sump level or pressure not increasing indicates containment bypass and a loss of containment integrity.

This indicator relies on operator recognition of an unexpected response for the condition and therefore does not have a specific value associated with it. The unexpected response is important because it is the indicator of a containment bypass condition.

Existence of an explosive mixture means a hydrogen and oxygen concentration of at least the lower deflagration limit curve exists.

The third Potential Loss threshold represents a potential loss of containment in that the containment heat removal/depressurization system are either lost or performing in a degraded manner, as indicated by containment pressure greater than the setpoint at which the equipment was supposed to have actuated.

3. Core Exit Thermocouple Reading

There is no Loss threshold associated with this item.

The conditions in these thresholds represent an IMMINENT core melt sequence which, if not corrected, could lead to vessel failure and an increased potential for containment failure. In conjunction with the Core Cooling and RCS Leakage criteria in the Fuel and RCS barrier columns, this threshold would result in the declaration of a General Emergency -- loss of two barriers and the potential loss of a third. If the function restoration procedures are ineffective, there is no "success" path.

The function restoration procedures are those emergency operating procedures that address the recovery of the core cooling critical safety functions. The procedure is considered effective if the temperature is lowering or if the vessel water level is rising.

Whether or not the procedures will be effective should be apparent within 15 minutes. The Emergency Coordinator should make the declaration as soon as it is determined that the procedures have been, or will be ineffective.

Primary Containment Barrier
Continued in next column

DEFINITION BOX

FAULTED – In a steam generator, the existence of secondary side leakage that results in an uncontrolled drop in steam generator pressure or the steam generator being completely depressurized.

FULL TRAIN OF DEPRESSURIZATION EQUIPMENT [1/2-EOP-03] ï

- Two Containment Spray Headers ï Flow in each header is at least 2550 [2700] gpm

––––– OR –––––

- Four Containment Coolers - Running

––––– OR –––––

- Two Containment Coolers - Running

AND

- One Containment Spray Header ï Flow in the header is at least 2550 [2700] gpm

IMMINENT – Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur. Where IMMINENT timeframes are specified, they shall apply.

PROMPTLY ISOLATED ï A steam release to the environment, from a leaking or ruptured S/G, that is stopped at the completion of the S/G isolation procedure Control Room steps, has been PR**O**MTLY ISOLATED.

RUPTURED – In a steam generator, existence of primary-to-secondary leakage of a magnitude sufficient to require or cause a reactor trip and safety injection.

UNISOLABLE – A breach or leak that cannot be PROMPTLY ISOLATED.

Definition Box
Continued in next column

PRIMARY CONTAINMENT BARRIER

4. SG Secondary Side Release with P-to-S Leakage

This Loss threshold recognizes that SG tube leakage can represent a bypass of the containment barrier as well as a loss of the RCS barrier.

The two Loss thresholds described could be considered redundant. The inclusion of a threshold that uses Emergency Procedure commonly used terms like ñRUPTURED and FAULTEDò adds to the ease of the classification process and has been included based on this human factor concern.

This threshold results in a NOUE for smaller breaks that; (1) do not exceed the normal charging capacity threshold in RCS leak rate barrier Potential Loss threshold, or (2) do not result in ECCS actuation in RCS SG tube rupture barrier Loss threshold. For larger breaks, RCS barrier threshold criteria would result in an Alert. For SG tube ruptures which may involve multiple steam generators or UNISOLABLE secondary line breaks, this threshold would exist in conjunction with RCS barrier thresholds and would result in a Site Area Emergency. Escalation to General Emergency would be based on "Potential Loss" of the Fuel Clad Barrier.

The first Loss threshold addresses the condition in which a RUPTURED steam generator is also FAULTED. This condition represents a bypass of the RCS and containment barriers and is a subset of the second threshold. In conjunction with RCS barrier loss threshold, this would always result in the declaration of a Site Area Emergency.

The second Loss threshold addresses SG tube leaks that exceed 10 gpm in conjunction with an UNISOLABLE release path to the environment from the affected steam generator. The threshold for establishing the UNISOLABLE secondary side release is intended to be a prolonged release of radioactivity from the RUPTURED steam generator directly to the environment (i.e., SG tube rupture with concurrent loss of off-site power and the RUPTURED steam generator is required for plant cooldown or a stuck open relief valve). This could be expected to occur when the main condenser is unavailable to accept the contaminated steam. If the main condenser is available, there may be releases via air ejectors, gland seal exhausters, and other similar controlled, and often monitored, pathways.

These pathways do not meet the intent of an UNISOLABLE release path to the environment. These minor releases are assessed using Abnormal Rad Levels / Radiological Effluent ICs.

5. CNTMT Isolation Failure or Bypass

This Threshold addresses incomplete containment isolation that allows direct release to the environment. It represents a loss of the containment barrier.

The use of the modifier ñdirectò in defining the release path discriminates against release paths through interfacing liquid systems. The existence of an inï line charcoal filter does not make a release path indirect since the filter is not effective at removing fission product noble gases. Typical filters have an efficiency of 95-99% removal of iodine. Given the magnitude of the core inventory of iodine, significant releases could still occur. In addition, since the fission product release would be driven by boiling in the reactor vessel, the high humidity in the release stream can be expected to render the filters ineffective in a short period.

There is no Potential Loss threshold associated with this item.

6. Containment Radiation Monitoring

There is no Loss threshold associated with this item.

The reading is a value which indicates significant fuel damage well in excess of the thresholds associated with both loss of Fuel Clad and loss of RCS Barriers. A major release of radioactivity requiring off-site protective actions from core damage is not possible unless a major failure of fuel cladding allows radioactive material to be released from the core into the reactor coolant.

Regardless of whether containment is challenged, this amount of activity in containment, if released, could have such severe consequences that it is prudent to treat this as a potential loss of containment, such that a General Emergency declaration is warranted.

7. Emergency Coordinator Judgment

This threshold addresses any other factors that are to be used by the Emergency Coordinator in determining whether the Containment barrier is lost or potentially lost. In addition, the inability to monitor the barrier should also be incorporated in this threshold as a factor in Emergency Coordinator judgment that the barrier may be considered lost or potentially lost.

The Containment Barrier should not be declared lost or potentially lost based on exceeding Technical Specification action statement criteria, unless there is an event in progress requiring mitigation by the Containment barrier. When no event is in progress (Loss or Potential Loss of either Fuel Clad and/or RCS) the Containment Barrier status is addressed by Technical Specifications.

DEFINITION BOX (CONTINUED)

RCS LEAK RATE ï Comprised of IDENTIFIED and UNIDENTIFIED leakage as defined by Technical Specifications.

UNIDENTIFIED LEAKAGE ï Leakage which is not IDENTIFIED LEAKAGE or CONTROLLED LEAKAGE.

CONTROLLED LEAKAGE – Seal water flow supplied from the reactor coolant pump seals.

IDENTIFIED LEAKAGE:

a. Leakage (except **CONTROLLED LEAKAGE**) into closed systems, such as pump seal or valve packing leaks that are captured, and conducted to a sump or collecting tank, or

b. Leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be PRESSURE BOUNDARY LEAKAGE, or

c. Reactor Coolant System leakage through a steam generator to the secondary system (Primary-to-secondary leakage).

ATTACHMENT 1
FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM
(Page 1 of 1)

On-line Verification: ☐ SWP/DEM ☐ DOH/BRC ☐ St. Lucie County/Ft. Pierce ☐ Martin County

1.* **A.** ☐ THIS IS A DRILL **B.** ☐ THIS IS AN EMERGENCY

2. **A.** Date: ___/___/___ **B.** * Contact Time: _____ **C.** Reported by: (Name) _____
D. Message Number: _____ **E.** Reported from: ☐ Control Room ☐ TSC ☐ EOF
F. ☐ Initial / New Classification OR ☐ Update Notification

3.* Site: **A.** ☐ Crystal River Unit 3 **B.** ☐ St. Lucie Unit 1 **C.** ☐ St. Lucie Unit 2
D. ☐ Turkey Point Unit 3 **E.** ☐ Turkey Point Unit 4

4.* Emergency Classification: **A.** ☐ Notification of Unusual Event **B.** ☐ Alert
C. ☐ Site Area Emergency **D.** ☐ General Emergency

5.* **A.** ☐ Emergency Declaration: **B.** ☐ Emergency Termination: Date: ___/___/___ Time: _____

6.* Reason for Emergency Declaration: **A.** ☐ EAL Number ____/____/____ OR **B.** ☐ Description:
Alpha / Alpha / Numeric
_____

7. Additional Information or Update: **A.** ☐ None OR **B.** ☐ Description:
_____
_____

8.* Weather Data: **A.** Wind direction from _____ degrees **B.** Downwind Sectors Affected: _____

9.* Release Status: **A.** ☐ None (Go to Item 11) **B.** ☐ In progress **C.** ☐ Has occurred, but stopped (Go to Item 11)

10. Release Significance Category at the Site Boundary:

A. ☐ Under evaluation **B.** ☐ Release within normal operating limits
C. ☐ Non-Significant (fraction of protective action guide range) **D.** ☐ Protective action guide range
E. ☐ Liquid release (no actions required)

11.* UTILITY PROTECTIVE ACTION RECOMMENDATIONS FOR THE PUBLIC:

A. ☐ No utility recommended actions at this time.

B. ☐ The utility recommends the following protective actions:

			Evacuate Sectors	Shelter Sectors	Monitor & Prepare Sectors
Evacuate Zones:	_____	OR 0 – 2	_____	_____	_____
Shelter Zones:	_____	2 – 5	_____	_____	_____
		5 – 10	_____	_____	_____

AND consider issuance of potassium iodide (KI)"

If form is completed in the Control Room, go to Item 15. If completed in the TSC or EOF, continue with item 12.

12. Plant Conditions: **A.** Reactor Shutdown? ☐ Yes ☐ No **B.** Core Adequately Cooled? ☐ Yes ☐ No
C. Containment Intact? ☐ Yes ☐ No **D.** Core Condition: ☐ Stable ☐ Degrading

13. Weather Data: **A.** * Wind Speed _____ mph **B.** Stability Class _____

14. Additional Release Information: **A.** ☐ Not Applicable (Go to Item 15)

Distance	*Projected Thyroid Dose (CDE) for ____ hour(s)*	*Projected Total Dose (TEDE) for ____ hour(s)*
1 Mile (Site Boundary)	**B.** _____ mrem	**C.** _____ mrem
2 Miles	**D.** _____ mrem	**E.** _____ mrem
5 Miles	**F.** _____ mrem	**G.** _____ mrem
10 Miles	**H.** _____ mrem	**I.** _____ mrem

15. (Do Not Read) EC or RM Approval Signature: _____ Date: ___/___/___ Time: _____

Message Received By: Name: _____ Date: ___/___/___ Time: _____

* Items are evaluated for NRC Performance Indicators (PI's)

END OF ATTACHMENT 1

~~E~~ ATTACHMENT 1A
DIRECTIONS FOR COMPLETING THE FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM

(Page 1 of 6)

ITEM ENTRY

NOTE
On-line verification occurs when notification of the State Watch Office (SWO) is initiated.

On-line Verification - **Check the appropriate boxes** as the State Watch Office Florida Division of Emergency Management (DEM) requests that the Department of Health Bureau of Radiation Control, St. Lucie County Department of Public Safety and the Martin County Department of Emergency Management get on the line, prior to initiating the notification. **All four agencies must be notified (includes Florida DEM)** through the SWO or alternate means.

1. Check appropriate box for drill or actual emergency as the case may be. During exercises, drills, or tests, each message shall be checked **THIS IS A DRILL.**

2A. Date

2B. Contact Time

2C. Reported by (Name)

2D. Enter the message number beginning with #1 and following sequentially throughout the event.

2E. Reported from

2F. Initial/New Classification or Update Notification

3. Site
Check the affected site / unit.

4. Emergency Classification

5. Emergency Declaration or Emergency Termination
Enter the **date** and **time** when the current emergency classification was (A) declared OR (B) terminated.

6. Reason for Emergency Declaration

A. Enter the Emergency Action Level (EAL) number as given in the EAL Tables.

ATTACHMENT 1A
DIRECTIONS FOR COMPLETING THE FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM
(Page 2 of 6)

7. Additional Information or Update

Check "Aò(None) if there is no information or ñBòto provide additional information/clarification or reason for the update. This will be provided by SM/EC.

Examples of additional information include:

- Change in PARs
- Change in radiological conditions
- Change in equipment status
- Injuries
- Condition affects both units
- Condition that would have resulted in the declaration of the same or lesser emergency classification

8. Weather Data

NOTE
10 meter data should be used.

A. Æ10 Wind direction can be obtained from ERDADS (DCS).

1. Alternate sources of wind direction data:

a. Met Tower Indicator Panel in the Unit 1 Control Room

b. Contact NOAA / NWS Melbourne Office (321)-254-6083 (24-hr coverage - Ask to speak with a forecaster).

c. Method 3, Attachment 7, Meteorological Data in EPIP-09, Off-Site Dose Calculations.

B. If the wind direction is **greater than 360°** the wind direction is determined by **subtracting 360°** from the indicated number.

- Wind direction should be rounded to the nearest whole number.
- If the wind direction fraction is exactly one half (e.g., 123.5 degrees), Then round up UNLESS rounding down would cause the addition of another sector (e.g., round 123.5 degrees down to 123 degrees to pick up the additional sector).

ATTACHMENT 1A
DIRECTIONS FOR COMPLETING THE FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM
(Page 3 of 6)

8. (continued)

C. If the wind is located on the edge of a sector (i.e., 11Á, 33Á, etc.) an additional (fourth) sector should be added.

D. Enter the wind direction (wind from) in degrees in item ñA.ò

E. Enter the downwind sectors in item ñBòusing the following chart

Wind From	Sectors Affected	Wind From	Sectors Affected	Wind From	Sectors Affected
348-11	HJK	123-146	PQR	236-258	CDE
11-33	JKL	146-168	QRA	258-281	DEF
33-56	KLM	168-191	RAB	281-303	EFG
56-78	LMN	191-213	ABC	303-326	FGH
78-101	MNP	213-236	BCD	326-348	GHJ
101-123	NPQ	There is no ñCòsector		There is no ñòsector	

9. Release Status

A. If there are no indications of a release of radioactive material, check box ñAò and go to item 11.

B. If a release is in progress, check box ñBòand go to item 10.

C. If a release has occurred, but stopped, check box ñCòand go to item 11.

10. Release Significance Category
Check the appropriate box as given by Dose Assessment or EC

ATTACHMENT 1A
DIRECTIONS FOR COMPLETING THE FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM
(Page 4 of 6)

11. Utility Recommended Protective Actions

A. If there are no Protective Action Recommendations (PARs), check Box "A" only.

B. If PARs are necessary, check Box "B". Use the "sector" format and determine appropriate PARs using the guidance in Attachment 2 to this procedure. Copy the PARs into item 11 "B." Indicate PARs using only the words NONE, ALL, ALL REMAINING or by listing the letters of the sectors affected.

AND

Æ18 (If PARs are issued, Then read this statement) "Consider issuance of Potassium Iodide (KI)"

NOTE
If completing the State Notification Form in the Control Room, continue to Step 15.

12. Plant Conditions

NOTE
Æ14 Safety Function Status is available from the affected Control Room.

Answer these questions by checking the appropriate box.

A. Is the reactor shut down?

- If the Reactivity Control Safety Function is being met, Then check the YES box.

B. Is the core adequately cooled?

- If the Core Heat Removal AND RCS Heat Removal Safety Functions are being met, Then check the YES box.

ATTACHMENT 1A
DIRECTIONS FOR COMPLETING THE FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM
(Page 5 of 6)

12. (continued)

C. Is the containment intact?

- If the Containment Isolation Safety Function is being met, Then check the YES box.

D. Is the condition of the core stable or degrading?

- If ñBòabove is YES, Then check the STABLE box.

OR

- If ñBòabove is NO, Then check the DEGRADING box.

13. Weather Data

NOTE
10 meter data should be used.

C. Stability Class - Enter the stability class as determined by using the figure below.

Delta-T	Stability Class
Less than or equal to -1.7	A
-1.6 to -1.5	B
-1.4	C
-1.3 to -0.5	D
-0.4 to +1.4	E
+1.5 to +3.6	F
Greater than +3.6	G

14. Additional Release Information

- Check box "A" Not Applicable (N/A) if no release is occurring and/or if dose information is not available.
- Otherwise, enter the information provided by dose assessor

ATTACHMENT 1A
DIRECTIONS FOR COMPLETING THE FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM
(Page 6 of 6)

NOTE
A peer check helps to avoid missing and/or incorrect information.

15. Message Received By

Obtain EC or RM approval

Transmit the form in accordance with EPIP-08, Appendix ñA,òstep 2.B.

END OF ATTACHMENT 1A

ATTACHMENT 4
ADDITIONAL STATE NOTIFICATION FORM INFORMATION
(Page 1 of 2)

1. SNF Line 3: Site
Do not check more than one unit. For dual unit events such as the approach of a hurricane or loss of off-site power, the fact that the other unit is affected by the condition should be stated in the ñAdditional Information or Updateò section.

2. SNF Line 5: When opening and closing an event in one notification:

- On line 5, both box A and box B apply
  Date(s) and times of declaration and termination are to be indicated.

3. SNF Line 9: Release Status

A. If, as a result of **accident conditions**, ANY of the following is true:

- A rise of (approximately) 10 times or one decade above pre-transient values is seen on one of the following monitors used for accident assessment:
  - A/B Main Steam Line: RE 26-62/63 (RIM 26-71/72) - ONLY if a steam release is in progress
  - A/B ECCS: RSC 26-2/3 (RS 26-69/70)
  - Plant Vent: RSC 26-1 (RS 26-90)
  - Fuel Building: RSC 26-4 (RS 26-12)
  - Health Physics detects unplanned elevated airborne radiation levels outside of plant buildings due to accident conditions
  - A Steam Generator, with primary-to-secondary leakage, due to a tube leak or rupture, is vented to atmosphere
  - Operating the C AFW pump from an affected Steam Generator
  - A release of radioactive material is in progress, even though it may be less than normal operating limits

  Then a RELEASE is in progress.

80. 062AA2.01 Loss of Nuclear Service Water / Ability to determine and interpret the following as they apply to the Loss of Nuclear Service Water: Location of a Leak in the SWS

Given the following conditions:

- Unit 1 is at 100% power
- 1A and 1B ICW pumps are in service

Subsequently:

- The Nuclear Plant Operator reports a significant ICW leak from SS-21-4A, ñAò TCW Heat Exchanger Strainer

Which ONE of the following completes the statements below?

Based on the leak location, ____(1)____ Intake Cooling Water (ICW) header pressure(s) will LOWER.

IF, MV-21-3, ñAò ICW Train to TCW HXS, breaker were to trip OPEN prior to full valve closure during leak isolation actions, Entry into Tech Spec LCO 3.7.4.1, Intake Cooling Water System, ____(2)____ required

A.	(1)	ONLY the A
	(2)	is
B.	(1)	ONLY the A
	(2)	is NOT
C.	(1)	BOTH the A and the B
	(2)	is
D.	(1)	BOTH the A and the B
	(2)	is NOT

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 is correct: The intake cooling water system is NOT normally cross connected, but is during backwashing evolutions of the TCW Heat Exchanger Strainer; therefore the leak will only impact ñAòICW header pressure indication. Part 2 is correct: MV-21-3 is required to isolate the ICW to TCW in the event of a Safety Injection. If this valve cannot automatically isolate the system, the ñAòICW header must be declared inoperable to ensure adequate cooling flow to the CCW Heat Exchangers.
B.	Incorrect:	Part 1 correct ï see Analysis ñAò Part 2 is incorrect but plausible. When the initial leak occurs, it is on the non-safety related section of the Intake Cooling Water System, therefore Tech Spec 3.7.4.1 would not be required to be entered solely due to the leak. When MV-21-3 breaker trips, the non-safety related piping can no longer be automatically isolated from the safety related portion, therefore TS 3.7.4.1 applies
C.	Incorrect:	Part 1 is incorrect: but plausible. The Component Cooling Water System is cross connected on the non-safety related portion of the system (ñNòHeader (Non-essential Header). Therefore if a similar leak occurred on the ñNòheader, BOTH the ñAòAND ñBòCCW header pressures would lower. Part 2 is correct ï see analysis ñAò Part 2 is correct see explanation A.
D.	Incorrect:	Part 1 is incorrect see explanation C. Part 2 is incorrect see explanation B.

Question Number: 80

Tier: 1 Group: 1

K/A: 062AA2.01 Loss of Nuclear Service Water / Ability to determine and interpret the following as they apply to the Loss of Nuclear Service Water: Location of a Leak in the SWS

Importance Rating: 2.9 3.5

10 CFR Part 55: (CFR 43.5 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know how to identify a leak in SWS and the TS implications.

Technical Reference: TS 3.7.4.1

Proposed references to be provided: None

Learning Objective: PSL OPS 0702313 - 3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

PLANT SYSTEMS

3/4.7.4 INTAKE COOLING WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.4.1 At least two independent intake cooling water loops shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With only one intake cooling water loop OPERABLE, restore at least two loops to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

SURVEILLANCE REQUIREMENTS

4.7.4.1 At least two intake cooling water loops shall be demonstrated OPERABLE:

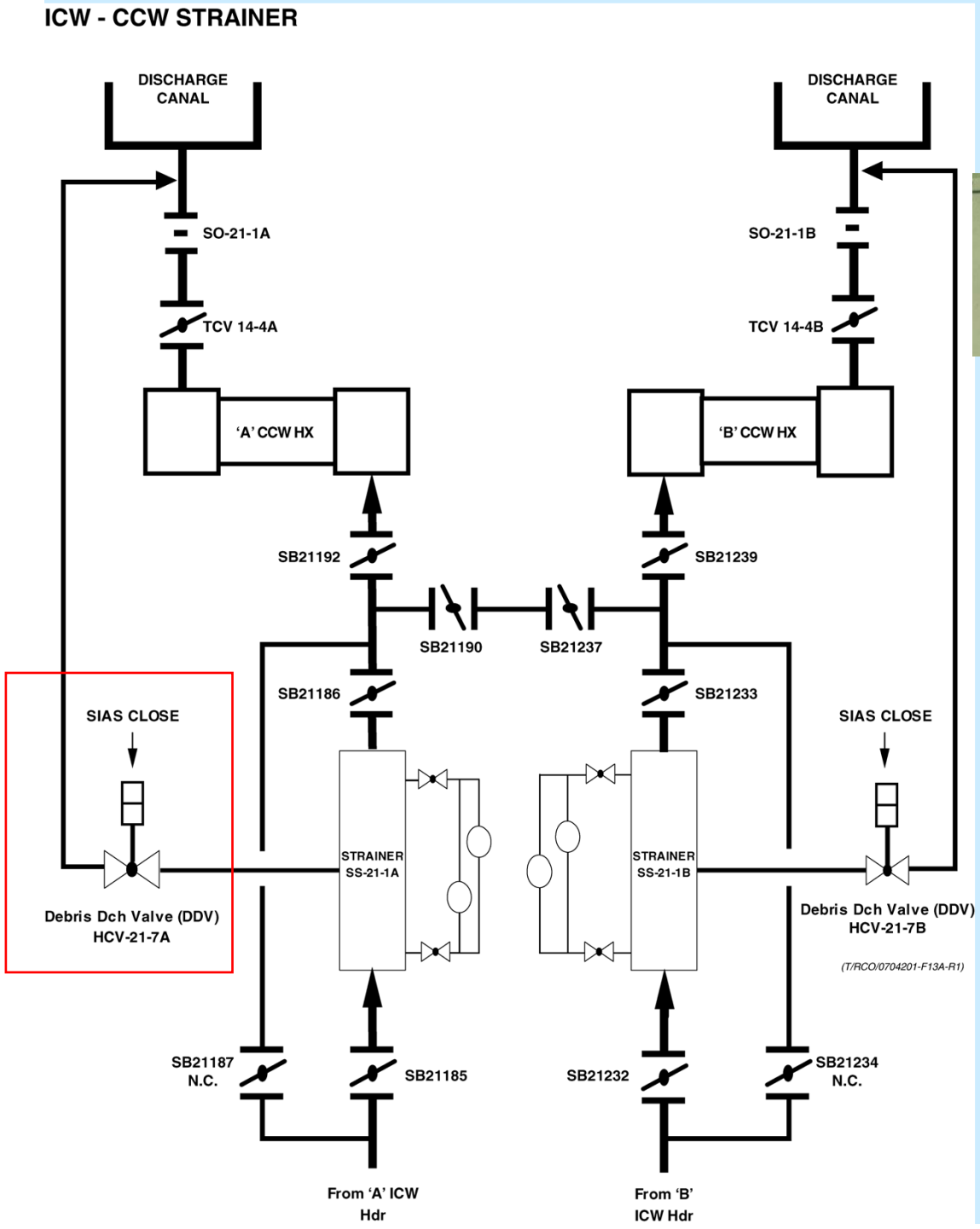
a. In accordance with the Surveillance Frequency Control Program by verifying that each valve (manual, power operated or automatic) servicing safety related equipment that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. In accordance with the Surveillance Frequency Control Program during shutdown by verifying that each automatic valve servicing safety related equipment actuates to its correct position on a Safety Injection Actuation signal.

NOTES	LESSON OUTLINE
	i) Permit isolation of either header
EO-4h	c) Header vacuum breakers
	i) Ensure header integrity when isolated
	ii) Break vacuum as water drains from system to prevent pipe collapse
	iii) Installed in areas isolated by SIAS signal (downstream of HCV-21-7A(B)
EO-3f, EO-15, EO-17a	d) Strainers
SIAS signal will de-energize the MCC-1[2]A(B)8 to lose power to the strainers and close HCV-21-7A(B) Which are powered from 125 V DC. Indicating lights in CR will still work for HCV-21-7A(B)	i) Remove sand, shell grit, small marine organisms and other fine debris
	ii) Normal Conditions (8,000 gpm)
	(a) Clean dP at 0.22 psid
30” and 40” in normal settings Set to 75” and 85” for SDC with local switch.	(b) Hi dP at 1.1 psid; 40-second auto backwash
	(c) Hi-hi dP at 1.4 psid; 10-minute auto backwash
	iii) Accident Conditions (16,500 gpm max flow)
	(a) Clean dP at 0.92 psid
Causes alarm ARP-01-E	(b) Hi dP at 3.3 psid
	iv) HCV-21-7A, B close on SIAS signal to make sure all flow goes to Hx.
	2) Pump and header cross-tie
EO-4b	a) Administratively locked closed cross-tie valves
	b) C pump can supply either A or B header
	3) Provides flow to the following components:
	a) CCW Heat Exchangers via seismic piping
	b) Two non-essential headers
	i) Supplied via MV-21-2 and MV-21-3
	c) Lube water system (Unit 1 only)

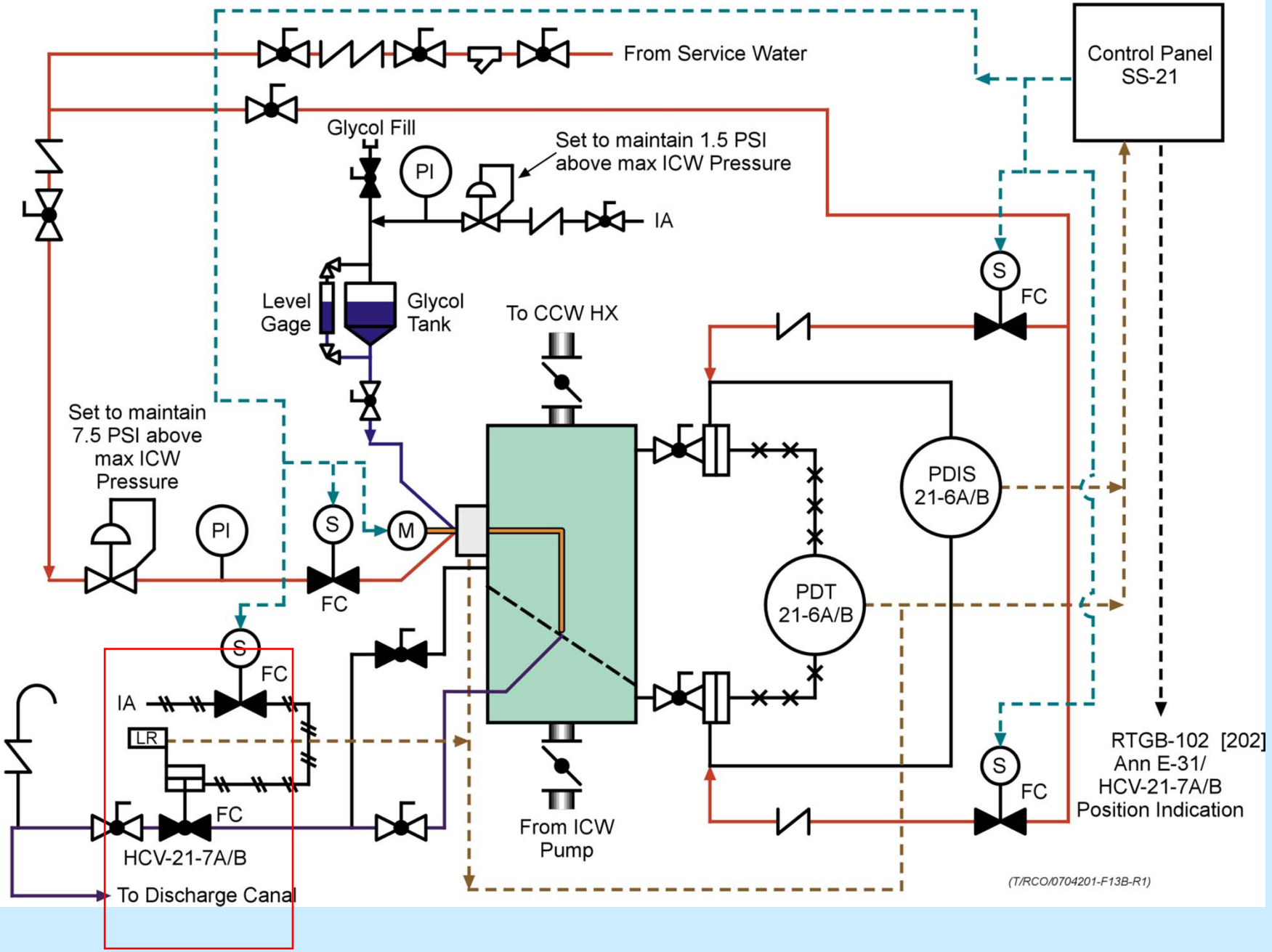
ICW Strainers (DFS) for CCW Hx –EO-3f, EO-15, EO-17a

- SIAS signal will de-energize the MCC-1[2]A(B)8 to lose power to the strainers and close HCV-21-7A(B), which are powered from 125 V DC. Indicating lights in CR will still work for HCV-21-7A(B). Valves close to prevent loss of flow to CCW Hx. There is also a 125 V DC backup signal to close the valves.
- 30” and 40” in normal settings for DP alarm.
- Set to 75” and 85” for SDC with local switch.
- HCV-21-7A (B) indicate on RTGB-102 (202) in different places as noted earlier.



Unit 1 indications of HCV-21-7A, 7B

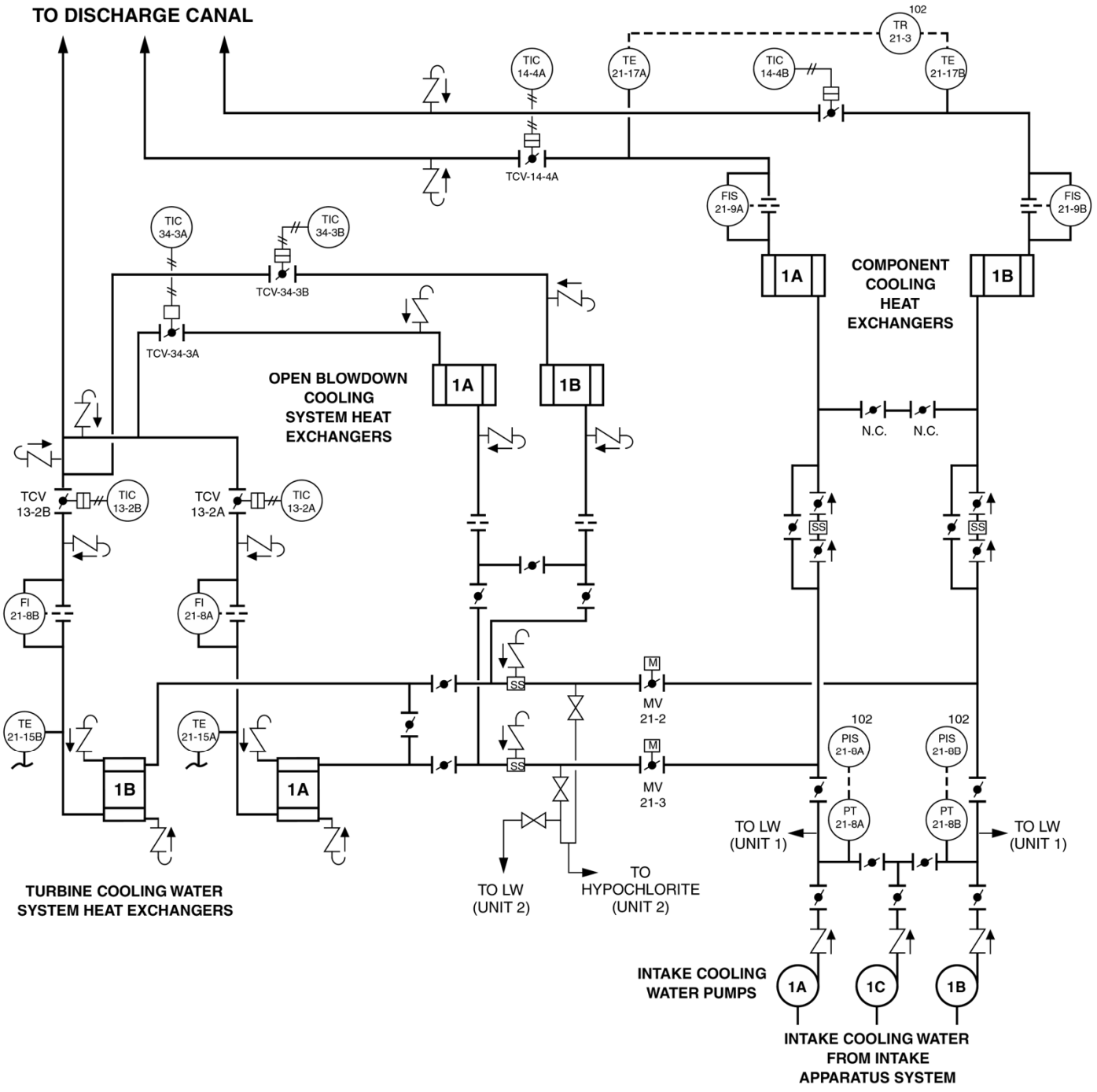
Unit 2 indications of HCV-21-7A, 7B


From Service Water
Control Panel
SS-21
Glycol Fill
PI
Set to maintain 1.5 PSI
above max ICW Pressure
IA
Level
Gage
Glycol
Tank
To CCW HX
S
FC
Set to maintain
7.5 PSI above
max ICW
Pressure
PI
S
M
FC
PDIS
21-6A/B
PDT
21-6A/B
S
FC
IA
LR
FC
HCV-21-7A/B
To Discharge Canal
From ICW
Pump
S
FC
RTGB-102 [202]
Ann E-31/
HCV-21-7A/B
Position Indication
(T/RCO/0704201-F13B-R1)

DESCRIPTION OF THE SYSTEM- EO-3a, EO-4a

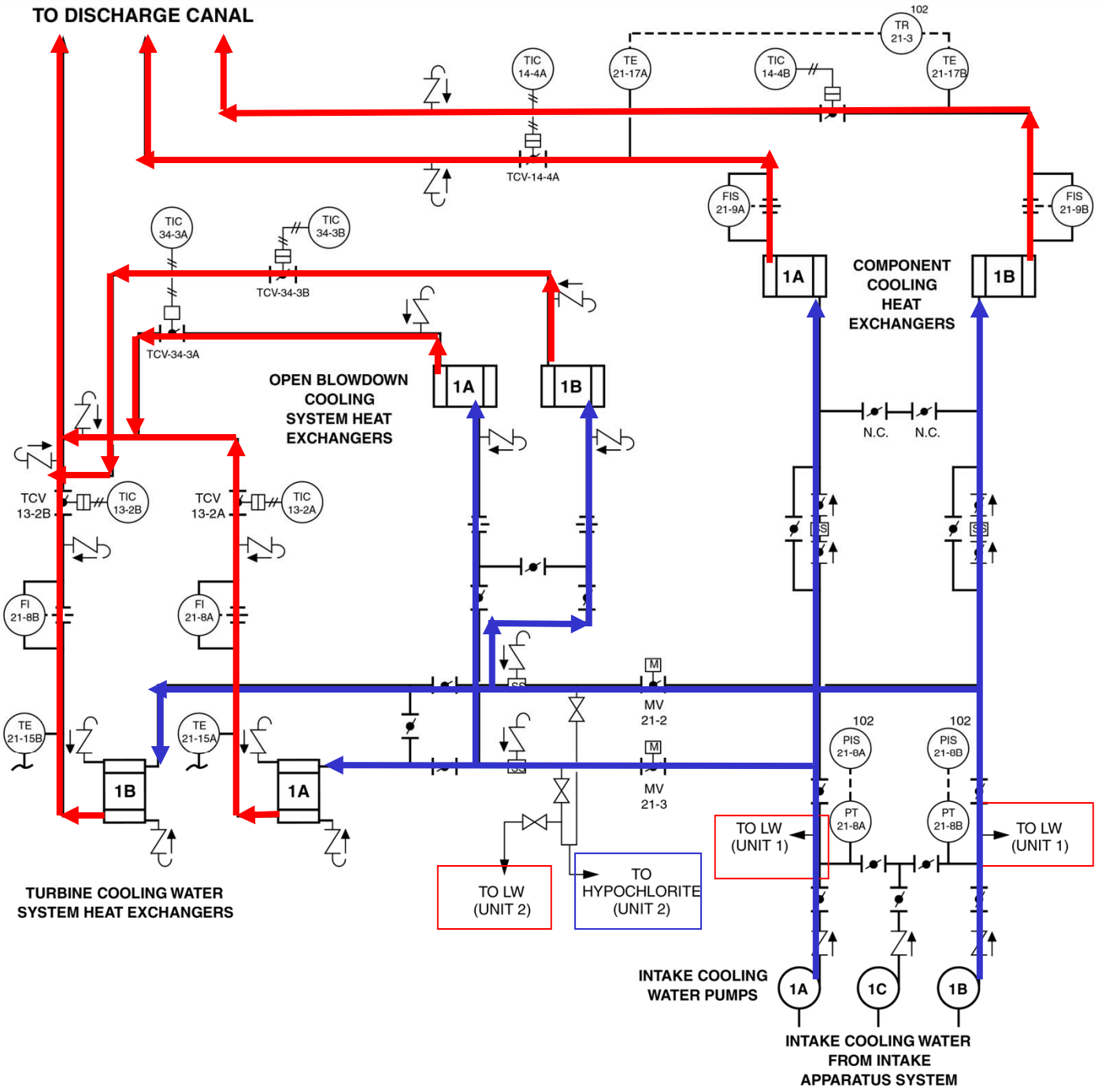
- Components
  - 3 Pumps
  - Heat Exchangers
  - Strainers
  - Associated Piping and Valves
- ICW system is a Seismic Category 1, Quality Group C system.
- Necessary for “Safe-Shutdown” of the unit.

- ICW divided into two redundant Headers, each Header is divided into two sections:
  - Essential: CCW
  - Non-Essential: TCW/SGOBDC
- The ‘C’ pump can be aligned to either Header
- The ICW system provides the normal supply of water to the Lube Water system.

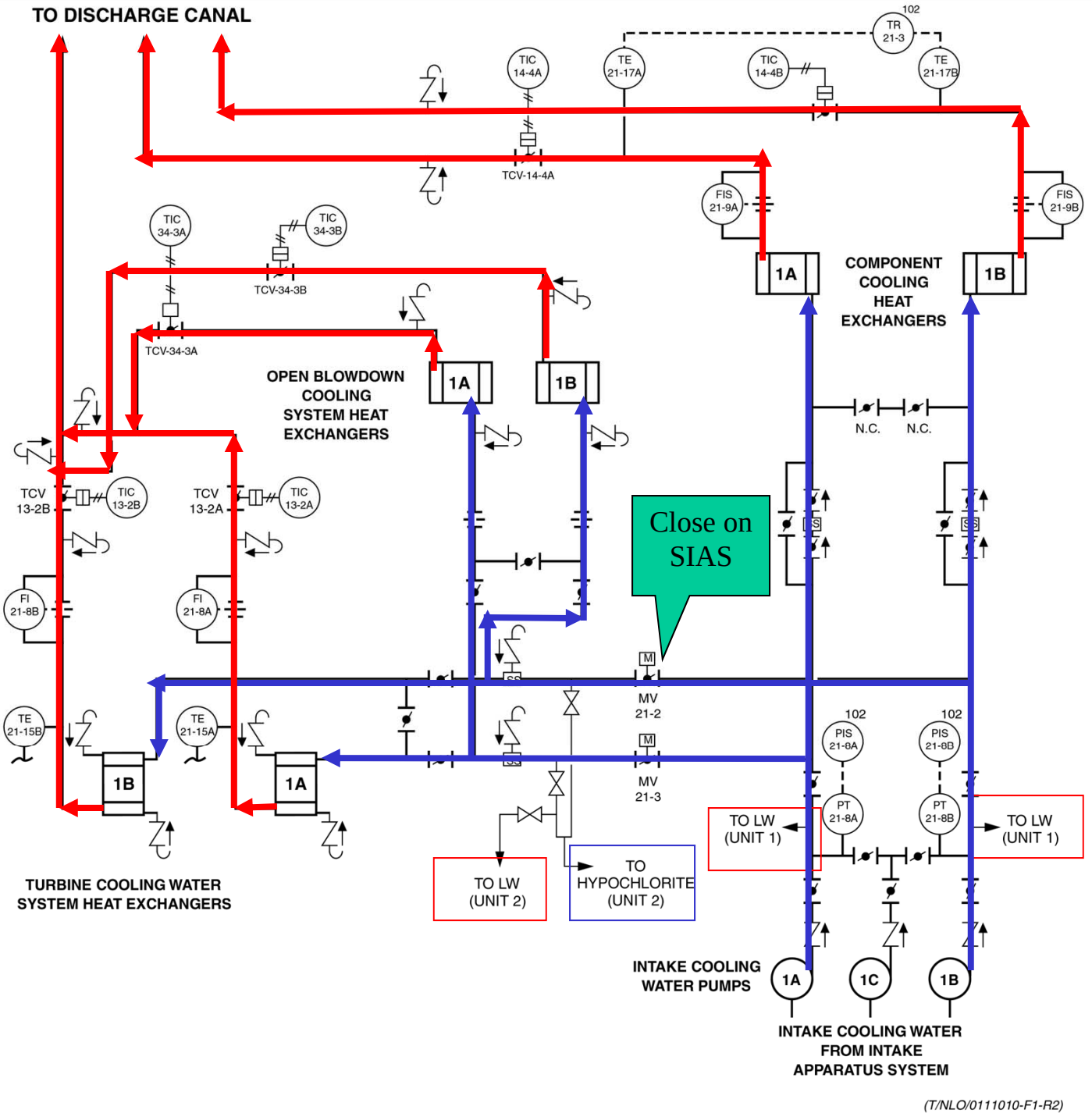


(T/NLO/0111010-F1-R2)

Draw, Label, and Explain Figure 1 – EO-5



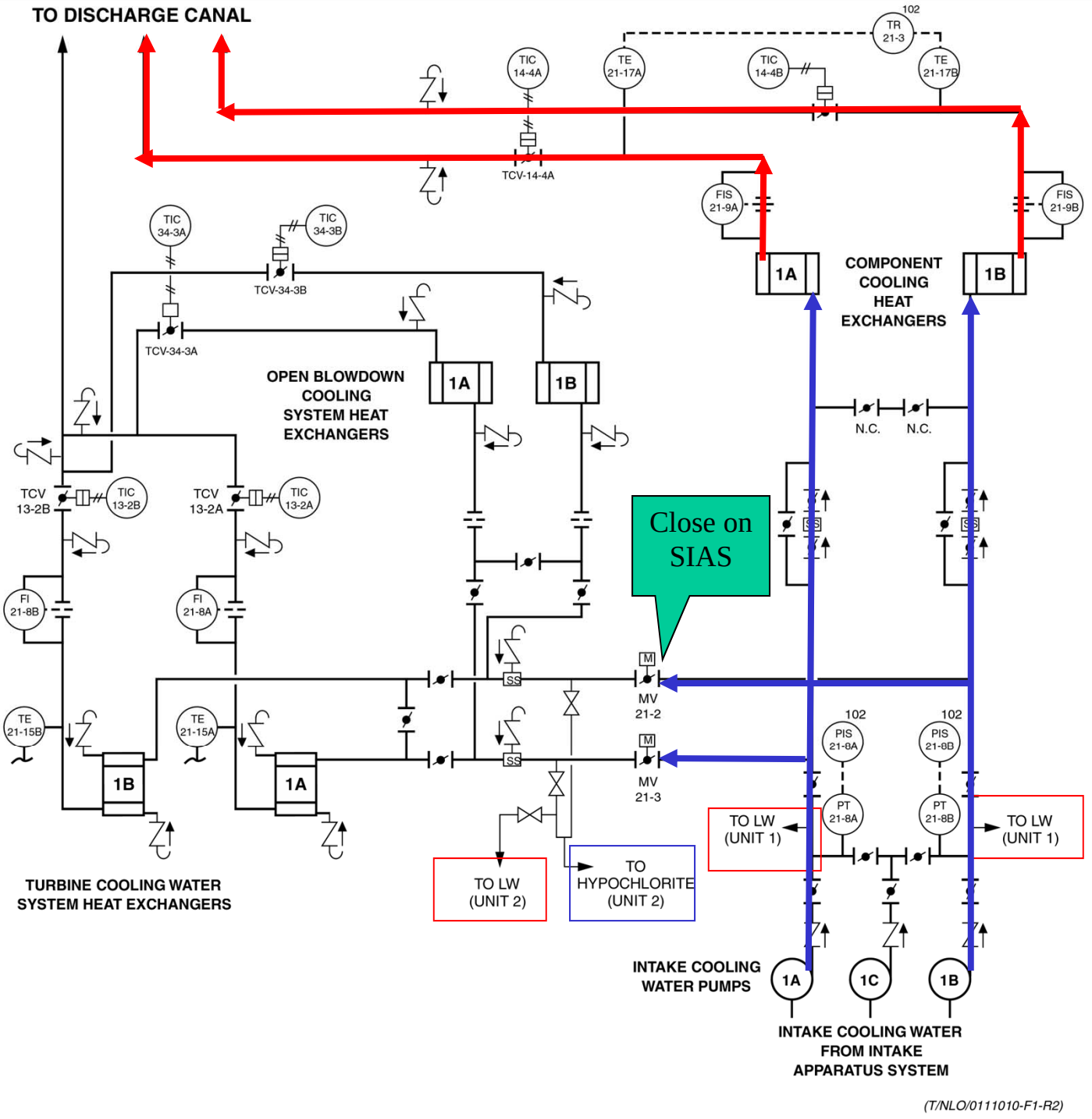
(T/NLO/0111010-F1-R2)



(T/NLO/0111010-F1-R2)

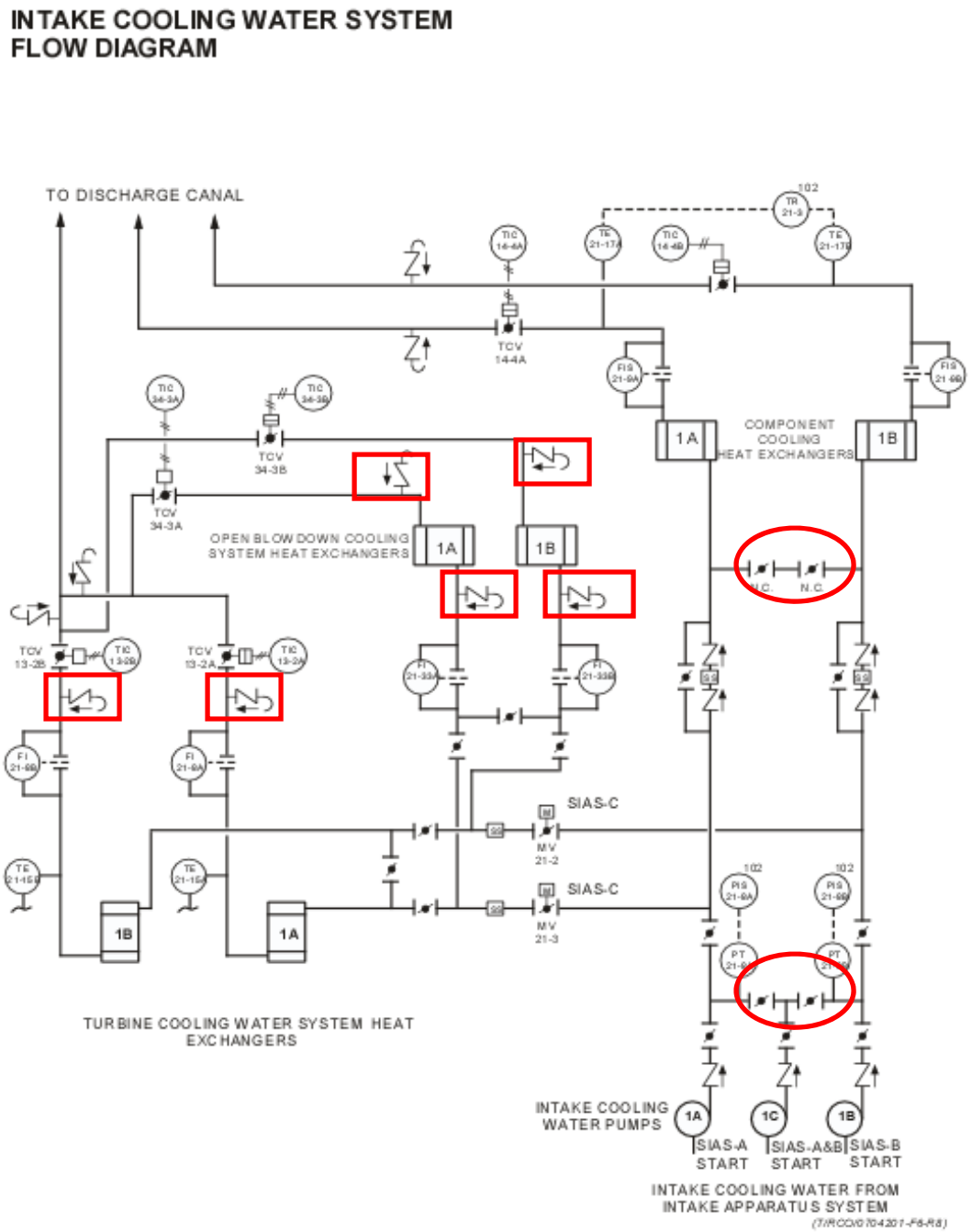
What Unit 2 systems are affected on a SIAS and NOT on Unit 1?

Lube Water and Hypochlorite.



ICW HEADERS- EO-4h

- Header Isolation Valves
- Header vacuum breakers
  - Ensure header integrity when isolated
  - Break vacuum as water drains from system to prevent pipe collapse
  - Installed in areas isolated by SIAS signal (downstream of HCV-21-7A(B) the ICW to CCW Hx DFS discharge valves)



81. 065 G2.4.8 Loss of Instrument Air / Knowledge of how abnormal operating procedures are used in conjunction with EOPs

Given the following conditions:

- Unit 1 is at 100% power

Subsequently:

- Instrument Air (IA) pressure is 80 psig and LOWERING
- 1-AOP-18.01, Instrument Air Malfunction is entered

Which ONE of the following completes the statements below?

If IA pressure continues to lower, a Reactor Trip is required at ____(1)____.

AFTER SPTAS are completed and during performance of 1-EOP-02, Reactor Trip Recovery, in accordance with ADM-11.16, Transient Procedure Use and Adherence, 1-AOP-18.01, is used ____(2)____.

A.	(1)	60 psig
	(2)	in parallel with 1-EOP-02
B.	(1)	60 psig
	(2)	after 1-EOP-02 is exited
C.	(1)	75 psig
	(2)	in parallel with 1-EOP-02
D.	(1)	75 psig
	(2)	after 1-EOP-02 is exited

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 is correct. IAW 1-AOP-18.01, at 60 psig the action is to trip the reactor. Part 2 is correct. IAW ADM-11.16, 4.2.1, IF during performance of EOPs, it is determined that guidance from an AOP would help maintain Safety Functions or achieve cold shutdown, THEN the AOP may be implemented in parallel with the EOPs. However the EOPs would remain the primary emergency response procedure until exit criteria is met. This is SRO because you know that if you don't perform the AOP in parallel with EOP you will lose CCW to the RCPs which will require transitioning to 1-EOP-09, Loss of Forced Circulation instead of remaining in 1-EOP-02, Rx Trip Recovery.
B.	Incorrect:	Part 1 is correct: See explanation A. Part 2 is incorrect: Normally SPTAs take precedence over all CR actions but as stated in ADM-11.16, if AOP guidance would help maintain safety function then the AOP may be performed in parallel.
C.	Incorrect:	Part 1 incorrect: 75 psig is the setpoint for commencing a downpower. Part 2 is correct see explanation A.
D.	Incorrect:	Part 1 incorrect: 75 psig is the setpoint for commencing a downpower. Part 2 is incorrect see explanation B.

Question Number: 81

Tier: 1 Group: 1

K/A: 065 G2.4.8 Loss of Instrument Air / Knowledge of how abnormal operating procedures are used in conjunction with EOPs

Importance Rating: 3.8 4.5

10 CFR Part 55: (CFR 41.10 / 43.5 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know how AOPs are used in conjunction with EOPs during a loss of IA.

Technical Reference: ADM-11.16, 1-AOP-18.01

Proposed references to be provided: None

Learning Objective: PSL OPS 0702413-10

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

4.2 AOP Use and Adherence

1. Discussion:

- AOP entry is generally event based rather than symptom based. Typical AOP events are **NOT** contingent on a reactor trip.
- IF during performance of EOPs, it is determined that guidance from an AOP would help maintain Safety Functions or achieve cold shutdown, THEN the AOP may be implemented in parallel with the EOPs. However the EOPs would remain the primary emergency response procedure until exit criteria is met.

2. WHEN an AOP is entered, THEN **PERFORM** a crew update.

3. AOP Compliance:

A. To avoid hasty decisions and hurried actions during implementation, timely thought out actions are required.

B. During plant operation, conditions may require the implementation of an AOP. Due to the potential urgent nature of initiating corrective actions, some AOPs include Immediate Operator actions which are expected to be carried out from memory. The corrective actions taken must then be verified with the actual steps from the appropriate AOP as soon as possible.

(1) Any AOP actions that are directed to be completed immediately after tripping the reactor (e.g., stopping a RCP due to a high bearing temperatures) should be evaluated upon the completion of verifying the reactor and turbine are tripped.

INSTRUCTIONS	CONTINGENCY ACTIONS

4.0 OPERATOR ACTIONS

4.1 Immediate Operator Actions

*	1.	**VERIFY** Instrument Air header pressure equal to or greater than 60 psig as indicated on PI-18-9, INSTR/STATION AIR PRESSURE.	1.1	IF Instrument Air header pressure indicates less than 60 psig and lowering, THEN **PERFORM** the following: **A.** **TRIP** reactor. **B.** **GO TO** 1-EOP-01, Standard Post Trip Actions.

4.2 Subsequent Operator Actions

*	1.	IF F-5, INSTR AIR PRESS HIGH / LOW, is IN ALARM and pressure is degrading as indicated on PI-18-9, INSTR/STATION AIR PRESSURE, THEN **PERFORM** the following: **A.** **OPEN** SH18718, SERVICE AIR CROSSTIE TO INSTR AIR ISOL. (TGB/24/S-6/W-A) **B.** **OPEN** SH18076, 1A/1B INSTR AIR DRYER BYPASS. (TGB/25/N-8/W-A)

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2 Subsequent Operator Actions (continued)

2. A. (continued)

A.3 IF 1C or 1D compressor can **NOT** be started, THEN **PERFORM** one of the following:

- **START** 1A Instrument Air Compressor per Attachment 1, Operation of 1A Instrument Air Compressor.
- **START** 1B Instrument Air Compressor per Attachment 2, Operation of 1B Instrument Air Compressor.

B. **DISPATCH** personnel to investigate Instrument Air System for leaks, failures, or equipment malfunctions.

NOTE

- The ability to maintain steam generator levels at full power conditions may be affected if Instrument Air pressure degrades below 75 psig.
- Air operated valves and instrumentation may lose full range operating capability.

☐ **3.** **VERIFY** Instrument Air pressure is equal to or greater than 75 psig.

3.1 **EVALUATE** need to shut down unit per 1-AOP-22.01, Rapid Downpower.

82.

028 AA2.01Ability to determine and interpret the following as they apply to the Pressurizer Level Control Malfunctions: PZR level indicators and alarms

Given the following conditions:

- Unit 2 is at 100% power
- Pressurizer Level Control is selected to Channel ñÝò
- Pressurizer Backup Heaters B1 are out of service due to a breaker failure

Subsequently:

- Pressurizer Level Transmitter, LT-1100Y indicates 0%
- Annunciator H-18, PZR Channel Y Level HI/LO is LIT
- 2-AOP-01.10, Pressurizer Pressure and Level, Att. 5, Recovering Power to Pressurizer Heaters has been completed

Which ONE of the following describes the heaters that can be recovered and the applicable Tech Spec requirements?

Based on the given conditions ____(1)____ can be recovered. Tech Spec 3.4.3, Pressurizer, Action (b) ____(2)____ required to be entered.

(REFERENCE PROVIDED)

A.	(1)	B2 and B3 heaters ONLY
	(2)	is
B.	(1)	B2 and B3 heaters ONLY
	(2)	is NOT
C.	(1)	B2, B3, B4, B5 and B6 heaters
	(2)	is
D.	(1)	B2, B3, B4, B5 and B6 heaters
	(2)	is NOT

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	On Unit 2 you can only recover the B2 and B3 heaters because the systems design with both the B2 and B3 heaters not having a 1E power supply. Only the B1 and B4 backup heaters are class 1E powered. With the initial conditions of B1 out of service and B4 unrecoverable TS 3.4.3, Action b is required to be entered. This is SRO because the applicant is required to apply the TS below the line actions.
B.	Incorrect:	Part 1 is correct on Unit 2 you can only recover the B2 and B3 heaters because the systems design. Only the B1 and B4 backup heaters are class 1E powered. Part 2 is plausible because of a Unit 2 design difference with Unit 1 with all Pressurizer Heaters having a 1E power supply. If the applicant believes that the B2 and B3 have a 1E power supply action b would not be required to be entered.
C.	Incorrect:	Part 1 is incorrect but plausible because on Unit 1 you can recover the B2, B3, B4, B5 and B6 heaters because the systems design. All backup heaters are class 1E powered. Part 2 is correct.
D.	Incorrect:	Part 1 is incorrect but plausible because on Unit 1 you can recover the B2, B3, B4, B5 and B6 heaters because the systems design. Part 2 is plausible because of a Unit 2 design difference with Unit 1 with all Pressurizer Heaters having a 1E power supply. If the applicant believes that the B2 and B3 have a 1E power supply action b would not be required to be entered.

Question Number: 82

Tier: 1 Group: 2

K/A: 028 AA2.01Ability to determine and interpret the following as they apply to the Pressurizer Level Control Malfunctions: PZR level indicators and alarms

Importance Rating: 3.3 3.6

10 CFR Part 55: (CFR 43.5)

10CFR55.43.b: 10CFR55.43.b(5)

K/A Match: K/A is matched because the applicant is required to interpret the indications and alarms and the TS implications.

Technical Reference: TS 3.4.3, Page 3/4 4-9

Proposed references to be provided: TS 3.4.3, Page 3/4 4-9

Learning Objective:

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: Bank question from the 2017 NRC SRO Exam

Comments: Slightly modified from 2017 Q#88 to be a better KA match for use in this Tier and Group

REACTOR COOLANT SYSTEM

3/4.4.3 PRESSURIZER

LIMITING CONDITION FOR OPERATION

3.4.3 The pressurizer shall be OPERABLE with a minimum water level of greater than or equal to 27% indicated level and a maximum water level of less than or equal to 68% indicated level and at least two groups of pressurizer heaters capable of being powered from 1E buses each having a nominal capacity of at least 150 kW.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

a. With one group of the above required pressurizer heaters inoperable, restore at least two groups to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

NOTE
Action not applicable when second group of required pressurizer heaters intentionally made inoperable.

b. With two groups of required pressurizer heaters inoperable, restore at least one group of required pressurizer heaters to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

c. With the pressurizer otherwise inoperable, be in at least HOT STANDBY with the reactor trip breakers open within 6 hours and in HOT SHUTDOWN within the following 6 hours.

SURVEILLANCE REQUIREMENTS

4.4.3.1 The pressurizer water volume shall be determined to be within its limits in accordance with the Surveillance Frequency Control Program.

4.4.3.2 The capacity of each of the above required groups of pressurizer heaters shall be verified to be at least 150 kW in accordance with the Surveillance Frequency Control Program.

4.4.3.3 The emergency power supply for the pressurizer heaters shall be demonstrated OPERABLE in accordance with the Surveillance Frequency Control Program by verifying that on an Engineered Safety Features Actuation test signal concurrent with a loss of offsite power:

a. the pressurizer heaters are automatically shed from the emergency power sources, and

b. the pressurizer heaters can be reconnected to their respective buses manually from the control room after resetting of the ESFAS test signal.

ATTACHMENT 1
General Information
(Page 1 of 2)

1. The following provides general information for PORV mode select switches:

- With PORV MODE SELECT in NORMAL, lift setpoint is 2370 psia when RCS temperature is greater than 255°F during heatup or greater than 240°F during cooldown.
- With PORV MODE SELECT in LTOP, lift setpoint is 490 psia when RCS temperature is less than 255°F during heatup or less than 240°F during cooldown.

2. Non-selected Pressurizer pressure control channel failure has no direct effect on stable plant operations.

3. Non-selected Pressurizer level control channel failing high has no direct effect on stable plant operations.

4. The following provides general information for restoring Pressurizer heaters:

A. A Safety Injection Actuation Signal (SIAS) will lockout the Pressurizer heaters 4160 VAC breakers. If SIAS has actuated, SIAS must be RESET before Pressurizer Heaters can be energized.

B. Undervoltage (LOOP) interlock will load shed the 4160 V breakers and open all 480 V heater contactors. They may be reclosed after verifying adequate EDG load capacity.

C. With less than 27% Pressurizer level on Channel X:

- "A" side breaker 2-20204, PRZR HEATER TRANSFORMER 2A3, trips, de-energizing P1, B1, B2, B3.
- "B" side 480V heater power supply contactors open, de-energizing P2, B4, B5, B6.

D. With less than 27% Pressurizer level on Channel Y:

- "B" side breaker 2-20403, PRZR HEATER TRANSFORMER 2B3, trips, de-energizing P2, B4, B5, B6.
- "A" side 480V heater power supply contactors open, de-energizing P1, B1, B2, B3.

ATTACHMENT 5
Recovering Power to Pressurizer Heaters
(Page 1 of 3)

1. **VERIFY** all the following conditions are met:

- IF SIAS has actuated, THEN SIAS is RESET.
- Pressurizer level is greater than 27%.
- At least one 4160V vital bus is energized:
  - 2A3
  - 2B3

2. IF any of the following control channels failed, THEN **ENSURE** non-affected control channel(s) selected:

- Reactor Regulating System
- Level
- Pressure

3. IF Bkr 2-20204, PRZR HEATER TRANSFORMER 2A3, is OPEN AND all of the following conditions are met:

- LIC-1110X, LEVEL, indicates greater than 27%
- Vital 4160 V bus 2A3 is energized
- SIAS A is RESET

THEN **PERFORM** the following:

A. **ENSURE** Bkr 2-20204, PRZR HEATER TRANSFORMER 2A3, control switch indicates green flag.

B. **CLOSE** Bkr 2-20204, PRZR HEATER TRANSFORMER 2A3.

ATTACHMENT 5
Recovering Power to Pressurizer Heaters
(Page 2 of 3)

4. IF Bkr 2-20403, PRZR HEATER TRANSFORMER 2B3, is OPEN AND all of the following conditions are met:

- LIC-1110Y, LEVEL, indicates greater than 27%
- Vital 4160 V bus 2B3 is energized
- SIAS B is RESET

THEN **PERFORM** the following:

A. **ENSURE** Bkr 2-20403, PRZR HEATER TRANSFORMER 2B3, control switch indicates green flag.

B. **CLOSE** Bkr 2-20403, PRZR HEATER TRANSFORMER 2B3.

NOTE

The Backup Interlock Bypass Key Switch, selected to the LEVEL position, allows the 480V heater power supply contactors controlled by the selected channel to be reset.

5. IF only one Pressurizer heater bus has power available OR only one Pressurizer level control channel is functioning, THEN **PLACE** B/U INTLK B/P (Key 98) in LEVEL.

6. IF EDG is powering vital bus(es), THEN **RESET** only Backup Banks B-1 and/or B-4 by placing heater control switch(es) to OFF / RESET and to AUTO or ON.

7. IF A Pressurizer Heater Bus is energized from offsite power, THEN **RESET** the following Pressurizer heaters by placing heater control switches to OFF / RESET and to AUTO or ON:

- PROPORTIONAL BANK P-1
- BACKUP BANK B-1
- BACKUP BANK B-2
- BACKUP BANK B-3

ATTACHMENT 5
Recovering Power to Pressurizer Heaters
(Page 3 of 3)

8. IF B Pressurizer Heater Bus is energized from offsite power, THEN **RESET** the following Pressurizer heaters by placing heater control switches to OFF / RESET and to AUTO or ON:

- PROPORTIONAL BANK P-2
- BACKUP BANK B-4
- BACKUP BANK B-5
- BACKUP BANK B-6

9. IF B/U INTLK B/P (Key 98) in LEVEL AND the following conditions are met:

- A and B Pressurizer heater buses energized
- X and Y Pressurizer level control channels available

THEN **PERFORM** the following:

A. **PLACE** B/U INTLK B/P in LOCKED OFF.

B. **ENSURE** all Pressurizer heaters RESET.

An outer receptacle is mounted over each element and seal welded to its heater well to provide a redundant (RCS pressure boundary) seal capable of withstanding the vessel design pressure of 2500 psia at a temperature of 700ÁF.

Spray Nozzle Assembly

Consists of a spray line penetration nozzle at the top of the Pressurizer, the spray line that enters the Pressurizer vessel, and the spray nozzle head inside the vessel. Refer to Figure 5.

- Spray line penetration nozzle is protected by a thermal sleeve.
- Spray nozzle is designed to produce a narrow angle cone spray pattern (30Á) which prevents cold water from impinging on the Pressurizer wall.
- The spray nozzle is designed to pass a total of 375 [450] gpm.

The driving force for this flow is developed by the pressure differential between the hot and cold legs (caused by the pressure drop across the reactor vessel).

The maximum spray flow rate is capable of preventing RCS pressure from reaching the high Pressurizer pressure reactor trip setpoint of **2400 [2370] psia** (which also opens the **PORVs**) following a step load reduction of 10% of rated power, assuming automatic CEA control (automatic CEA control is not used at PSL).

PRESSURIZER HEATER POWER DISTRIBUTION

The Pressurizer heaters are grouped into eight banks, two proportional and six backup banks. The rated thermal capacity of each heater is 12.5 [50] kW for a total of 1500 kW from all 120 [30] heaters; the UFSAR minimum required is 1375 [700] kW. Pressurizer heaters are powered from the A3 and B3 480 VAC load centers.

The power distribution path to the heaters is shown in:

- Figure 6 for the two banks of proportional heaters
- Figure 7 for the backup banks
- The A3 and B3 480 VAC load centers are supplied from the safety-related A3 and B3 4160 VAC buses via a 4160V feeder breaker and a 4160V/480V transformer.

Each heater bank has an associated power panel located in the containment 45ô elevation.

- The heater distribution panels house the 3-phase distribution circuit breakers for the heaters of their respective banks. Unit 1 has one distribution breaker for every string of 3 heaters. [Unit 2 has one heater per distribution breaker].

- Unit 1 heaters are delta-connected with 3 heaters per string such that a single open heater would not de-energize the whole string. Each heater operates on single phase power. [Unit 2 heaters have 3 internal heating elements, delta connected.]

The number of heaters per bank, bank thermal output, and the power supply and power panel for each bank is listed below.

HEATER DIFFERENCE TABLE

HEATER BANKS	HEAT OUTPUT	HEATERS/ BANK	480V BUS	POWER PANEL
P-1	150 kW	12 [3]	A3	124 [224]
B-1	187.5 kW [200]	15 [4]	A3	126 [226]
B-2	187.5 kW [200]	15 [4]	A3	127 [227]
B-3	225 kW [200]	18 [4]	A3	128 [228]
P-2	150 kW	12 [3]	B3	125 [225]
B-4	187.5 kW [200]	15 [4]	B3	129 [229]
B-5	187.5 kW [200]	15 [4]	B3	130 [230]
B-6	225 kW [200]	18 [4]	B3	131 [231]

4160 VAC Pressurizer Heater Transformer Feeder Breaker

Breakers from the A3 and B3 4160 VAC buses supply the A3 and B3 Pressurizer heater 480V load centers. They are operated from RTGB 101 [201].

- **Undervoltage (LOOP) interlock** will load shed the 4160V breakers, but they can be re-closed after verifying adequate EDG load capacity. [Can restore only the B1 and B4 heaters.]

- **SIAS interlock** will lockout the 4160V breakers. The breaker cannot be re-closed until SIAS is reset.

- [Unit 2 **PRESSURIZER LO-LO level 27% interlock** locks out the 4160V breakers.]

- Each 4160V feeder breaker has a NORMAL/ISOLATE selector switch located on its associated breaker cubicle in the cable spreading room.

  - In NORMAL, the breaker receives its control signal from the control room, but can be locally tripped at the breaker.

  - In ISOLATE, the 4160V feeder breaker can be locally closed and tripped, but **still receives UV bus strip signal**. **SIAS [and LO-LO level] is [are] blocked in ISOLATE.**

480V Heater Breaker Control Features

Eight 480V heater bank control switches are provided on RTGB-103 [203] for control of proportional and backup heaters through contactors. Refer to Figure 8.

- **Interlocked with Pressurizer level ≤ 28 [27]%** to prevent energizing the heaters.
- **480V heater bus undervoltage/loss of control power** also locks out the supply contactor.

- After the condition clears, reset heater controls by turning the control switch to OFF, then back to ON or AUTO for each heater bank.

- [All Unit 2 480V heater banks are also provided with a **high pressure heater cutoff** as a backup to the normal pressure control signals. Refer to Figure 8. This cutoff:

  - Opens the contactors if pressure reaches **2340 psia**.

  - Automatically restores proportional heater bank control when pressure returns below setpoint; control switch reset is NOT necessary.

  - Backup heater control reset is necessary when pressure returns to < 2340 psia.]

- All Unit 2 heaters have a breaker **permissive from the 3-to-2 4160 VAC bus tie breaker.** It must be closed to operate, EXCEPT for the B1 and B4 safety designated backup heaters. Refer to Figure 8.

- All Unit 2 backup heaters are prevented from energizing during a +3.6% insurge if PZR pressure is Ó2275 psia.]

All Unit 1 [Unit 2 backup heaters only] 480V heater bank supply breakers have a NORMAL/ISOLATE selector switch located on isolation panels in the cable spreading room. Refer to Figures 9, 10 and 11.

- In NORMAL, the heater bank 480V supply breaker receives its control signal from the control room switch and the selected Pressurizer Pressure Control System.

- In ISOLATE, the breaker receives its control signal from the ON/OFF switch at the HSCP. It is **isolated from all other control circuitry, [except 3-to-2 4160 VAC bus tie breaker, for the B1 and B4 safety designated backup heaters]**.

Low Level Cutout Switch, HS-1110-2

Low level heater cutoff signal bypasses all heater breaker control switches and directly trips the power supply contactors to all six banks of backup heaters and both banks of proportional heaters.

- On Unit 1 only, the **Low Level Cutout Switch, HS-1110-2** located on RTGB-103, enables the operator to defeat either of the two low level trip signals on transmitter failure **by selecting the remaining good channel**.

  - The Low Level Cutout Switch is a three-position switch, **CH. X/BOTH/CH. Y**.

In the BOTH position (its normal position), HS-1110-2 allows either of the level signals to deenergize the heaters, regardless of which level transmitter is selected for control.

[Unit 2 Pressurizer Backup Interlock Bypass Key Switch (RTGB-203)]

[4-position, key-locked Pressurizer Backup Interlock Bypass Key Switch, **HS-124**. Refer to Figure 8.]

- To remove the key, the switch must be placed in the LOCKED OFF position.
- **LOCKED OFF** - **normal operating position** which enables all the heaters 480V contactors to be tripped by a Lo-Lo level or a high pressure condition from any of the four control channels (2 level/2 pressure).
- **PRESSURE/LEVEL** - **This position is only used in the Response To Fire off-normal** procedure. Overrides **high pressure AND low level inputs** to Pressurizer heater trips. A second set of contacts in this position ensures B1 and B4 backup heater operation.
- **PRESSURE** - This position is not used. Overrides the high pressure heater trip.
- **LEVEL** - **Overrides the low level heater trip** due to a failed low level control channel. This position will allow resetting the 480V heater controls on the opposite channel proportional and backup heaters. This **override** removes the low level heater trip of the 480V contactors for **all** heater banks. This **override** does **not** affect any 4160V protective features. LO-LO level heater protection is still available by the selected level channel, which will trip the 4160V feeder breaker on an actual low level at **27%**.

The following scenarios explain the use of HS-124: (Refer to Figure 8.)

SCENARIO 1: Pressurizer level control channel X is selected and fails low:

Result: 'A' side 4160V feeder breaker trips, de-energizing P1, B1, B2, & B3.
'B' 480V heater power supply contactors open, de-energizing P2, B4, B5 & B6.

Recovery: Select operable level channel for level control (Y).
Turn key switch to "LEVEL" (overrides LC-1110XL trip of the 'B' side heater contactors and prevents a LC-1110YL trip of the 'A' side heater contactors).
Reset 480V heater controls on B side to restore P2, B4, B5 & B6. (Take switch to OFF, then back to ON or AUTO)

NOTE: Only 1 side of Pressurizer heaters are available while level control channel is failed low (side opposite failed level channel).

(If level channel óYôfailed low, the other heater banks would be effected:

- óBôside 4160V feeder breaker and P1, B1, B2, B3 480V contactors open.
- óAôside 480V heater bank controls to P1, B1, B2, B3 could be reset.)

SCENARIO 2: Loss of off-site power: No repositioning of HS-124 is necessary.

Result: Both 4160V feeder breakers and all eight 480V contactors open (contactors open due to de-energizing the control circuitry).
D/Gs start and carry emergency loads on 2A3 and 2B3 4160 VAC buses.

Recovery: When Pressurizer level > 27%, close 'A' and 'B' 4160V breakers, and Reset 480V heaters on RTGB-203 to restore backup heaters B1 and B4. (All other Unit 2 heaters are interlocked out (for DG loading concerns) by 3-to-2 4160 VAC bus tie breaker open interlock.)

SCENARIO 3: Pressurizer pressure control channel X is selected and fails high:
NO repositioning of HS-124 is necessary.

Result: All 480V heater contactors open.

Recovery: Select operable pressure control channel (Y),
Proportional heater 480V contactors reset automatically.
Reset and close backup heater 480V heater contactors. (Take switch to OFF, then back to ON or AUTO)

NOTE: If non-selected channel fails high there is no adverse effect on the heaters.

SCENARIO 4: One pressure control channel failed high, with
One level control channel failed low:

Result: Associated 480V contactors, along with the affected 4160V breaker trip.

Recovery: Select the operable pressure control channel,
Select the operable level control channel,
Turn HS-124 key switch to "LEVEL"
Reset 480V control circuits on unaffected side only. (Take switch to OFF, then back to ON or AUTO)

A summary of these Unit 2 only actions is included in Table 5.

Proportional Heaters

Proportional Heater Banks P-1 and P-2 are normally controlled from RTGB 103 [203] by ON/OFF control switches. Refer to Figures 6 and 10.

Two silicon controlled rectifier (SCR) power control units (one for each proportional heater bank) regulate the three-phase proportional heater supply voltage from 0 to 480 volts.

Pressurizer Pressure Control System (PPCS) analog control signal acts directly on the SCRs to vary their power output:

- **At setpoint, 50% voltage is supplied.** (Refer to Figures 30 and 31.)
- Above setpoint, proportionally less voltage is conducted to the heaters, until, at a pressure deviation of **+25 psi**, the SCRs deliver **zero power** to the heaters.
- Below setpoint, proportionally more voltage is conducted to the heaters, until, at a pressure deviation of **-25 psi**, the SCRs deliver **maximum power** to the heaters.

SCR power output is then applied through the 480V proportional heater power supply breakers. Refer to Figure 8 for proportional heater supply breaker control logic:

- The proportional bank contactor trips open and locks out when Pressurizer level drops to **28 [27]%**.
- **Bus undervoltage/loss of control power** also trips open and locks out the contactor.
- [Unit 2 heaters are interlocked with **3-to-2 4160 VAC bus tie breaker**. It must be closed for operation.]
- The lockout condition must be reset by selecting OFF, and then ON with the RTGB-103 [203] switch for each heater bank after level/voltage [and the 3-to-2 4160 VAC bus tie breaker] is restored.
- [Unit 2 heaters have a backup **HI-HI pressure cutout** at **2340 psia** to deenergize the heaters. The permissive for the proportional heaters auto resets when pressure returns < 2340 psia. The backup heaters must be manually reset.]

Unit 1 proportional heaters have a NORMAL/ISOLATE switch at the heater bus breaker.

- **NORMAL** - allows RTGB breaker operation, along with interlock protection.
- **ISOLATE - blocks RTGB control, along with the LO-LO level.**
  - In ISOLATE, heater bank now manually operated from the HSCP ON/OFF switch. When closed, PPCS auto signal to the SCR still functions to vary heater output.
  - ISOLATE triggers the RTGB-103 loss of control power annunciator.
  - ISOLATE de-energizes the affected breaker position indication on RTGB 103.

Backup Heaters

Backup Heaters Bank B1, B2, B3, B4, B5 and B6 are normally controlled from RTGB 103 [203]. Refer to Figure 11.

Each of the six (6) backup heater banks has three switches for heater control:

- A maintained contact three position switch, OFF-RESET/AUTO/ON, on RTGB-103 [203]
- A maintained contact, two position, NORMAL/ISOLATE switch at the breaker.
- An ON/OFF switch at the HSCP
- If the NORMAL/ISOLATE switch for backup heaters is in NORMAL with Pressurizer level **≥ 28 [27]%**, backup heaters are energized when the control switch is selected to ON.
- [Unit 2 B/U heaters will de-energize if pressure **≥ 2340 psia** and must be reset when pressure reduces to < 2340 psia.]
- If Pressurizer level is **≥ 28 [27]%** and AUTO is selected, the backup heaters will cycle:
  - **OFF at 2220 psia** increasing and **ON at 2200 psia decreasing**, or
  - **ON if Pressurizer level exceeds setpoint by 3.6%**.
    - The heaters cycle on when an insurge is indicated due to anticipation of a pressure decrease from the colder water and a subsequent outsurge.
    - [If pressure is Ó2275 psia, the backup heaters that are in óAutoô will not energize.]

- [Unit 2 safety backup heaters B1 and B4 operate regardless of 3-2 4160 VAC bus tie breaker position; other Unit 2 backup bank contactors cannot close if the 3 to 2 4160 VAC bus tie breaker is open.]

- If the NORMAL/ISOLATE switch for these heaters is in ISOLATE, they are controlled from the HSCP OFF/ON switch with **no automatic protection or control functions**.

PRESSURIZER SPRAY

Spray Control Valves

There are two, 3òair-operated globe valves, **PCV-1100E and PCV-1100F** in parallel spray lines from cold leg loops **B2 and B1, respectively**. Refer to Figures 12, 12a, 13 and 14.

- Spray valves admit subcooled RCS fluid into the Pressurizer steam space to reduce pressure by condensing some of the steam and cooling the Pressurizer liquid.

- The valves **Fail Closed** on loss of instrument air.

- Each valve is independently capable of supplying sufficient spray flow to prevent PORV actuation during normal load transients.

- An electro-pneumatic converter, mounted outside the Pressurizer cubicle wall, converts the electric control signal from the Pressurizer Pressure Control System (PPCS) to an air signal for valve operation.

A maintained-contact, three-position switch, 1100E/BOTH/1100F located on RTGB 103 [203], selects either or both spray control valves for automatic operation.

- During normal operation with the selector switch in the BOTH position, the two valves operate on a ramped program from **full closed at setpoint +50 psi (typically 2300 psia) [setpoint +25 psi (typically 2275 psia)] to full open at setpoint +100 psi (typically 2350 psia) [setpoint +75 psi (typically 2325 psia)]**.

- When removed from the BOTH position, only the selected valve will operate on pressure control. The control signal is blocked to the non-selected valve, which will fail closed.

ATTACHMENT 1
General Information
(Page 1 of 1)

1. The following provides general information for PORV control switch:

A. With PORV control switch in NORM RANGE, lift setpoint is 2400 psia when RCS temperature is greater than 300°F.

B. With PORV control switch in LOW RANGE:

- Lift setpoint is 530 psia when RCS temperature is less than or equal to 300°F but greater than 200°F.
- Lift setpoint is 350 psia with temperature less than or equal to 200°F.
- Auto swap occurs between above lift setpoints at 200°F.

C. When the PORV control switch is in OVERRIDE, status lights will indicate PORV closed irrespective of actual PORV position.

2. Non-selected Pressurizer pressure control channel has no direct effect on stable plant operations.

3. Non-selected Pressurizer level control channel failing high has no direct effect on stable plant operations.

4. The following provides general information for restoring Pressurizer heaters:

A. A Safety Injection Actuation Signal (SIAS) will lockout the Pressurizer heaters 4160 VAC breakers. If SIAS has actuated, SIAS must be RESET before Pressurizer Heaters can be energized.

B. Undervoltage (LOOP) will load shed the 4160V breakers and open all 480 V heater contactors. They may be reclosed after verifying adequate EDG load capacity.

C. Either selected or non-selected Pressurizer level control channel level transmitter failing low, or actual Pressurizer low level, will open all 480 V heater contactors.

D. The Low Level Cutout switch allows a level control channel that has failed low to be disconnected from the low-low level heater cutoff circuit and the 480V heater power supply contactors controlled by the selected channel to be reset.

ATTACHMENT 5
Recovering Power to Pressurizer Heaters
(Page 2 of 3)

4. IF Bkr 1-20204, PRZR HEATER TRANSFORMER 1A3, is OPEN, AND both of the following conditions are met:

- Vital 4160 V bus 1A3 is energized
- SIAS A is RESET

THEN **PERFORM** the following:

A. **ENSURE** Bkr 1-20204, PRZR HEATER TRANSFORMER 1A3, control switch indicates green flag.

B. **CLOSE** Bkr 1-20204, PRZR HEATER TRANSFORMER 1A3.

5. IF Bkr 1-20403, PRZR HEATER TRANSFORMER 1B3, is OPEN, AND both of the following conditions are met:

- Vital 4160 V bus 1B3 is energized
- SIAS B is RESET

THEN **PERFORM** the following:

A. **ENSURE** Bkr 1-20403, PRZR HEATER TRANSFORMER 1B3, control switch indicates green flag.

B. **CLOSE** Bkr 1-20403, PRZR HEATER TRANSFORMER 1B3.

6. IF EDG is powering vital bus(es), THEN **PERFORM** the following:

A. **VERIFY** there is adequate EDG capacity for heaters selected to be energized on that bus.

B. **RESET** only selected heaters by placing heater control switch(es) to RESET and to AUTO or ON.

ATTACHMENT 5
Recovering Power to Pressurizer Heaters
(Page 3 of 3)

7. IF vital 4160 VAC bus 1A3 is energized from offsite power, THEN **RESET** the following Pressurizer heaters by placing heater control switches to RESET/OFF (OFF for proportional heaters) and to AUTO or ON:

- P-1 PROPNL HEATER BANK
- B-1 BACKUP HEATER BANK
- B-2 BACKUP HEATER BANK
- B-3 BACKUP HEATER BANK

8. IF vital 4160 VAC bus 1B3 is energized from offsite power, THEN **RESET** the following Pressurizer heaters by placing heater control switches to RESET/OFF (OFF for proportional heaters) and to AUTO or ON:

- P-2 PROPNL HEATER BANK
- B-4 BACKUP HEATER BANK
- B-5 BACKUP HEATER BANK
- B-6 BACKUP HEATER BANK

9. IF LOW LEVEL CUTOUT switch selects only one Pressurizer level control channel AND both level control channels available, THEN **PLACE** LOW LEVEL CUTOUT switch in BOTH.

ORIGINAL QUESTION FROM 2017 NRC

88.

010 A2.01 Pressurizer Pressure Control / Ability to (a) predict the impacts of the following malfunctions or operations on the PZR PCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Heater Failures

Given the following conditions:

- Unit 2 is at 100% power
- Pressurizer Level Control is selected to Channel ñÝò
- Pressurizer Backup Heaters B1 are out of service due to a breaker failure

Subsequently:

- Pressurizer Level Transmitter, LT-1100Y fails LOW
- 2-AOP-01.10, Pressurizer Pressure and Level, Att. 5, Recovering Power to Pressurizer Heaters has been completed

Which ONE of the following describes the heaters that can be recovered and the applicable Tech Spec requirements?

Based on the given conditions ____(1)____ can be recovered. Tech Spec 3.4.3, Pressurizer, Action (b) ____(2)____ required to be entered.

(REFERENCE PROVIDED)

A.	(1)	B2 and B3 heaters ONLY
	(2)	is
B.	(1)	B2 and B3 heaters ONLY
	(2)	is NOT
C.	(1)	B2, B3, B4, B5 and B6 heaters
	(2)	is
D.	(1)	B2, B3, B4, B5 and B6 heaters
	(2)	is NOT

ORIGINAL QUESTION FROM 2017 NRC

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	On Unit 2 you can only recover the B2 and B3 heaters because the systems design with both the B2 and B3 heaters not having a 1E power supply. Only the B1 and B4 backup heaters are class 1E powered. With the initial conditions of B1 out of service and B4 unrecoverable TS 3.4.3, Action b is required to be entered. This is SRO because the applicant is required to apply the TS below the line actions.
B.	Incorrect:	Part 1 is correct on Unit 2 you can only recover the B2 and B3 heaters because the systems design. Only the B1 and B4 backup heaters are class 1E powered. Part 2 is plausible because of a Unit 2 design difference with Unit 1 with all Pressurizer Heaters having a 1E power supply. If the applicant believes that the B2 and B3 have a 1E power supply action b would not be required to be entered.
C.	Incorrect:	Part 1 is incorrect but plausible because on Unit 1 you can recover the B2, B3, B4, B5 and B6 heaters because the systems design. All backup heaters are class 1E powered. Part 2 is correct.
D.	Incorrect:	Part 1 is incorrect but plausible because on Unit 1 you can recover the B2, B3, B4, B5 and B6 heaters because the systems design. Part 2 is plausible because of a Unit 2 design difference with Unit 1 with all Pressurizer Heaters having a 1E power supply. If the applicant believes that the B2 and B3 have a 1E power supply action b would not be required to be entered.

ORIGINAL QUESTION FROM 2017 NRC

Question Number: 88

Tier: 2 Group: 1

K/A: 010 A2.01 Pressurizer Pressure Control / Ability to (a) predict the impacts of the following malfunctions or operations on the PZR PCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Heater Failures

Importance Rating: 3.3 3.6

10 CFR Part 55: (CFR 43.5)

10CFR55.43.b: 10CFR55.43.b(5)

K/A Match: K/A is matched because the applicant is required predict the impact of the malfunction and the TS implications.

Technical Reference: TS 3.4.3, Page 3/4 4-9

Proposed references to be provided: TS 3.4.3, Page 3/4 4-9

Learning Objective:

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: New question for the 2017 NRC SRO Exam

Comments:

83. 032 G2.1.27 Loss of Source Range NI / Knowledge of system purpose and or function

Given the following conditions:

- Unit 2 is shutdown performing a cooldown in accordance with 2-GOP-305, Reactor Plant Cooldown - Hot Standby to Cold Shutdown
- RCS Temperature is 320 ÁF
- 2B1 and 2B2 RCPs are in operation
- 1 ADV on each S/G is in operation
- 2A and 2B Charging Pumps are running

Subsequently:

- Annunciator L-31, Boron Concentration LOW Channel 1 is LIT

Which ONE of the following completes the statements below?

The Source Range NI has failed ____(1)____.

Given that ONLY 1 Source NI has failed, in accordance with UFSAR, 13.7.2.4, Backup Boron Dilution Detection Sampling, the US ____(2)____ required to direct chemistry to sample the RCS for boron concentration.

A.	(1)	LOW
	(2)	is
B.	(1)	LOW
	(2)	is NOT
C.	(1)	HIGH
	(2)	is
D.	(1)	HIGH
	(2)	is NOT

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: It is plausible that the applicant doesn't understand how the Source Range NI failure will affect the BDAS Alarm. If it were to fail LOW, the BDAS would not function due to low counts. Part 2 correct: See analysis C
B.	Incorrect:	Part 1 incorrect: See analysis A Part 2 incorrect: It is plausible that the applicant would think that 2 SRNIs are required prior to requiring sampling. Unit 2 allows for using the other detectors in place of the failed detector.
C.	Correct:	Part 1 correct: The Source Range NI failure will have an effect on the BDAS Alarm. If it were to fail HIGH, the BDAS alarm would be LIT due to the appearance of High Counts. Part 2 correct: The UFSAR states that should one or both of the automatic boron dilution alarms become inoperable; the RCS must be sampled within 30 minutes. Unit 2 is in mode 4 with RCPs operating. The 2A and 2B Charging Pumps are operating and the 2C Charging Pump is operable.
D.	Incorrect:	Part 1 correct: See analysis C Part 2 incorrect: See analysis B

Question Number: 83

Tier: 1 Group: 2

K/A: 032 G2.1.27 Loss of Source Range NI / Knowledge of system purpose and or function

Importance Rating: 3.9 4.0

10 CFR Part 55: (CFR 41.7)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know knowledge of system purpose of SRNI Losses and UFSAR basis

Technical Reference: UFSAR 13.7.2.4; 2-ARP-L-31; REACTOR PLANT COOLDOWN - HOT STANDBY TO COLD SHUTDOWN

Proposed references to be provided: NONE

Learning Objective: PSL OPS 0702403-10

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

TABLE 1.2

OPERATIONAL MODES

	OPERATIONAL MODE	REACTIVITY CONDITION, K_{eff}	% OF RATED THERMAL POWER*	AVERAGE COOLANT TEMPERATURE
1.	POWER OPERATION	$\geq$ 0.99	> 5%	$\geq$ 325°F
2.	STARTUP	$\geq$ 0.99	$\leq$ 5%	$\geq$ 325°F
3.	HOT STANDBY	< 0.99	0	$\geq$ 325°F
4.	HOT SHUTDOWN	< 0.99	0	325°F > T_{avg} > 200°F
5.	COLD SHUTDOWN	< 0.99	0	$\leq$ 200°F
6.	REFUELING**	$\leq$ 0.95	0	$\leq$ 140°F

* Excluding decay heat.

** Fuel in the reactor vessel with the vessel head closure bolts less than fully tensioned or with the head removed.

CAUSES: Any of the following:
- Actual plant conditions
- A failed Linear Range Nuclear Instrument.

BORON CONCENTRATION LOW CHANNEL 1

L-31

DEVICE: Boron Dilution Calculator

SETPOINT: Variable

LOCATION: RTGB-204

ALARM CONFIRMATION

1. JR-64-1, Start up/Power Range Control, indicates counts are rising.
2. Start up Nuclear Instruments, at the RRS, indicate counts are rising.
3. JI-001A thru JI-001D, Wide Range % Power, indicate counts rising.
4. JR-001A thru JR-001D, Wide Range % Power, indicate counts rising.
5. Audio Count Rate, if selected to channel #A, indicates rising counts.

NOTE

- BDAS alarm error codes are as follows:
  E.01 Boron Dilution Event
  E.02 Computer Board Malfunction
  E.03 Computer Board Malfunction
- This alarm is expected during reactor startup and RCS dilutions in preparation for plant startup

OPERATOR ACTIONS

1. **MONITOR** JR-64-1, Recorder For Startup/Power Range Control, for rising counts and trend rate.
2. **PERFORM** a Channel Check with Channel 2 Boron Dilution system to Validate alarm.
3. **DETERMINE** if changing count rate is due to in-progress plant evolutions.
4. IF the alarm is **NOT** valid, THEN **IMPLEMENT** 2-AOP-02.01, Boron Concentration Control System (BCCS) Abnormal Operations.
5. If alarm is **NOT** due to in-progress plant evolutions, THEN **STOP** all positive reactivity additions.
6. IF monitor failure is indicated, THEN **NOTIFY** I&C to investigate.
7. **GO TO** 2-AOP-01.07, Recovery From Dilution of RCS Loops.

REFERENCES:
1. CWD 2998-B-327 SH 64, 55, 57, 60
2. VTM 2998-16185

If sensors are replaced with types not previously evaluated, then response time testing (RTT) for the new sensor must either be performed and the appropriate changes made to plant procedures, or an additional request for RTT elimination must be submitted and approved. If, however, the replacement sensor is one for which RTT elimination has been approved, then FPL may modify the plant procedures, using an allocated response time based upon a vendor-supplied response time value, or upon statistical analysis of historical data for that transmitter type and model.

13.7.2.3 Flood Protection

Plant operating restrictions associated with the flood protection were removed from the facility Technical Specifications by License Amendment #82 and NRC Safety Evaluation Report issued April 11, 1996.

The beach dunes, old beach road, and mangrove swamp provide additional assurance that safety-related structures are adequately protected during design basis flooding events.

13.7.2.3.1 Surveillance Requirements

A visual inspection shall be conducted by a qualified engineer after every hurricane and at a minimum a visual inspection every 5 years if there has been no hurricane in that period. If the visual inspection finds the beach dune and the old beach road to have been breached, the inspection will be expanded to include an evaluation of the mangrove swamp and SR-A1A embankment adjacent to the site. If the expanded visual inspection finds significant erosion requiring repair of the SR-A1A roadbed or embankment, then FPL will consider the effects of the storm damage as part of the hurricane recovery activities.

13.7.2.4 Backup Boron Dilution Detection Sampling

Should one or both of the automatic boron dilution alarms become inoperable, Table 13.7.2-3 provides the requirements for sampling frequencies to ensure that sufficient time is available to the operators, from the detection of dilution until criticality, to mitigate the consequences of any boron dilution event.

13.7.2.5 ESF Pump Acceptance Criteria and Test Methods

The performance criteria values and test procedural details for Surveillance Requirements (SR) 4.1.2.5, "Boric Acid Makeup Pumps - Shutdown," 4.1.2.6, "Boric Acid Makeup Pumps - Operating," 4.5.2.g, "ECCS Subsystems - Operating," and 4.6.2.1.b, "Containment Spray and Cooling Systems," were removed from the facility Technical Specifications (TS) by License Amendment No. 136 and NRC Safety Evaluation Report issued October 6, 2004. The License Amendment and SER also completely deleted SR 4.5.2.i from TS.

13.7.2.5.1 Surveillance Requirements 4.1.2.5, "Boric Acid Makeup Pumps - Shutdown" and 4.1.2.6, "Boric Acid Makeup Pumps - Operating"

The boric acid makeup pump(s) required by LCOs 3.1.2.5 and 3.1.2.6 shall be demonstrated OPERABLE by verifying, that on recirculation flow, the pump develops a discharge pressure of greater than or equal to 90 psig when tested pursuant to the Inservice Testing Program.

Table 13.7.2-3

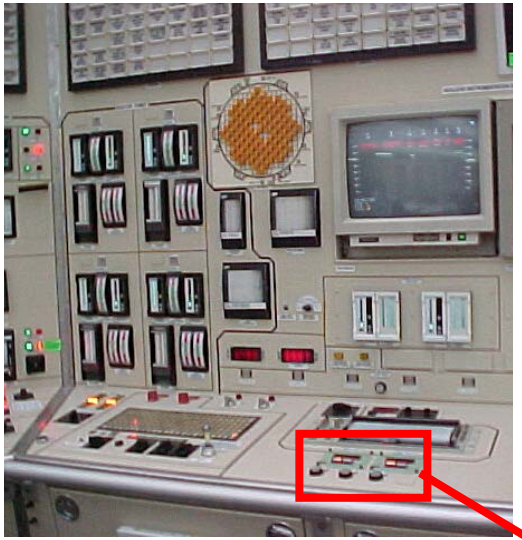
MONITORING FREQUENCIES FOR BACKUP BORON DILUTION DETECTION

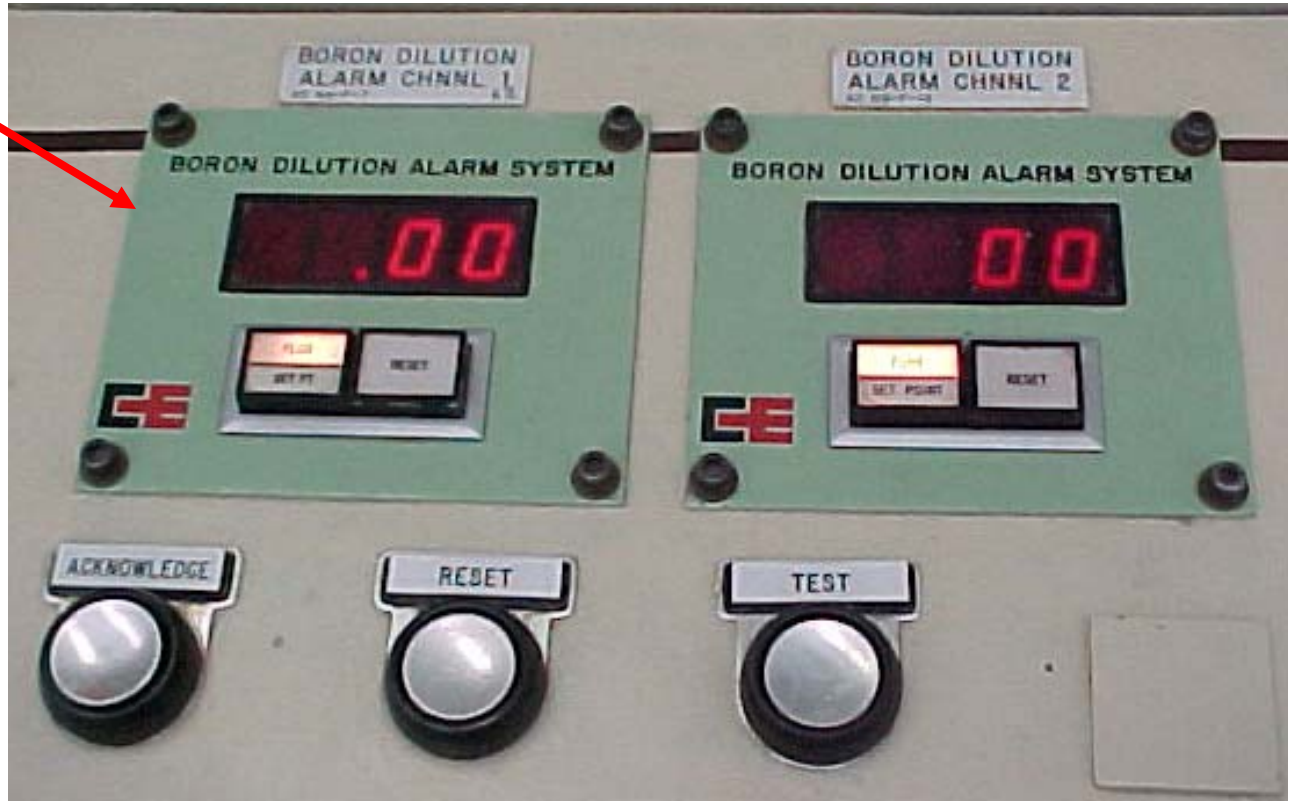
	NUMBER OF OPERABLE CHARGING PUMPS*			
MODE	0	1	2	3
3	12 hr	100 min	40 min	25 min
4 (At least 1 RCP)	12 hr	130 min	50 min	30 min
4 (No RCPs)	12 hr	75 min	35 min	30 min
5	8 hr	30 min	30 min	30 min
5 (RCS Level below hot leg centerline)	8 hr	30 min	Operation Not Allowed**	Operation Not Allowed**
6	24 hr	75 min	40 min	30 min

* Charging pump OPERABILITY for any period of time shall constitute OPERABILITY for the entire monitoring frequency.

** In MODE 5 with the RCS level below the hot leg centerline, at least two charging pumps shall be verified to be inoperable by racking out their motor circuit breaker.

U2: Boron Dilution Alarm System



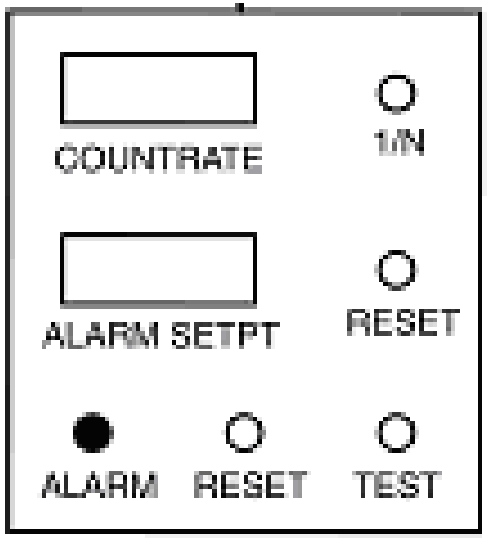


Input: BF_3 Log
SU Proportional
Counter

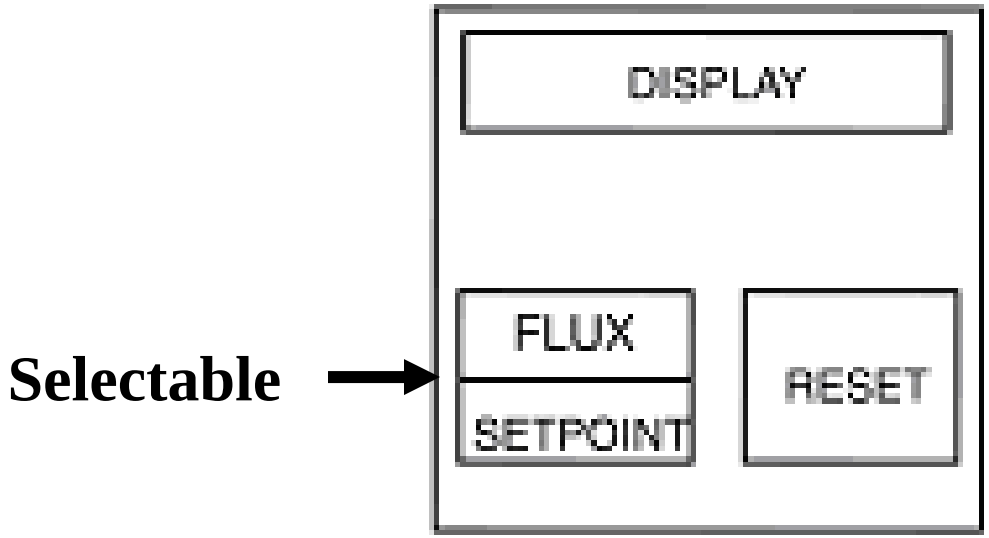
U1 vs. U2 Boron Dilution Alarm System

- Protects against inadvertent dilution accident
- UFSAR but not T.S.
- Unit 1 used Excore APP-R detector
- Unit 2 Uses BF_3 SU detector
- Alarms if current cps reading reaches adjustable alarm setpoint

Unit 1



Unit 2



Unit 2 BF_3 Instrument Failures

EO-6, 8

Failed High:

ÅPossible total loss due to HV cutout.
ÅPossible Boron dilution alarm (BDAS) alarm on high cps.
ÅPossible High audio counts if selected during startups.

Failed Low:

ÅLoss of Boron dilution alarm (BDAS) alarm on that channel

ÅLoss of Audio Counts if selected during startups

84. 036 AA2.01 Fuel Handling Accident / Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: ARM system indications

Given the following conditions:

- Fuel Handling Radiation Monitors indicate on the RMCS:

SA		SB	
GAG-007	DRK BLUE	GAG-008	GREEN
GAG-009	DRK BLUE	GAG-010	GREEN
GAG-011	GREEN	GAG-012	GREEN

Subsequently:

- A Unit 2 spent fuel assembly has been dropped in the Fuel Handling Building

SA		SB	
GAG-007	DRK BLUE	GAG-008	RED
GAG-009	DRK BLUE	GAG-010	YELLOW
GAG-011	RED	GAG-012	RED

Which ONE of the following completes the statements below?

In accordance with TS 3.3.3.1, Radiation Monitoring Instrumentation, the MINIMUM number of OPERABLE Fuel Storage Pool Area Monitors ____(1)____ MET.

After the fuel assembly drops, the Spent Fuel Pool exhaust transfers to ____(2)____ train(s) of the Shield Building Ventilation System.

(REFERENCE PROVIDED)

A.	(1)	is
	(2)	BOTH
B.	(1)	is
	(2)	ONLY ONE
C.	(1)	is NOT
	(2)	BOTH
D.	(1)	is NOT
	(2)	ONLY ONE

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 is correct: Per the table 4 channels of Fuel Storage Pool Area Monitors are required to be operable. The 2 Monitors that are Dark Blue are inoperable. Part 2 is correct: Fuel Handling System Ventilation and its automatic alignment changes are a unique difference than ALL other station coincidence circuits. This systemõs difference is ï if 2/3 coincidence is met on EITHER radiation monitor train, BOTH trains of Shield Building Ventilation is started and aligned to the FHB ventilation system. There are 6 radiation monitors that make up both the ñAòTrain and the ñBòTrain. When 2 of 3 radiation monitors go into high alarm (as indicated by a RED alarm on RMCS (or at the RM-23) auto action impacting BOTH trains is initiated regardless of the status of the other rad monitoring train. RMCS color indications reflect the severity of the detected condition. When YELLOW, the rad monitor is in ALERT status. When RED, the rad monitor is in HIGH alarm with resulting automatic actuations occurring when this is met. Per the stem, on Train B will actuate due to 2/3 rad monitors indicating HIGH alarm ï therefore system actuation with Train A indicating only high alarm on one channel ï therefore no system actuation being driven from this train. This is specific to Unit 2 ONLY. See highlighted attached training materials and references.
B.	Incorrect:	Part 1 is correct: Per the table 4 channels of Fuel Storage Pool Area Monitors are required to be operable. The 2 Monitors that are Dark Blue are inoperable. Part 2 is incorrect. Incorrect but plausible. If this system operated similar to other RPS, ESFAS systems, automatic action would be train specific, therefore ONLY train ñBòSBVS would start and be aligned to the Fuel Handling Building Ventilation system.
C.	Incorrect:	Part 1 is incorrect but plausible if the applicant believes that the minimum operable channels is 2 per train for a total of 4. This is how it is applied to RPS and ESFAS Part 2 is correct see explanation B.
D.	Incorrect:	Part 1 is incorrect see Explanation C Part 2 is incorrect. see Explanation B

Question Number: 84

Tier: 1 Group: 2

K/A: 036 AA2.01 Fuel Handling Accident / Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: ARM system indications

Importance Rating: 3.2 3.9

10 CFR Part 55: (CFR 43.5 / 45.6)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to determine Fuel Handling incidents utilizing ARM indications

Technical Reference: TS 3.3.3.1
0711601 Auxiliary Building Ventilation Systems Text,
0711411 U2 RMS Text, 2-ONP-26.02 ONP Area Radiation Monitors , Containment Systems DBD

Proposed references to be provided: TS 3.3.3.1 and Table 3.3-6

Learning Objective: PSL-0702602-41, 0702601-12 & 13

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	X
Bank	

Question History: Modified from 2017 NRC RO Exam #24

Comments: Modified by changing the initial status of the ARMs and adding the SRO component regarding minimum operability requirements.

INSTRUMENTATION

3/4.3.3 MONITORING INSTRUMENTATION

RADIATION MONITORING INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.3.1 The radiation monitoring instrumentation channels shown in Table 3.3-6 shall be OPERABLE with their alarm/trip setpoints within the specified limits.

APPLICABILITY: As shown in Table 3.3-6.

ACTION:

a. With a radiation monitoring channel alarm/trip setpoint exceeding the value shown in Table 3.3-6, adjust the setpoint to within the limit within 4 hours or declare the channel inoperable.

b. With one or more radiation monitoring channels inoperable, take the ACTION shown in Table 3.3-6.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.1 Each radiation monitoring instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations in accordance with the Surveillance Frequency Control Program.

4.3.3.2 In accordance with the Surveillance Frequency Control Program, each Control Room Isolation radiation monitoring instrumentation channel shall be demonstrated OPERABLE by verifying that the response time of the channel is within limits.

TABLE 3.3-6

RADIATION MONITORING INSTRUMENTATION

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ALARM/TRIP SETPOINT	MEASUREMENT RANGE	ACTION
1.	AREA MONITORS					
	a. Fuel Storage Pool Area					
	i. Criticality and Ventilation System Isolation Monitor	4	*	≤ 20 mR/hr	10^{-1} ï 10^{4} mR/hr	22
	b. Containment Isolation	3	****	≤ 90 mR/hr	1 ï 10^{7} mR/hr	25
	c. Containment Area ï Hi Range	1	1, 2, 3 & 4	Not Applicable	1 - 10^{7} R/hr	27
	d. Control Room Isolation	1 per intake	ALL MODES	≤ 320 cpm	10^{-7}ï 10^{-2} µCi/cc	26
2.	PROCESS MONITORS					
	a. Containment					
	i. Gaseous Activity RCS Leakage Detection	1	1, 2, 3 & 4	Not Applicable	10^{-7} ï 10^{-2} µCi/cc	23
	ii. Particulate Activity RCS Leakage Detection	1	1, 2, 3 & 4	Not Applicable	10 ï 10^{7} cpm	23

* With fuel in the storage pool or building.
**** During movement of recently irradiated fuel assemblies within containment.

3/4.3.3 MONITORING INSTRUMENTATION

RADIATION MONITORING INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.3.1 The radiation monitoring instrumentation channels shown in Table 3.3-6 shall be OPERABLE with their alarm/trip setpoints within the specified limits.

APPLICABILITY: As shown in Table 3.3-6.

ACTION:

a. With a radiation monitoring channel alarm/trip setpoint exceeding the value shown in Table 3.3-6, adjust the setpoint to within the limit within 4 hours or declare the channel inoperable.

b. With one or more radiation monitoring channels inoperable, take the ACTION shown in Table 3.3-6.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.1 Each radiation monitoring instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations in accordance with the Surveillance Frequency Control Program.

4.3.3.2 In accordance with the Surveillance Frequency Control Program, each Control Room Isolation radiation monitoring instrumentation channel shall be demonstrated OPERABLE by verifying that the response time of the channel is within limits.

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	b. Containment Isolation	3	****	≤ 90 mR/hr	1 ï 10^{7} mR/hr	25
	c. Containment Area ï Hi Range	1	1, 2, 3 & 4	Not Applicable	1 - 10^{7} R/hr	27
	d. Control Room Isolation	1 per intake	ALL MODES	≤ 320 cpm	10^{-7}ï 10^{-2} µCi/cc	26
2.	PROCESS MONITORS					
	a. Containment					
	i. Gaseous Activity RCS Leakage Detection	1	1, 2, 3 & 4	Not Applicable	10^{-7} ï 10^{-2} µCi/cc	23
	ii. Particulate Activity RCS Leakage Detection	1	1, 2, 3 & 4	Not Applicable	10 ï 10^{7} cpm	23

* With fuel in the storage pool or building.
**** During movement of recently irradiated fuel assemblies within containment.

ATTACHMENT 6
RMCS Alarm Status Summary
(Page 1 of 2)

NOTE

Alarm priority by color ranked from highest to lowest:

1. Blink / Red
2. Blink / Yellow
3. Solid Magenta
4. Blink / Dark Blue
5. Blink / Light Blue
6. Solid / Dark Blue
7. Solid / Red
8. Solid / Yellow
9. Solid / Light Blue
10. Solid / White
11. Solid / Gray
12. Blink / Half Intensity Light Blue
13. Solid / Green

ALARM DESCRIPTION	COLOR	STATUS INDICATOR
MONITOR LINE STATUS		
Monitor Offline/ Not Being Polled	WHITE	IOF
ALARMS DISABLED		
RM-80 (RM-23P) Disable Alarming	GRAY	DSAB
Disabled Alarming (Still polling, alarms hidden)	GRAY	DSAB
RMCS COMMUNICATIONS		
Channel Not Responding to Poll	MAGENTA	COMM
Monitor Communications Failure	MAGENTA	COMM
System Login Attempts Exceeds Maximum	MAGENTA	COMM
CHANNEL HIGH ALARM		
Channel in High Alarm	RED	HI
CHANNEL ALERT ALARM		
Channel in Alert Alarm	YELLOW	
SYSTEM FAILURE		
Monitor Status Unknown	DARK BLUE	DEV
Channel Out Of Service	DARK BLUE	DEV
Monitor Loss Of Sample Flow	DARK BLUE	DEV
Channel Filter Not Moving	DARK BLUE	DEV
No Pulses Received On Channel	DARK BLUE	DEV
Checksource Test Failed	DARK BLUE	DEV
Checksource Test Failed Assc Channel	DARK BLUE	DEV
No Pulses Received By Assc Channel	DARK BLUE	DEV
EQUIPMENT FAILURE		
Monitor Loss of Process Flow	LIGHT BLUE	CFN
Monitor in Scan Overload	LIGHT BLUE	CFN
Channel Filter Clogged	LIGHT BLUE	CFN
Channel Excessive Negative Deltas	LIGHT BLUE	CFN
Monitor Loss of Flow Control	LIGHT BLUE	CFN
Monitor Loss of Isokinetic Control	LIGHT BLUE	CFN
Monitor Loss of RM-23 Communications	LIGHT BLUE	CFN
Monitor Instrument Failure	LIGHT BLUE	CFN
Monitor Low Vacuum Alarm	LIGHT BLUE	CFN
Monitor High Vacuum Alarm	LIGHT BLUE	CFN

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.4 Fuel Handling Building Radiation Monitor Alarm

NOTE

- The Spent Fuel Pool Radiation Monitor System consists of 6 radiation monitor inputs, divided into 2 groups, SA and SB. Instrumentation is shown in Table 3.
- 2 out of 3 HIGH Alarms on Train A or 2 out of 3 HIGH Alarms on Train B will initiate FHB ventilation transfer to Shield Building Ventilation System (SBVS) on both trains.

Table 3

Channel	Monitor			Recorder
Monitor SA	RC-26-7	RC-26-9	RC-26-11	RR-26-1 (Channels 17,18,19)
RMCS SA	GAG-007	GAG-009	GAG-011	
Monitor SB	RC-26-8	RC-26-10	RC-26-12	RR-26-2 (Channels 17,18,19)
RMCS SB	GAG-008	GAG-010	GAG-012	

☐ **1.** **VERIFY** only one FHB monitor is alarmed.

1.1 **GO TO** Section 4.2.4, Step 4.

2. IF greater than one FHB monitor exhibits UNEXPECTED rising radiation levels challenging HIGH ALARM setpoints,
THEN **PERFORM** the following:

A. **SUSPEND** any fuel movement or Independent Spent Fuel Storage Installation (ISFSI) cask loading or unloading operations in progress.

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2.4 Fuel Handling Building Radiation Monitor Alarm (continued)

☐ **4.** IF more than one HIGH alarm in a train actuated,
THEN **ENSURE** FHB ventilation transfer to SBVS as follows:

NOTE

Contingency actions are performed at HVAC Panel or locally as conditions allow.

A. **ENSURE** the following fans, STOPPED:

- HVS-6, FUEL POOL SUPPLY FAN
- HVS-7, FUEL HANDLING BLDG SUPPLY FAN
- HVE-15, FUEL HANDLING BLDG EXHAUST FAN
- HVE-16A, FUEL POOL EXHAUST FAN
- HVE-16B, FUEL POOL EXHAUST FAN
- HVE-17, FUEL BLDG H&V ROOM EXHAUST FAN (FHB/52/FH6/E-RAC)

A.1 **STOP** any running fan.

ATTACHMENT 1
RMCS Alarm Status Summary
(Page 1 of 2)

NOTE

Alarm priority by color ranked from highest to lowest:

1. Blink / Red
2. Blink / Yellow
3. Solid Magenta
4. Blink / Dark Blue
5. Blink / Light Blue
6. Solid / Dark Blue
7. Solid / Red
8. Solid / Yellow
9. Solid / Light Blue
10. Solid / White
11. Solid / Gray
12. Blink / Half Intensity Light Blue
13. Solid / Green

ALARM DESCRIPTION	COLOR	STATUS INDICATOR
MONITOR LINE STATUS		
Monitor Offline/ Not Being Polled	WHITE	IOF
ALARMS DISABLED		
RM-80 (RM-23P) Disable Alarming	GRAY	DSAB
Disabled Alarming (Still polling, alarms hidden)	GRAY	DSAB
RMCS COMMUNICATIONS		
Channel Not Responding to Poll	MAGENTA	COMM
Monitor Communications Failure	MAGENTA	COMM
System Login Attempts Exceeds Maximum	MAGENTA	COMM
CHANNEL HIGH ALARM		
Channel in High Alarm	RED	HI
CHANNEL ALERT ALARM		
Channel in Alert Alarm	YELLOW	
SYSTEM FAILURE		
Monitor Status Unknown	DARK BLUE	DEV
Channel Out Of Service	DARK BLUE	DEV
Monitor Loss Of Sample Flow	DARK BLUE	DEV
Channel Filter Not Moving	DARK BLUE	DEV
No Pulses Received On Channel	DARK BLUE	DEV
Checksource Test Failed	DARK BLUE	DEV
Checksource Test Failed Assc Channel	DARK BLUE	DEV
No Pulses Received By Assc Channel	DARK BLUE	DEV
EQUIPMENT FAILURE		
Monitor Loss of Process Flow	LIGHT BLUE	CFN
Monitor in Scan Overload	LIGHT BLUE	CFN
Channel Filter Clogged	LIGHT BLUE	CFN
Channel Excessive Negative Deltas	LIGHT BLUE	CFN
Monitor Loss of Flow Control	LIGHT BLUE	CFN
Monitor Loss of Isokinetic Control	LIGHT BLUE	CFN
Monitor Loss of RM-23 Communications	LIGHT BLUE	CFN
Monitor Instrument Failure	LIGHT BLUE	CFN
Monitor Low Vacuum Alarm	LIGHT BLUE	CFN
Monitor High Vacuum Alarm	LIGHT BLUE	CFN

ATTACHMENT 1
RMCS Alarm Status Summary
(Page 2 of 2)

MONITOR FUNCTIONS		
Channel Checksource	HALF INTENSITY	MCAV
Monitor Purging	HALF INTENSITY LIGHT BLUE	MCAV
Channel Filter Advancing	HALF INTENSITY LIGHT BLUE	MCAV
NORMAL OPERATIONS		
Normal Operating Condition	GREEN	OK

- Control Room Outside Air Intake Radiation Monitors – Four monitoring stations

Containment Isolation Actuation Signal (CIAS) Radiation Monitors (RIM-26-3, 4, 5,& 6)

Four (4) Containment Isolation Actuation Signal (CIAS) Radiation Monitor detectors are spaced 90 degrees apart in containment and provide continuous radiation monitoring. Their associated RM-80s are located in the RAB.

Unlike most radiation monitors, the CIAS monitors have not only RMCS high and alert alarms, but they also have separate alarms (and actions) based on 1) their ESFAS bistable and 2) their RTGB-206 OTEK bistable. If two of the four CIAS monitors reach their preset high alarm setpoint (the ESFAS bistable setpoint), they will initiate a Containment Isolation Actuation Signal (CIAS). Each monitoring station uses a gamma sensitive IC detector. One out of four detectors in pretrip (Alert) (on the OTEKs on RTGB-206) will actuate the containment evacuation alarm and the CNTMT RAD HIGH CIS CHANNEL PRE TRIP annunciator (P-15). Each CIAS RM is powered from an instrument power supply.

The setpoints are ≤ 10R/hr in Modes 1-3 and ≤ 90 mR/hr in Mode 6 (if the ESFAS bistables are set as if moving recently irradiated fuel). RMCS designates these monitors as GAG-001, 002, 003, & 004. The CIAS monitors are required by plant Technical Specifications 3.3.2, 3.3.3.1, & 3.9.9 and are used in EPIP-01 for classifications of emergencies. These monitors are powered by 120VAC instrument buses MA, MB, MC, & MD and as such will be available post loss of offsite power (LOOP).

Spent Fuel Pool Monitors (RIM-26-7, 8, 9, 10, 11, &12)

The Spent Fuel Pool Monitors use GM detectors to indicate problems around the Spent Fuel Pool. They are grouped into 2 groups, group SA 7, 9, & 11and group SB 8,10, & 12, each having 3 channels. Refer to the Functional Diagram (Figure 4) for the arrangement. Redundant logic assemblies provide alarm output signals when either of the two circuits (groups) have high radiation alarm signals. Two out of three channels (in the same group) alarming will initiate a FHB and Fuel ventilation transfer to the Shield Building Ventilation System (SBVS). By starting the SBV fans and stopping the FHB exhaust fan This action “scrubs” the spent fuel pool exhaust through the SBVS HEPA and Charcoal Filters prior to discharge to the atmosphere. The ventilation component actuation sequence is discussed in the RAB Ventilation Lesson Text 0711601. The setpoint for alarm and actuation is ≤ 15mR/hr. RMCS designates these

SIMPLIFIED FUNCTIONAL DIAGRAM FOR SPENT FUEL POOL 2 OF 3 LOGIC ASSEMBLIES

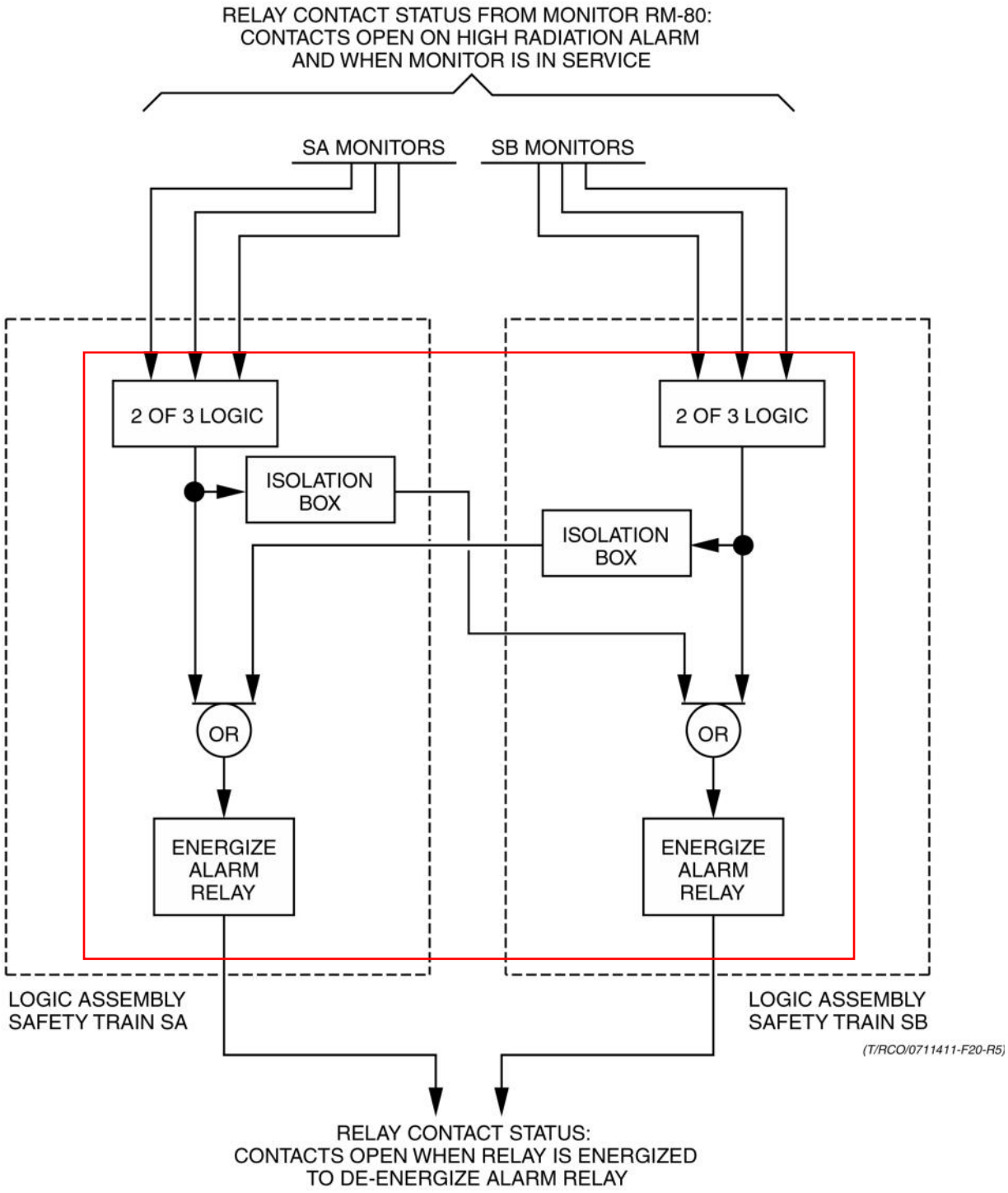


Figure 4

The outside air makeup line motor-operated valve is opened automatically when the annulus differential pressure reaches negative one-inch water gauge. A check valve in the cooling line is designed to open at negative one-inch water gauge to provide vacuum control in the system and to allow outside air to cool the filters.

During normal plant operation, both systems are de-energized and the annulus is maintained at atmospheric pressure. In the event of a LOCA, both systems will be energized automatically by the Containment Isolation Signal (CIS) [Containment Isolation Actuation Signal (CIAS)]. Both systems will remain in operation until shutdown by the operator. At this time, one system is left energized and the other system is placed in standby.

The hydrogen purge system can be manually aligned to the shield building ventilation system to make use of the SBVS filters to reduce the activity of the gas (air) being exhausted from the containment by the purge system.

Shield Building Exhaust Fans, HVE-6A and HVE-6B

The shield building exhaust fans are 480 VAC, 60 hp, centrifugal fans. They are rated for a flow rate of 6,000 cfm against a 21" static water pressure. They are powered from 480 VAC emergency motor control centers 1A6 and 1B6 [2A6 and 2B6], respectively.

The shield building exhaust fans are normally controlled from RTGB 106 [HVCB] by STOP/START spring return to neutral switches. The exhaust fans are also provided with local STOP/START pushbuttons and NORMAL/ISOLATE switches at their respective motor control center. If the motor control center switch is in ISOLATE, only local starting is available. Red-run and green-stop indication for each exhaust fan is located above the respective control switch on RTGB 106 [HVCB].

Both exhaust fans are automatically started on a CIS [CIAS or on a high radiation condition in the Fuel Handling Building.]. Additionally, if one fan is running, the standby fan will automatically start on a low flow of 1500 cfm, as sensed by FS-25-15B for fan A and FS-25-15A for fan B.

Outside Air Valves, FCV-25-11 and FCV-25-12

Motor-operated flow control valves FCV-25-11 and 12 are designed to provide outside cooling air to the SBVS filters after operation of the system has evacuated the annulus. The Outside Air Valves also assist in control of Fuel Handling Building pressure when the Fuel Handling Building Ventilation System is aligned to the Shield Building Ventilation System. The valves are controlled from RTGB 106 [HVCB] by AUTO/OVERRIDE switches. In AUTO, the valves will open at an annulus to outside differential pressure of negative one inch water gauge as sensed by PDS-25-7A and B. While the Fuel Handling Building Ventilation System is aligned to the Shield Building Ventilation System, the outside air valves will open at a negative two inches of water gauge between the Fuel Handling Building and atmosphere. The valves are also interlocked with their associated exhaust fan; the valve will not open unless the fan is running. The SHIELD BUILDING VENT CHANNEL A (B) FCV-25-11 (12) MOTOR OVERLOAD alarms to warn of the loss of the outside air valves due to overload. Red-open and green-closed indication for each valve is provided on RTGB 106 [HVCB].

Unit 2 Differences

Several differences exist between the SBVS for Unit 1 and Unit 2. The SBVS for Unit 2 is shown on Figure 24 and the differences described in the following paragraphs.

Unit 2 has a Fuel Handling Building (FHB) emergency ventilation connection to the SBVS through motor-operated FCV-25-30 and FCV-25-31. These valves are controlled from the HVCB with CLOSE/AUTO/OPEN switches. In AUTO, the valves will automatically open on a high radiation signal in the FHB. Upon receipt of a CIAS, the valves will automatically close. When the operator resets the CIAS to allow realignment of other systems following a SIAS, the possibility exists that the FHB ventilation system may realign to SBVS, blocking SBVS evacuation. Extremely high containment radiation levels could cause this realignment to occur after CIAS is reset.

Additionally, the operator is directed to reset the Fuel Pool Hi-Radiation monitors on the HVCB before resetting CIAS. Valve position indication is provided on the HVCB.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	036AA1.02	
	Importance Rating	3.1	

Fuel Handling Accident: ARM system

Proposed Question: RO 22

On Unit 2 a spent fuel bundle has been dropped while being transported across the Spent Fuel Pool by the Spent Fuel Handling Machine. The status of the Fuel Handling Radiation Monitors as indicated on PC-11 are:

SA		SB	
GAG-007	Red	GAG-008	Red
GAG-009	Amber	GAG-010	Amber
GAG-011	Amber	GAG-012	Red

If at the same time Unit 2 dropped their fuel assembly and had a spurious CIAS actuation and has NOT been reset, which ONE of the following correctly describes the status of the Fuel Handling Building Ventilation System?

A. It remains in its normal configuration.

B. Normal ventilation isolates but Spent Fuel Pool exhaust does NOT transfer to the Shield Building Ventilation exhaust system.

C. Normal ventilation isolates and Spent Fuel Pool exhaust transfers to BOTH trains of the Shield Building Ventilation exhaust system.

D. Normal ventilation isolates and Spent Fuel Pool exhaust transfers to ONLY one train of the Shield Building Ventilation exhaust system.

Proposed Answer: B

Explanation (Optional):

A. Incorrect, Could be chosen if student forgets high alarms meeting the 2/3 logic for channel B.

B. correct. The 2/3 logic is met on train B by two detectors in high as indicated by the Red status on GAG-008. CIAS on Unit 2 to prevent lineup to the SBVS. Normal FHB Vent will isolate when either train of radiation monitors go into 2/3 logic as indicated by two B

C. Incorrect. The 2/3 logic is met on train B by two detectors in high as indicated by the Red status on GAG-008. Either of the two trains with 2/3 logic isolates the normal ventilation flowpath, and then aligns it to the SBVS exhaust units provided Unit 2 does not have a CIAS actuation signal present. Since there was a CIAS actuation ONLY the normal ventilation flowpath was isolated.

D. Incorrect. Could be chosen if either student does not recall or mixes up the channel logic with the train specific logic used with the Control Room Radiation Monitors and does not recall the affect a CIAS will have on the lineup to SBV.

Technical Reference(s): 0711601 Auxiliary Building Ventilation Systems Text, 0711411 U2 RMS Text, 2-ONP-26.02 ONP Area Radiation Monitors , Containment Systems DBD (Attach if not previously provided)

Proposed references to be provided to applicants during examination: _____

Learning Objective: PSL-0702602-41, 0702601-12 & 13 (As available)

Question Source: Bank # 2095

Modified Bank # _____ (Note changes or attach parent)

New _____

Question History: Last NRC Exam _____

Question Cognitive Level: Memory or Fundamental Knowledge _____

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 _____

55.43 _____

Comments:

Examination Outline Cross-reference: Level RO SRO

Tier # 1 _____

ORIGINAL QUESTION FROM 2017 NRC RO

24. 061AA1.01 Ability to operate and / or monitor the following as they apply to the Area Radiation Monitoring (ARM) System Alarms: ARM System Alarms: Automatic actuation

Given the following conditions:

- A Unit 2 spent fuel assembly has been dropped in the Fuel Handling Building
- Fuel Handling Radiation Monitors indicate on the RMCS:

	SA		SB
GAG-007	RED	GAG-008	RED
GAG-009	YELLOW	GAG-010	YELLOW
GAG-011	YELLOW	GAG-012	RED

Which ONE of the following describes the status of the Fuel Handling Building Ventilation System?

The Fuel Handling Building Normal ventilation _____.

A.	remains in its normal configuration
B.	ISOLATES, but the Spent Fuel Pool exhaust does NOT transfer to the Shield Building Ventilation System
C.	ISOLATES, and the Spent Fuel Pool exhaust transfers to BOTH trains of the Shield Building Ventilation System
D.	ISOLATES, and the Spent Fuel Pool exhaust transfers to ONLY one train of the Shield Building Ventilation System

ORIGINAL QUESTION FROM 2017 NRC RO

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Incorrect but plausible. If spent fuel pool radiation alarms occurred on Unit 1, there is NO automatic realignment; ventilation would remain in its normal configuration. This is a Unit difference. Additionally, the applicant must understand the color representation to be able to determine if the automatic realignment threshold is met.
B.	Incorrect:	Incorrect but plausible. If there was a concurrent CIAS signal present on Unit 2, the SBVS starting and alignment to the FHB ventilation would be overridden with the SBVS being aligned to the shield building annulus only.
C.	Correct:	Fuel Handling System Ventilation and its automatic alignment changes are a unique difference than ALL other station coincidence circuits. This system's difference is – if 2/3 coincidence is met on EITHER radiation monitor train, BOTH trains of Shield Building Ventilation is started and aligned to the FHB ventilation system. There are 6 radiation monitors that make up both the "A" Train and the "B" Train. When 2 of 3 radiation monitors go into high alarm (as indicated by a RED alarm on RMCS (or at the RM-23) auto action impacting BOTH trains is initiated regardless of the status of the other rad monitoring train. RMCS color indications reflect the severity of the detected condition. When YELLOW, the rad monitor is in ALERT status. When RED, the rad monitor is in HIGH alarm with resulting automatic actuations occurring when this is met. Per the stem, on Train B will actuate due to 2/3 rad monitors indicating HIGH alarm – therefore system actuation with Train A indicating only high alarm on one channel – therefore no system actuation being driven from this train. This is specific to Unit 2 ONLY. See highlighted attached training materials and references.
D.	Incorrect:	Incorrect but plausible. If this system operated similar to other RPS, ESFAS systems, automatic action would be train specific, therefore ONLY train "B" SBVS would start and be aligned to the Fuel Handling Building Ventilation system.

ORIGINAL QUESTION FROM 2017 NRC RO

Question Number: 24

Tier: 1 Group: 2

K/A: 061AA1.01 Ability to operate and / or monitor the following as they apply to the Area Radiation Monitoring (ARM) System Alarms: ARM System Alarms: Automatic actuation

Importance Rating: 3.6 3.6

10 CFR Part 55: (CFR 41.7)

10CFR55.43.b: Not applicable

K/A Match: K/A is matched because the applicant is required.

Technical Reference: 0711601 Auxiliary Building Ventilation Systems Text, 0711411 U2 RMS Text, 2-ONP-26.02 ONP Area Radiation Monitors , Containment Systems DBD

Proposed references to be provided: None

Learning Objective: PSL-0702602-41, 0702601-12 & 13

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	X
Bank	

Question History: Modified from 2009 NRC RO Exam #22

Comments: Modified by removing the spurious CIAS from the stem to make a different choice the correct answer.

85. A16 2.4.23 Excess RCS Leakage Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.

Given the following conditions:

- Unit 1 is experiencing a LOCA
- 1-EOP-03, LOCA is in progress
- The following parameters are observed

Time	0045	0100	0115
CET	430 °F	445 °F	446 °F
RCS Pressure	550 psia	550 psia	550 psia
Pzr Level	0%	0%	0%
ECCS Flow	500 gpm	350 gpm	340 gpm
Containment Temp	174 °F	176 °F	178 °F

Which ONE of the following completes the statement below?

In accordance with ADM-11.16, Transient Procedure Use and Adherence, at time ___(1)____ the crew MUST exit 1-EOP-03 and implement 1-EOP-15, Functional Recovery, Success Path ____(2)____.

REFERENCE PROVIDED

A.	(1)	0100
	(2)	IC-2 – Inventory Control
B.	(1)	0100
	(2)	PC-3 - Saturated Pressure Control
C.	(1)	0115
	(2)	IC-2 – Inventory Control
D.	(1)	0115
	(2)	PC-3 - Saturated Pressure Control

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is incorrect but plausible. The applicant may think that they may have to transition to EOP-15 once the safety function is not met such as with the E plan that if the EC doesn't anticipate recovering the safety function within 15 minutes the Emergency Declaration should be made and not wait for the 15 minutes to elapse . Part 2 is correct – see analysis "C".
B.	Incorrect:	Part 1 correct – see Analysis "A". Part 2 is incorrect but plausible since PC-3 is not met but it is lower in the hierarchy than IC-2, the applicant may not recognize that IC-2 is higher than PC-3l.
C.	Correct:	Part 1 correct: See explanation below Part 2 correct: See explanation below At time 0045, you are meeting both Figure 1A and Figure 2. Figure 2 is met by single train only, but that is acceptable. IAW ADM-11.16: Recovering Safety Functions (1) If the safety function status check acceptance criteria is NOT met for a particular safety function, the operator should immediately report this to the Unit Supervisor, then the operating crew should take appropriate contingency actions necessary to restore the safety function. If the safety function can NOT be restored within 15 minutes or there is no procedural success path, the EOP in use is NOT working. The operating crew should then re-diagnose the event and exit to the appropriate optimal EOP or the Functional Recovery Procedure (EOP-15). Per 1-EOP-15, the hierarchy is Inventory Control prior to Pressure Control. Neither safety function is met (due to ECCS flow, and Figure 1A is not met) 1-EOP-03, RCS Inventory Control Safety Function is not met due to not meeting figure 2. RCS Pressure Control is not met due to not meeting Figure 1A. Transition to 1-EOP-15 is required.
D.	Incorrect:	Part 1 correct: See analysis C. Part 2 incorrect See analysis B.

Question Number: 85

Tier: 1 Group: 2

K/A: A16 2.4.23 Excess RCS Leakage Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.

Importance Rating: 3.4 4.4

10 CFR Part 55: (CFR 41.10 / 43.5 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know the bases for performing safety function in the Functional Recovery Procedure.

Technical Reference: 1-EOP-03, 1-EOP-99, ADM-11.16

Proposed references to be provided: Redacted 1-EOP-99, Fig 1A/1B and Fig 2

Learning Objective: PSL OPS 0702828-4

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

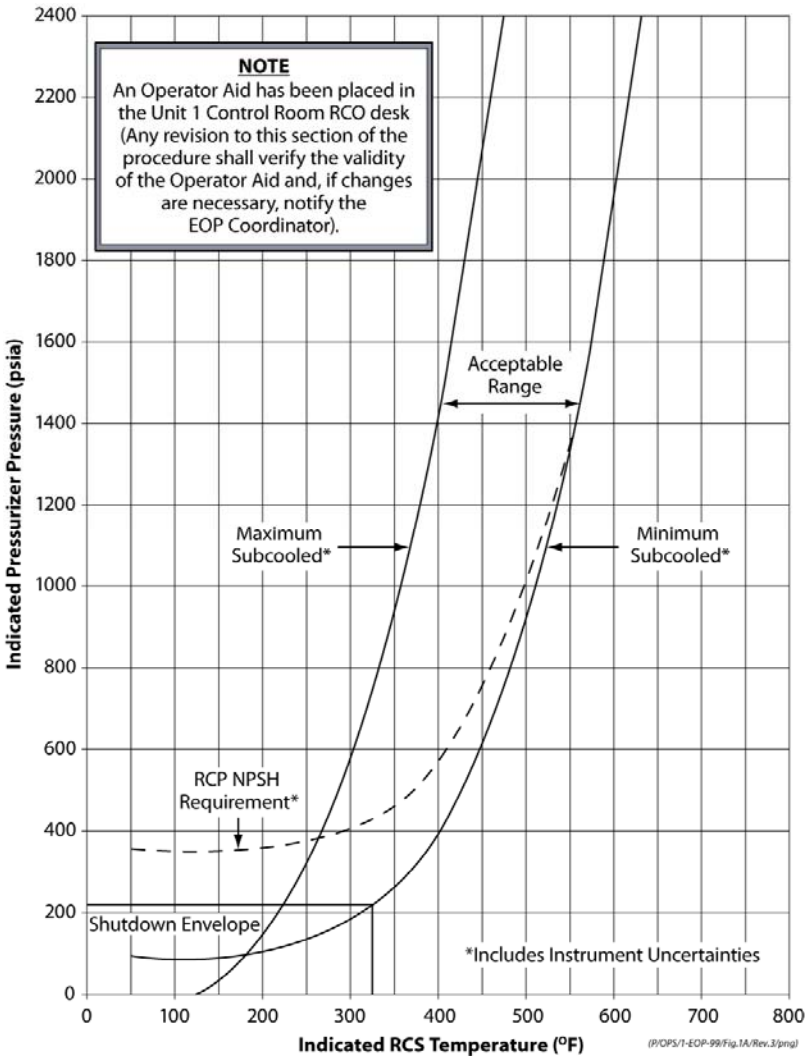
Question History: New question for the 2019 NRC Exam

Comments:

FIGURE 1A
RCS PRESSURE TEMPERATURE
(Page 1 of 1)

[redacted]

CAUTION
The RCP NPSH curve assumes one pump is operating in each loop. RCP instrumentation should be monitored for seal and pump performance in accordance with 1-EOP-99, Table 13.



RCS Pressure Range	Required QSPDS Subcooled Margin Reading (Rep CET)
2250 psia to 1000 psia	40 to 180°F
1000 psia to 500 psia	50 to 170°F
Less than 500 psia	80 to 160°F

FIGURE 1B
RCS PRESSURE TEMPERATURE
(Page 1 of 1)

[redacted]

CAUTION
The RCP NPSH curve assumes one pump is operating in each loop. RCP instrumentation should be monitored for seal and pump performance in accordance with 1-EOP-99, Table 13.

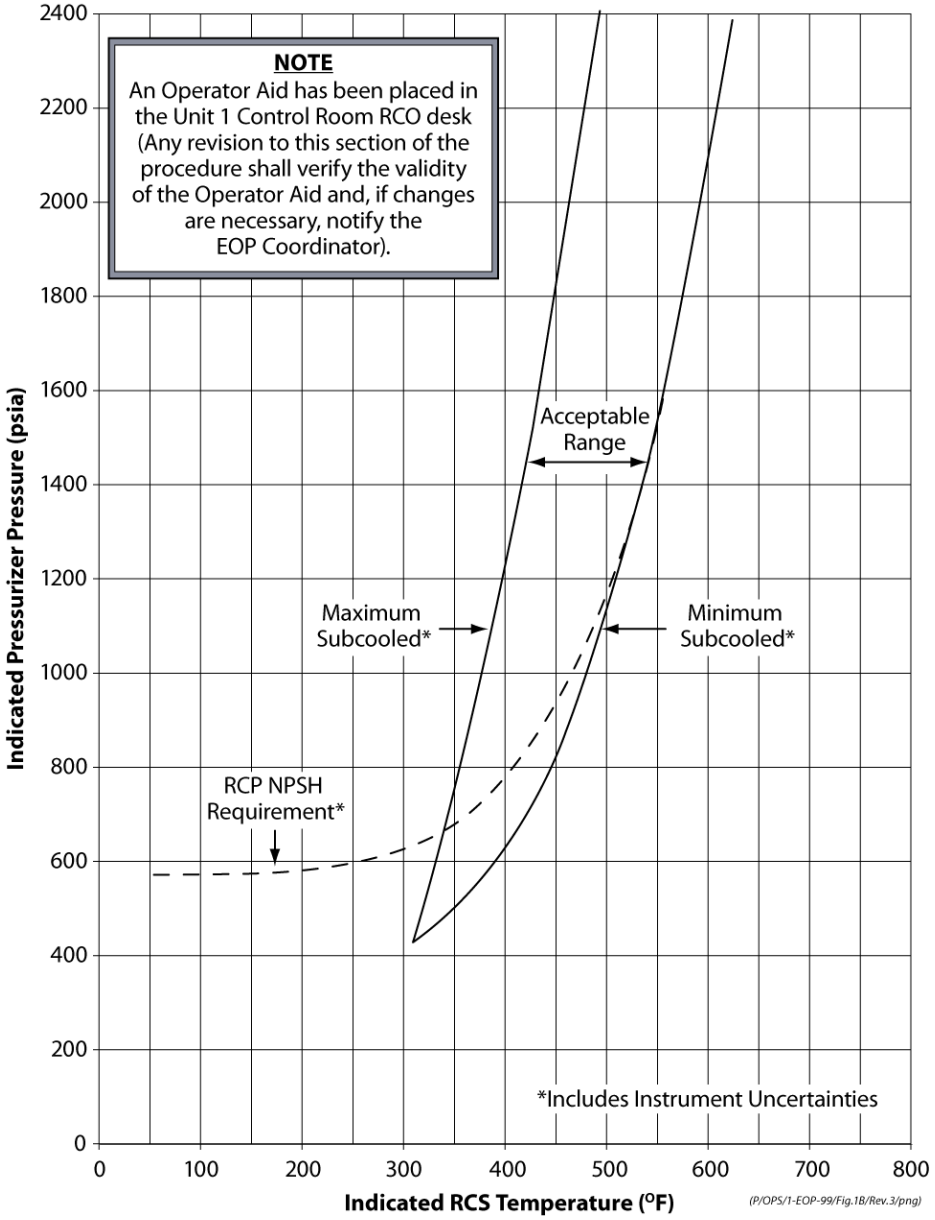
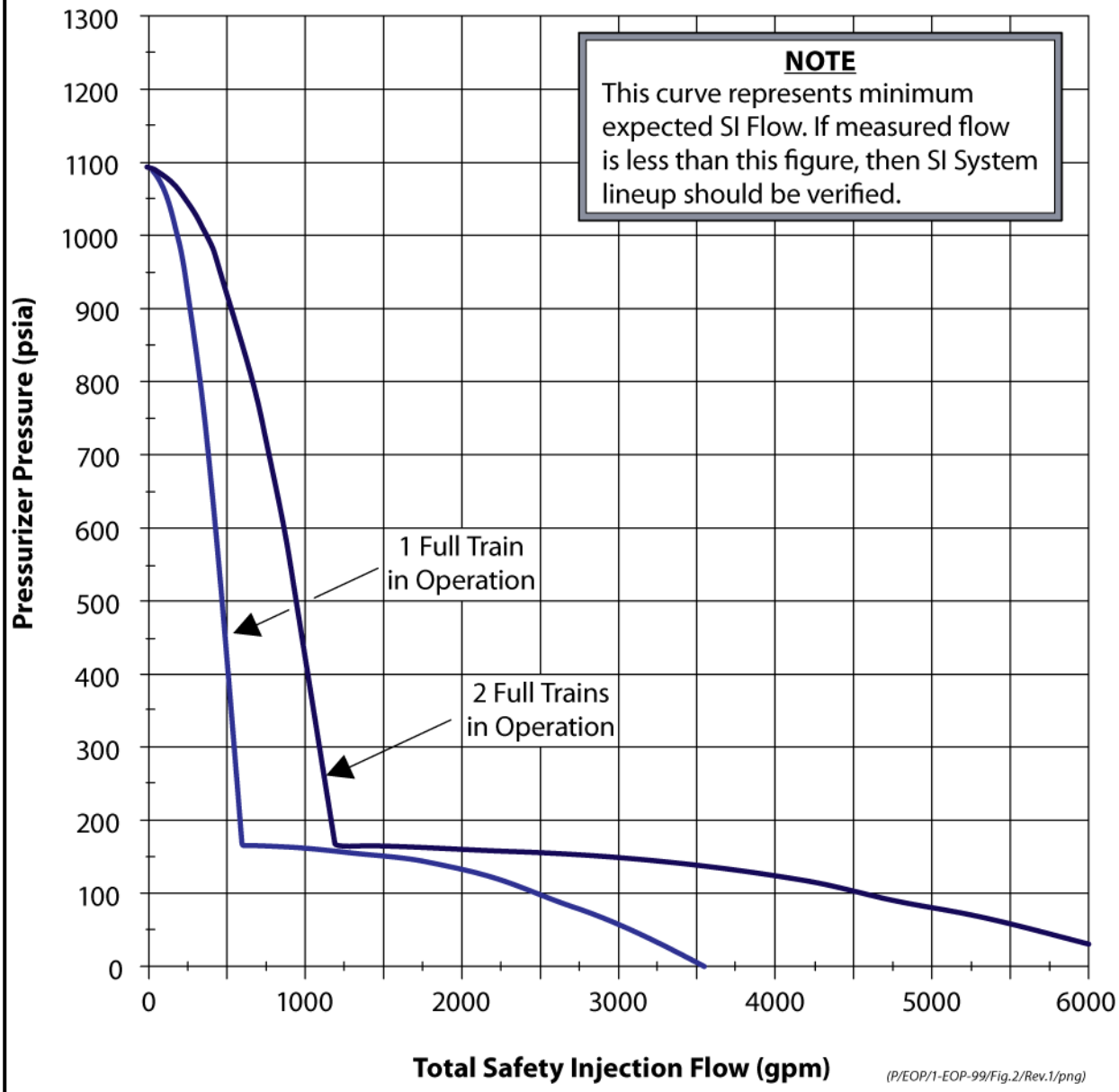


FIGURE 2
SAFETY INJECTION FLOW VS. RCS PRESSURE
(Page 1 of 1)



4.3 EOP Use and Adherence (continued)

1. (continued)

F. Recovering Safety Functions

(1) If the safety function status check acceptance criteria is **NOT** met for a particular safety function, the operator should immediately report this to the Unit Supervisor, then the operating crew should take appropriate contingency actions necessary to restore the safety function. If the safety function can **NOT** be restored within 15 minutes or there is no procedural success path, the EOP in use is **NOT** working. The operating crew should then re-diagnose the event and exit to the appropriate optimal EOP or the Functional Recovery Procedure (EOP-15).

(2) Safety functions not being met may be classifiable if not recovered promptly. Safety functions are not evaluated as being met or not met while in EOP-01 but are rather assessed and addressed as part of the diagnosis process. Once the crew transitions out of EOP-01 and into an optimal or functional recovery EOP, then safety functions do apply. As soon as indications are available in the control room that a classifiable safety function (i.e. RCS heat removal, core heat removal, etc.) is not met, then the time clock for classification begins. The 15 minutes in the guidance box in the safety function row of the fission product barrier table is provided to allow restoration of recoverable casualties (i.e. loss of all AFW, ECCS flow less than figure 2) and to preclude unnecessary classifications when the condition may be promptly corrected. However, if the classifiable safety function cannot be restored in 15 minutes, and EOP-15 is in use at the end of the 15 minute period, then classification of the safety function based EAL would be required. No additional time is allowed for assessment in this instance. Whether the 15 minutes recovery time in response to a specific failure is taken in an optimal procedure or the functional recovery procedure is irrelevant. There is not an additional 15 minutes allowed in EOP-15 if 15 minutes were taken in an optimal EOP to recover a classifiable safety function.

4.3 EOP Use and Adherence (continued)

1. F. (continued)

(3) The EOP-06, RCS heat removal safety function with both S/Gs less than 15% wide range level (which requires immediate initiation of once through cooling) is NOT a recoverable safety function and so the 15 minute allowance in the guidance box does NOT apply. When once through cooling (OTC) criteria is met, the remaining S/G inventory is expended (all available ADVs/SBCS valves opened) to allow successful once through cooling implementation. After once through cooling (OTC) is established, EOP-06 directs transition to EOP-15. Therefore, the crew should declare a site area emergency per FS1 based on potential loss of the RCS and clad barriers within 15 minutes of not meeting the EOP-06 RCS heat removal safety function. Once in EOP-15, if OTC is successful, the HR-3 once through cooling safety function would be met which would allow a subsequent downgrade of the emergency to an alert (loss of the RCS barrier due to PORVs open causing RCS subcooling loss) by the Recovery Manager.

G. Implementation Guidelines for EOPs

(1) RCO:

a. Following implementation of EOP-01, the Board RCO should perform required actions in the vicinity of RTGB 105[205] to the AFW station on RTGB 102[202].

b. Following implementation of EOP-01, the Desk RCO should perform required actions at RTGB 101[201], 106[206], and the plant auxiliary panels and control boards.

c. There may be some instances where the above guidelines are too restrictive and one or the other operator will be required to go outside of his / her designated area to perform actions or evaluate parameters.

4.0 OPERATOR INITIAL ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
* **11. Perform Success Path Instructions** PERFORM **ALL** the following **IN THE ORDER LISTED:** **A.** Instructions for a success path **MOST LIKELY** to be met for safety functions that are NOT met by **ANY** success path. **B.** Instructions for success paths for safety functions that are NOT met by Success Path 1. **C.** Instructions for **ALL** other success paths for safety functions met by Success Path 1.	
* **12. Perform Long Term Actions** When **ALL** Safety Function Status Check acceptance criteria are being satisfied, Then PERFORM Long Term Actions. **REFER TO** Section 4.9, Long Term Actions.	

END OF INITIAL ACTIONS

ATTACHMENT 3
FUNCTIONAL RECOVERY SUCCESS PATHS
(Page 1 of 1)

Safety Functions	Success Paths	Checkoffs					
		1	2	3	4	5	6
Reactivity Control	RC-1, CEA Insertion						
	RC-2, Boration via CVCS						
	RC-3, Boration via SIAS						
Maint of Vital Aux - DC	MVA-DC-1, Batteries/Chargers						
Maint of Vital Aux - AC	MVA-AC-1, Startup Transformers						
	MVA-AC-2, EDGs						
	MVA-AC-3, Unit Crosstie						
RCS Inventory Control	IC-1, CVCS						
	IC-2, Safety Injection						
RCS Pressure Control	PC-1, Subcooled Control						
	PC-2, PORVs/Pzr Vent						
	PC-3, Saturated Control						
RCS & Core Heat	HR-1, S/G Without SIAS						
	HR-2, S/G With SIAS						
	HR-3, Once Through Cooling						
Containment Isol	CI-1, Automatic/Manual Isol						
Cntmt Press & Temp	CTPC-1, Normal Cntmt Fans						
	CTPC-2, Cntmt Fan Coolers						
	CTCP-3, Cntmt Spray						

END OF ATTACHMENT 3

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 6 of 15)

3. RCS INVENTORY CONTROL — CVCS, IC-1

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
Pressurizer Level	At least 30%	
		AND
RCS Subcooling	Greater than or equal to minimum subcooling	
		AND
Reactor Vessel Level	Hot legs covered (sensors 4 through 8 covered)	
		OR
	Less than 20°F difference between T_{HOT} and Representative CET temperature	

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 7 of 15)

3. RCS INVENTORY CONTROL — SIAS, IC-2

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
Reactor Vessel Level	Core covered (sensors 7 and 8 covered)	
	OR	
Rep CET	Not superheated by more than 22°F	
	AND	
HPSI Throttling Criteria NOT Met:		
Charging Pumps	**ALL** available running (Unless post RAS)	
	AND	
Safety Injection Flow	In accordance with Figure 2, Safety Injection Flow vs. RCS Pressure	
	OR	
	RAS with at least **ONE** HPSI Pump running	

END OF SAFETY FUNCTION 3

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 8 of 15)

4. RCS PRESSURE CONTROL

Subcooled Pressure Control, PC-1

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
RCS pressure	Within limits of Figure 1A or 1B, RCS Pressure Temperature	☐

PORVs/Pzr Vents, PC-2

RCS pressure	Within limits of Figure 1A or 1B, RCS Pressure Temperature	☐

Saturated Pressure Control, PC-3

Charging Pumps	**ALL** available running (Unless post RAS)	☐
	AND	
Safety Injection Flow	In accordance with Figure 2, Safety Injection Flow vs. RCS Pressure	☐
	OR	
	RAS with at least **ONE** HPSI Pump running	☐

END OF SAFETY FUNCTION 4

Implementation Strategy

Step 11: *Perform Success Path Instructions

PERFORM **ALL** the following **IN THE ORDER LISTED**:

A. Instructions for a success path **MOST LIKELY** to be met for safety functions that are NOT met by **ANY** success path.

B. Instructions for success paths for safety functions that are NOT met by Success Path 1.

C. Instructions for **ALL** other success paths for safety functions met by Success Path 1.

Step 12: *Perform Long Term Actions

When **ALL** Safety Function Status Check acceptance criteria are being satisfied, Then PERFORM Long Term Actions..

ATTACHMENT 3
FUNCTIONAL RECOVERY SUCCESS PATHS

(Page 1 of 1)

Safety Functions	Success Paths	Checkoffs					
		1	2	3	4	5	6
Reactivity Control	RC-1, CEA Insertion						
	RC-2, Boration via CVCS						
	RC-3, Boration via SIAS						
Maint of Vital Aux - DC	MVA-DC-1, Batteries/Chargers						
Maint of Vital Aux - AC	MVA-AC-1, Startup Transformers						
	MVA-AC-2, EDGs						
	MVA-AC-3, Unit Crosstie						
RCS Inventory Control	IC-1, CVCS						
	IC-2, Safety Injection						
RCS Pressure Control	PC-1, Subcooled Control						
	PC-2, PORVs/Pzr Vent						
	PC-3, Saturated Control						
RCS & Core Heat	HR-1, S/G Without SIAS						
	HR-2, S/G With SIAS						
	HR-3, Once Through Cooling						
Containment Isol	CI-1, Automatic/Manual Isol						
Cntmt Press & Temp	CTPC-1, Normal Cntmt Fans						
	CTPC-2, Cntmt Fan Coolers						
	CTCP-3, Cntmt Spray						

86. 012 A2.05 Reactor Protection System / 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

Given the following conditions:

- Unit 2 is at 100% power
- RPS Channel “MA” Linear Range Nuclear Instrument has Failed High

Which ONE of the following describes the RPS Bistables that have tripped and the required actions in accordance with 2-AOP-99.01, Loss of Tech Spec Instrumentation?

Bistables HI POWER, (and) LOC PWR DEN ____(1)____have tripped.

Azimuthal Power Tilt per TS 3.2.4, Azimuthal Power Tilt - Tq ____(2)____ required to be determined at least once per 12 hours.

A.	(1)	ONLY
	(2)	is
B.	(1)	ONLY
	(2)	is NOT
C.	(1)	and TM/LO PRESS
	(2)	is
D.	(1)	and TM/LO PRESS
	(2)	is NOT

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is incorrect. It is plausible that the applicant incorrectly thinks that only the Pressure input affects the tripping of the TM/LP bistable (the Linear Range NI) provides a penalty factor for the TM/LP pressure setpoint. Part 2 is correct. With a linear range channel failure, per both TS 3.2.4 and 2-AOP-99.01, Tq is required to be determined every 12 hours.
B.	Incorrect:	Part 1 is incorrect. See explanation A Part 2 is incorrect . With a linear range channel failure, per both TS 3.2.4 and 2-AOP-99.01, Tq is required to be determined every 12 hours.
C.	Correct:	Part 1 is correct. Pressure input affects the tripping of the TM/LP bistable (the Linear Range NI) provides a penalty factor for the TM/LP pressure setpoint. Part 2 is correct. With a linear range channel failure, per both TS 3.2.4 and 2-AOP-99.01, Tq is required to be determined every 12 hours.
D.	Incorrect:	Part 1 is correct. See explanation C. Part 2 is incorrect. With a linear range channel failure, per both TS 3.2.4 and 2-AOP-99.01, Tq is required to be determined every 12 hours.

Question Number: 86

Tier: 2 Group: 1

K/A: 012 A2.05 Reactor Protection System / 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

Importance Rating: 3.1 3.2

10 CFR Part 55: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know the failed detector's impact on the RPS are and the TS implications.

Technical Reference: 2-AOP-99.01, Loss of TS Instrumentation
TS 3.2.4

Proposed references to be provided: None

Learning Objective: PSL OPS 0702403-6/8; 0702407-10

Cognitive Level:

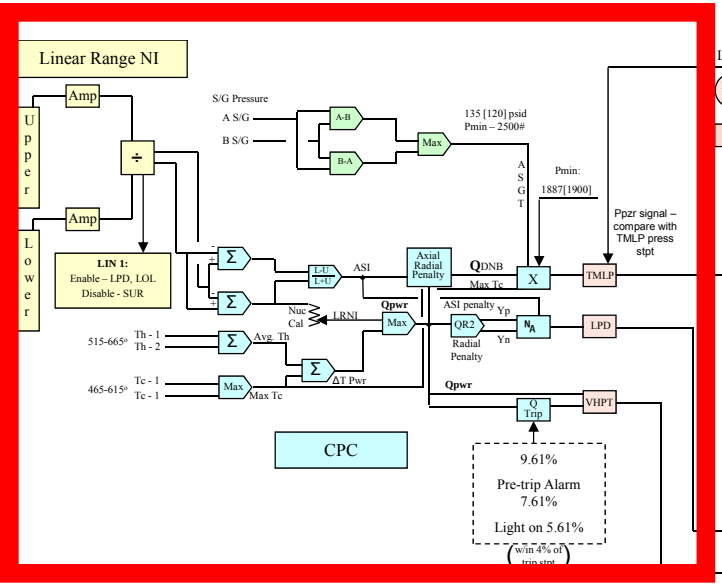
Higher	X
Lower	

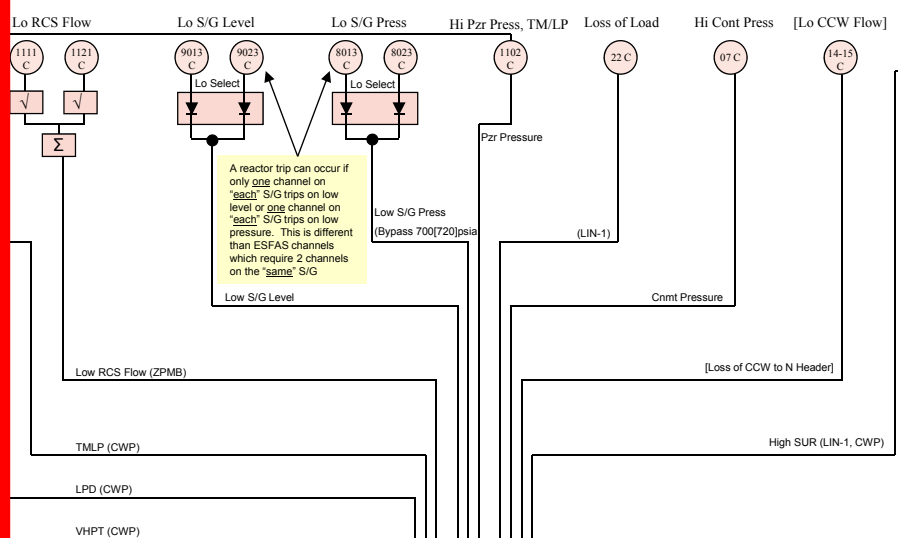
Question Source:

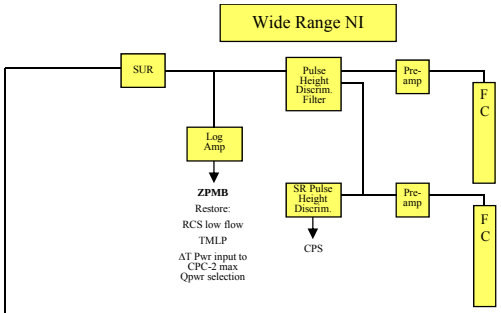
New	
Modified Bank	X
Bank	

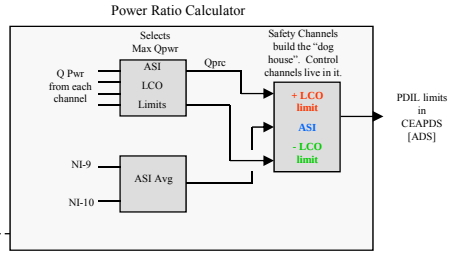
Question History: Significantly modified Bank question from 2017 NRC Exam #91 for the 2019 NRC Exam

Comments:

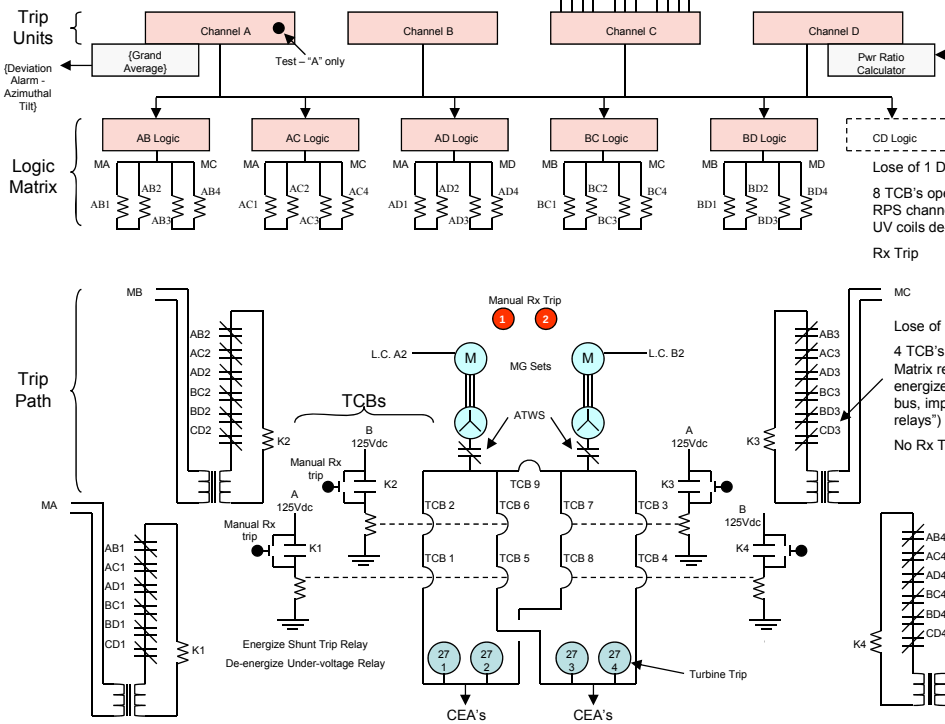


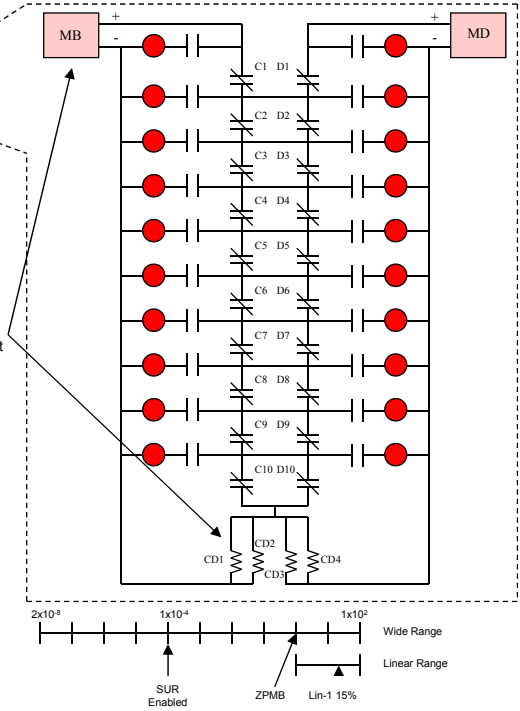






Parameter	Setpoint	Bases
Variable Hi Power	≥9.61% Min – 15% Max – 107%	DNBR
High SUR	2.49 dpm	Equipment Protection
Lo RCS Flow	95 [95.4]%	DNBR
Lo S/G Level	35[35]% NR	DNBR
Lo S/G Pressure	600[626] psia	Restart
Hi Pzr Pressure	2400 [2370] psia	RCS Pressure Safety Limit
TMLP --- (ASGT via TMLP)	1887[1900] psia or calculated --- 135[120]psid	DNBR --- Asymmetric temps causing radial peaking
Loss of Load	1000#	Equipment Protection
Hi Containment Pressure	3.3[3.0]#	Rx Trip concurrent with ESFAS
Local Power Density	21[22] Kw/ft	Fuel Centerline Melt
[Loss of CCW]	[1220 gpm] Ensures 636 gpm at RCP	Equipment Protection





G.T.

Rx Protection Interrelation Big Note – 8/10/11

$$ASI = \frac{L - U}{L + U}$$

What if Lower Detector Fails High?

$$ASI = \frac{\uparrow L - U}{\uparrow L + U} = +ASI$$

Example: Calculate ASI initial and final ASI values given the following:

Initial Upper Detector output = 46%

Initial Lower Detector output = 52%

Final Lower Detector output = 100%

$$ASI_{initial} = \frac{52 - 48}{52 + 48} = \frac{4}{100} = +.04$$

$$ASI_{final} = \frac{100 - 48}{100 + 48} = \frac{52}{148} = +.35$$

U1/2 Linear Power Range Safety Channel

EO-6,8

Instrument Failures : Upper Detector Fails High or Low

Linear Range Safety NI	HIGH on the Upper Detector	**VHP, TM/LP, LPD channel trips (RPS & CWP in 1/3 Logic)** **Loss of Load channel trip if EH trip header <1000psig** Hi SUR Rate channel trip disabled by Lin 1 PDIL alarm and CMI (if power $\geq 10^{-4}$%) Enables Loss of Load trip Unit1 ONLY: •HI & HI-HI deviation lights on failed channel •L20 Reactor Power Range Subchannel Deviation alarm
Linear Range Safety NI	LOW on the Upper Detector	**TM/LP & LPD channel trips trips (RPS & CWP in 1/3 Logic)** Disables Loss of Load channel trip (now 2/3 logic). Forces ΔT pwr to be Qpwr Hi select input (unless blocked). Unit1 ONLY: •HI & HI-HI deviation lights on failed channel •L20 Reactor Power Range Subchannel Deviation alarm

U1/2 Linear Power Range Safety Channel

EO-6,8

Instrument Failures : Lower Detector Fails High or Low

Linear Range Safety NI	HIGH on the lower Detector	**VHP, TM/LP, & LPD channel trips (RPS & CWP in 1/3 logic)** **Loss of Load channel trip if EH trip header <1000psig** Hi SUR Rate channel trip disabled by Lin 1 PDIL alarm and CMI (if power $\geq 10^{-4}$%) Enables Loss of Load trip Unit1 ONLY: •HI & HI-HI deviation lights on failed channel •L20 Reactor Power Range Subchannel Deviation alarm
Linear Range Safety NI	LOW on the lower Detector	**TM/LP & LPD channel trips** (RPS & CWP in 1/3 logic) Forces ΔT pwr to be Qpwr Hi select input (unless blocked). Unit1 ONLY: HI & HI-HI deviation lights on failed channel •L20 Reactor Power Range Subchannel Deviation alarm

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2.5 Nuclear Instrument Linear Range Safety Channel Failure (continued)

☐ **5.** IF power is greater than 75%, THEN **REQUEST** RE to determine Azimuthal Power Tilt at least once per 12 hours per TS 3.2.4, Azimuthal Power Tilt - Tq.

☐ **6.** **VERIFY** proper positive and negative ASI limits on JR-012.

6.1 **ENSURE** ASI is within limits of COLR Figure 3.2-4.

POWER DISTRIBUTION LIMITS

3/4.2.4 AZIMUTHAL POWER TILT – T_q

LIMITING CONDITION FOR OPERATION

3.2.4 The AZIMUTHAL POWER TILT (T_q) shall not exceed 0.03.

APPLICABILITY: MODE 1*.

ACTION:

a. With the indicated AZIMUTHAL POWER TILT determined to be > .030 but ≤ 0.10, either correct the power tilt within 2 hours or determine within the next 2 hours and at least once per subsequent 8 hours, that the TOTAL INTEGRATED RADIAL PEAKING FACTOR (F_r^T) is within the limits of Specification 3.2.3.

b. With the indicated AZIMUTHAL POWER TILT determined to be > 0.10, operation may proceed for up to 2 hours provided that the TOTAL INTEGRATED RADIAL PEAKING FACTOR (F_r^T) is within the limits of Specification 3.2.3. Subsequent operation for the purpose of measurement and to identify the cause of the tilt is allowable provided the THERMAL POWER level is restricted to ≤ 20% of the maximum allowable THERMAL POWER level for the existing Reactor Coolant Pump combination.

SURVEILLANCE REQUIREMENTS

4.2.4.1 The provisions of Specification 4.0.4 are not applicable.

4.2.4.2 The AZIMUTHAL POWER TILT shall be determined to be within the limit by:

a. Calculating the tilt in accordance with the Surveillance Frequency Control Program.

b. Using the incore detectors to determine the AZIMUTHAL POWER TILT at least once per 12 hours when one excore channel is inoperable and THERMAL POWER is > 75% of RATED THERMAL POWER.

* See Special Test Exception 3.10.2.

3/4.2 POWER DISTRIBUTION LIMITS

3/4 2.1 LINEAR HEAT RATE

LIMITING CONDITION FOR OPERATION

3.2.1 The linear heat rate shall not exceed the limits specified in the COLR.

APPLICABILITY: MODE 1.

ACTION:

With the linear heat rate exceeding its limits, as indicated by four or more coincident incore channels or by the AXIAL SHAPE INDEX outside of the power dependent control limits of COLR Figure 3.2-2, within 15 minutes initiate corrective action to reduce the linear heat rate to within the limits and either:

a. Restore the linear heat rate to within its limits within 1 hour, or

b. Be in at least HOT STANDBY within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.1.1 The provisions of Specification 4.0.4 are not applicable.

4.2.1.2 The linear heat rate shall be determined to be within its limits by continuously monitoring the core power distribution with either the excore detector monitoring system or with the incore detector monitoring system.

4.2.1.3 Excore Detector Monitoring System – The excore detector monitoring system may be used for monitoring the linear heat rate by:

a. Verifying in accordance with the Surveillance Frequency Control Program that the full-length CEAs are withdrawn to and maintained at or beyond the Long Term Steady State Insertion Limit of Specification 3.1.3.6.

b. Verifying in accordance with the Surveillance Frequency Control Program that the AXIAL SHAPE INDEX alarm setpoints are adjusted to within the limits shown on COLR Figure 3.2-2.

ATTACHMENT 3
Surveillances Performed Each Shift For MODES 1 and 2
(Page 4 of 19)

1.0 INSTRUCTIONS (continued)

7. IF the following conditions exist:

STA

- One excore linear range channel is inoperable,
- Power is greater than 75%,

THEN **PERFORM** the following:

- **DETERMINE** azimuthal power tilt once per 12 hours.
- **NOTIFY** Reactor Engineering.

Tech Spec: 4.2.4.2.b

Applicability: MODE 1.

Acceptance Criteria	Results (✓)
Performance is completed.	☐ SAT ☐ UNSAT ☐ N/A

ORIGINAL QUESTION FROM 2017 NRC

91.015G2.4.31 Nuclear Instrumentation System / Knowledge of annunciator alarms, indications, or response procedures

Given the following conditions:

- Unit 2 is at 100% power
- JI-006A, Axial Power Shape (ASI) indicates FULL Scale MAX Positive
- Beacon is in service with ALL In-Core detectors OPERABLE

The following Annunciators are LIT:

- L-9, Reactor Power High Channel Trip
- L-22, Local Power Density Channel Trip
- L-34, Nuclear/ΔT Power Channel Deviation
- L-36, TM/LP Channel Trip

Which ONE of the following completes the statements below?

The ____(1)____ detector has failed HIGH.

Azimuthal Power Tilt per TS 3.2.4, Azimuthal Power Tilt - Tq ____(2)____ required to be determined at least once per 12 hours.

A.	(1)	UPPER
	(2)	is
B.	(1)	UPPER
	(2)	is NOT
C.	(1)	LOWER
	(2)	is
D.	(1)	LOWER
	(2)	is NOT

ORIGINAL QUESTION FROM 2017 NRC

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is incorrect. Lower detector is failed high which makes it higher than the upper detector which results in a max positive indication on JI-006A. ASI is calculated by Lower Detector – Upper Detector. The applicant may believe the opposite is true. Part 2 is correct. With a linear range channel failure, per both TS 3.2.4 and 2-AOP-99.01, Tq is required to be determined every 12 hours.
B.	Incorrect:	Part 1 is incorrect. Lower detector is failed high which makes it higher than the upper detector which results in a max positive indication on JI-006A. ASI is calculated by Lower Detector – Upper Detector. The applicant may believe the opposite is true. Part 2 is incorrect . With a linear range channel failure, per both TS 3.2.4 and 2-AOP-99.01, Tq is required to be determined every 12 hours.
C.	Correct:	Part 1 is correct. Lower detector is failed high which makes it higher than the upper detector which results in a max positive indication on JI-006A. Lower detector is failed high which makes it higher than the upper detector which results in a max positive. Part 2 is correct. With a linear range channel failure, per both TS 3.2.4 and 2-AOP-99.01, Tq is required to be determined every 12 hours.
D.	Incorrect:	Part 1 is correct. Lower detector is failed high which makes it higher than the upper detector which results in a max positive indication on JI-006A. Lower detector is failed high which makes it higher than the upper detector which results in a max positive. Part 2 is incorrect. With a linear range channel failure, per both TS 3.2.4 and 2-AOP-99.01, Tq is required to be determined every 12 hours.

Note: Training and the Ops Facility Rep states Ops management expects the applicant understands the surveillance required in the event of a Linear Range NI Detector Failure. Expectations of compliance are defined in 2-AOP-99.01 and 2-OSP-100.27, Surveillances performed each shift in Mode 1 and 2 in addition to the TS, which is required knowledge of an SRO at PSL.

ORIGINAL QUESTION FROM 2017 NRC

Question Number: 91

Tier: 2 Group: 2

K/A: 015G2.4.31 Nuclear Instrumentation System / Knowledge of annunciator alarms, indications, or response procedures.

Importance Rating: 4.2 4.1

10 CFR Part 55: (CFR 43.5)

10CFR55.43.b: 10CFR55.43.b(5)

K/A Match: K/A is matched because the applicant is required to know what the alarms associated with the NIS are and the TS implications.

Technical Reference: 2-AOP-99.01, Loss of TS Instrumentation
TS 3.2.4

Proposed references to be provided: None

Learning Objective: PSL OPS 0702403-6/8; 0702407-10

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: New question for the 2017 NRC SRO Exam

Comments:

87. 013 A2.06 ESFAS / Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based Ability on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Inadvertent ESFAS Actuation

Given the following conditions:

- Unit 2 is at 100% power
- Annunciator S-9 RAS Channel A/B Actuation is LIT
- LIS-07-2A thru 2D, RWT Level indicate 34 feet
- MV-07-1A, SUCTION FROM RWT TRAIN A is CLOSED
- MV-07-2A, SUCT FROM CNTMT SUMP A TRAIN is OPEN
- "B" Train RAS components were NOT affected
- 2-AOP-69.01, Inadvertent ESFAS Actuation has been entered

Which ONE of the following completes the statement below?

In accordance 2-AOP-69.01, a Reactor Trip ____(1)____ required.

In accordance with LI-AA-102-1001, Regulatory Reporting, an 8 hour report ____(2)____ required due to the Inadvertent ESFAS actuation.

(REFERENCE PROVIDED)

A.	(1)	is
	(2)	is
B.	(1)	is
	(2)	is NOT
C.	(1)	is NOT
	(2)	is
D.	(1)	is NOT
	(2)	is NOT

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is incorrect: It is plausible that the applicant believe that inadvertent RAS requires a Rx Trip since MSIS and SIAS do. Part 2 is incorrect: This is not reportable due to being an invalid actuation per the purpose section of 2-AOP-69.01. It is plausible since a valid actuation would require an 8 hour report, also Any event or condition that at the time of discovery could have prevented the fulfillment of the safety function of structures or systems that are needed to: (A) Shut down the reactor and maintain it in a safe shutdown condition; (B) Remove residual heat; (C)Control the release of radioactive material; or (D)Mitigate the consequences of an accident." Would also require an 8 hour report be made.
B.	Incorrect:	Part 1 is incorrect: See explanation A. Part 2 is correct: See explanation D.
C.	Incorrect:	Part 1 is correct: See explanation D. Part 2 is incorrect: See explanation A.
D.	Correct:	Part 1 is correct: Per 2-AOP-69.01, Step 4.2.1.2, ONLY MSIS AND SIAS require a Rx Trip. Part 2 is correct: This is not reportable due to being an invalid actuation per the purpose section of 2-AOP-69.01. This actuation is invalid IAW LI-102-1001, 1.10, Invalid Actuations - Include actuations that are not the result of valid signals and are not intentional manual actuations. Invalid actuations include instances where instrument drift, spurious signals, human error, or other invalid signals caused actuation of the system (e.g., jarring a cabinet; error in use of jumpers or lifted leads; an error in actuation of switches or controls; equipment failure; or radio frequency interference).

Question Number: 87

Tier: 2 Group: 1

K/A: 013 A2.06 ESFAS / Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based Ability on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Inadvertent ESFAS Actuation

Importance Rating: 3.7 4.0

10 CFR Part 55: (CFR 41.5 / 43.5 / 45.3 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to predict the impacts of the malfunction and mitigate the consequences.

Technical Reference: 2-AOP-69.01/ LI-AA-102-1001

Proposed references to be provided: LI-AA-102-1001, Section 1 and ATTACHMENT 1

Learning Objective: PSL OPS 0702812-04

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

1.0 PURPOSE

This procedure provides guidance for the preparation, review and approval of various reports required by regulatory agencies. These reports include periodic and/or routine reports required by NextEra Energy plant Technical Specifications, Title 10 of the Code of Federal Regulations and site specific reporting requirements. TERMS AND DEFINITIONS

1. Immediate Notification Event (INE) - An Immediate Notification Event is an incident that requires a 1, 4, 8, or 24 hour telephone notification as defined in 10 CFR 50.72, 10 CFR 20, 10 CFR 26, 10 CFR 72.74, 10 CFR 72.75 and 10 CFR 73.

2. Licensee Event Report (LER) - A Licensee Event Report is a document which provides a mechanism for reporting, in writing to the NRC, the identification and evaluation of a Reportable Event as defined in 10 CFR 50.73, 10 CFR 71.95, 10 CFR 73.71 and 10 CFR 73.77.

3. 10 CFR 72 Event Report - A document which provides in writing to the NRC, the identification and evaluation of a Reportable Event as defined in 10 CFR 72.

4. Non-Routine Reports - Reports that are submitted to the NRC due to a change in the normal routine of the plant.

5. Packaging - One or more receptacles or wrappers used for the transportation of radioactive material and their contents, excluding fissile material and other radioactive material, but including absorbent material, spacing structures, thermal insulation, radiation shielding devices for cooling and absorbing mechanical shock, external fittings, neutron moderators, non-fissile neutron absorbers, and other supplementary equipment.

6. Reportable Event - A Reportable Event is an incident that requires a written LER or 10 CFR 72 Event Report (or, in some cases a telephone report) as defined in 10 CFR 50.73, 10 CFR 71.95, 10 CFR 72.74, 10 CFR 72.75, 10 CFR 73.71 and 10 CFR 73.77. Attachments 1, 2, and 3 provide a listing of events that are considered reportable.

7. Routine Reports - Reports that are required to be submitted to the NRC on a scheduled basis during the normal lifetime of the plant.

1.0 PURPOSE (continued)

8. Technical Specification (Tech Spec) Violation - Includes conditions prohibited by Tech Specs. For any event where actions are taken in accordance with Tech Spec action statements, a Tech Spec violation has not occurred unless the total specified time period in Tech Specs for all required actions is exceeded.

9. Valid Actuations - Those actuations that result from "valid signals" or from intentional manual initiation, unless it is part of a preplanned test. Valid signals are those signals that are initiated in response to actual plant conditions or parameters satisfying the requirements for initiation of the safety function of the system. A system is considered to actuate even if the only components to change state are those that complete the minimum actuation logic. For example, a loss of offsite power of other electrical fault results in an actuation of the emergency diesel generator when the undervoltage relays change state; even if the EDG had been previously removed from service and prohibited from starting. (Section 6.1.2.6, Reference 6)

10. Invalid Actuations - Include actuations that are not the result of valid signals and are not intentional manual actuations. Invalid actuations include instances where instrument drift, spurious signals, human error, or other invalid signals caused actuation of the system (e.g., jarring a cabinet; error in use of jumpers or lifted leads; an error in actuation of switches or controls; equipment failure; or radio frequency interference).

11. Time of Discovery - Used throughout the reporting requirements of 10 CFR 50.72 and 50.73, time of discovery refers to the time an event physically occurred, such as an ESF actuation, failure of a surveillance test, initiation of a plant shutdown, time of a unit trip, identification of a significant degraded or unanalyzed condition, etc.

If the time of occurrence is unknown, it may be assumed that the event or condition occurred at the time of discovery by plant personnel, unless there is firm evidence to the contrary. For example, if a standby component with a 7 day allowed outage time is found to be inoperable because it was assembled improperly during the maintenance conducted 30 days previously, then there is firm evidence that it had been inoperable for the entire 30 days. The date of occurrence, therefore, is the date on which the component was removed from service for maintenance and not the date of discovery.

1.0 PURPOSE (continued)

11. (continued)

The discovery date is generally the date when the event was discovered rather than the date when an evaluation of the event is completed. For example, if a technician sees a problem, but a delay occurs before an engineer or supervisor has a chance to review the situation, the discovery date (which starts the 60-day clock) is the date that the technician sees a problem.

12. Unanalyzed Condition - NRC reporting is required by 10 CFR 50.72(b)(3)(ii)(B)/50.73(a)(2)(ii)(B), for any identified degraded or non-conforming condition that results in the plant being sufficiently outside the bounds described in the Final Safety Analysis Report that safety is no longer assured. These conditions are generally identified through engineering evaluations in accordance with EN-AA-203-1001, “Operability Determinations/Functionality Assessments.” It should be noted that a loss of TS function is not reported under this criterion, so the majority of these reports will come from non-TS SSCs being found out of service. Examples include Fire Protection barriers, which could result in loss of Safe Shutdown capability, but are not in TS.

2.0 TERMS AND DEFINITIONS

None

ATTACHMENT 1
REPORTABLE EVENTS
(Page 1 of 8)

Declaration of an Emergency Class (See NUREG-1022 Section 3.1.1)	
1 Hour Report § 50.72(a)(1)(i) "The declaration of any of the Emergency Classes specified in the licensee's approved Emergency Plan."	
Plant Shutdown Required by Technical Specifications (See NUREG-1022 Section 3.2.1)	
4 Hour Report § 50.72(b)(2)(i) "The initiation of any nuclear plant shutdown required by the plant's Technical Specifications."	**60 Day LER § 50.73(a)(2)(i)(A)** "The completion of any nuclear plant shutdown required by the plant's Technical Specifications."
Operation or Condition Prohibited by Technical Specifications (See NUREG-1022 Section 3.2.2)	
	60 Day LER § 50.73(a)(2)(i)(B) "Any operation or condition which was prohibited by the plant's Technical Specifications except when: (1) The Technical Specification is administrative in nature; (2) The event consisted solely of a case of a late surveillance test where the oversight was corrected, the test was performed, and the equipment was found to be capable of performing its specified safety functions; or (3) The Technical Specification was revised prior to discovery of the event such that the operation or condition was no longer prohibited at the time of discovery of the event."

ATTACHMENT 1
REPORTABLE EVENTS
(Page 2 of 8)

Deviation from Technical Specifications Authorized under § 50.54(x) (See NUREG-1022 Section 3.2.3)	
1 Hour Report§ 50.72(b)(1) "... any deviation from the plant's Technical Specifications authorized pursuant to § 50.54(x) of this part."	**60 Day LER § 50.73(a)(2)(i)(C)** "Any deviation from the plant's Technical Specifications authorized pursuant to § 50.54(x) of this part."
Degraded or Unanalyzed Condition (See NUREG-1022 Section 3.2.4)	
8 Hour Report § 50.72(b)(3)(ii) "Any event or condition that results in:	**60 Day LER 50.73(a)(2)(ii)** "Any event or condition that resulted in:
(A) The condition of the nuclear power plant, including its principal safety barriers, being seriously degraded; or (B) The nuclear power plant being in an unanalyzed condition that significantly degrades plant safety."	(A) The condition of the nuclear power plant, including its principal safety barriers, being seriously degraded; or (B) The nuclear power plant being in an unanalyzed condition that significantly degraded plant safety."
External Threat or Hampering (See NUREG-1022 Section 3.2.5)	
	60 Day LER § 50.73(a)(2)(iii) "Any natural phenomenon or other external condition that posed an actual threat to the safety of the nuclear power plant or significantly hampered site personnel in the performance of duties necessary for the safe operation of the nuclear power plant."

ATTACHMENT 1
REPORTABLE EVENTS
(Page 3 of 8)

System Actuation (See NUREG-1022 Section 3.2.6)	
4 Hour Report § 50.72(b)(2)(iv)(A) "Any event that results or should have resulted in emergency core cooling system (ECCS) discharge into the reactor coolant system as a result of a valid signal except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation." **4 Hour Report § 50.72(b)(2)(iv)(B)** "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." **8 Hour Report § 50.72(b)(3)(iv)(A)** "Any event or condition that results in valid actuation of any of the systems listed in paragraph (b)(3)(iv)(B) of this section, except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation."	**60 Day LER § 50.73(a)(2)(iv)(A)** "Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section, except when: (1) The actuation resulted from and was part of a pre-planned sequence during testing or reactor operation; or (2) The actuation was invalid and; (i) Occurred while the system was properly removed from service; or (ii) Occurred after the safety function had been already completed. As indicated in 10 CFR 50.73(a)(1), in the case of an invalid actuation reported under 10 CFR 50.73(a)(2)(iv)(A) other than actuation of the RPS when the reactor is critical, the licensee may, at its option, provide a telephone notification to the NRC Operations Center within 60 days after discovery of the event instead of submitting a written LER.

ATTACHMENT 1
REPORTABLE EVENTS
(Page 4 of 8)

8 Hour Report § 50.72(b)(3)(iv)(B) "The systems to which the requirements of paragraph (b)(3)(iv)(A) of this section apply are:	**§ 50.73(a)(2)(iv)(B)** "The systems to which the requirements of paragraph (a)(2)(iv)(A) of this section apply are:
(1) Reactor protection system (RPS) including: reactor scram and reactor trip. [5]	(1) Reactor protection system (RPS) including: reactor scram or reactor trip.
(2) General containment isolation signals affecting containment isolation valves in more than one system or multiple main steam isolation valves (MSIVs).	(2) General containment isolation signals affecting containment isolation valves in more than one system or multiple main steam isolation valves (MSIVs).
(3) Emergency core cooling systems (ECCS) for pressurized water reactors (PWRs) including: high-head, intermediate-head, and low-head injection systems and the low pressure injection function of residual (decay) heat removal systems.	(3) Emergency core cooling systems (ECCS) for pressurized water reactors (PWRs) including: high-head, intermediate-head, and low-head injection systems and the low pressure injection function of residual (decay) heat removal systems.
(4) ECCS for boiling water reactors (BWRs) including: high-pressure and low-pressure core spray systems; high-pressure coolant injection system; low pressure injection function of the residual heat removal system.	(4) ECCS for boiling water reactors (BWRs) including: high-pressure and low-pressure core spray systems; high-pressure coolant injection system; low pressure injection function of the residual heat removal system.
(5) BWR reactor core isolation cooling system; isolation condenser system; and feedwater coolant injection system.	(5) BWR reactor core isolation cooling system; isolation condenser system; and feedwater coolant injection system.
(6) PWR auxiliary or emergency feedwater system.	(6) PWR auxiliary or emergency feedwater system.
(7) Containment heat removal and depressurization systems, including containment spray and fan cooler systems	(7) Containment heat removal and depressurization systems, including containment spray and fan cooler systems.
(8) Emergency ac electrical power systems, including: emergency diesel generators (EDGs); hydroelectric facilities used in lieu of EDGs at the Oconee Station; and BWR dedicated Division 3 EDGs.	(8) Emergency ac electrical power systems, including: emergency diesel generators (EDGs); hydroelectric facilities used in lieu of EDGs at the Oconee Station; and BWR dedicated Division 3 EDGs.
[5] Actuation of the RPS when the reactor is critical is reportable under § 50.72(b)(2)(iv)(B)	(9) Emergency service water systems that do not normally run and that serve as ultimate heat sinks.

ATTACHMENT 1
REPORTABLE EVENTS
(Page 5 of 8)

Event or Condition that Could Have Prevented Fulfillment of a Safety Function (See NUREG-1022 Section 3.2.7)	
8 Hour Report § 50.72(b)(3)(v) "Any event or condition that at the time of discovery could have prevented the fulfillment of the safety function of structures or systems that are needed to: (A) Shut down the reactor and maintain it in a safe shutdown condition; (B) Remove residual heat; (C) Control the release of radioactive material; or (D) Mitigate the consequences of an accident." **8 Hour Report § 50.72(b)(3)(vi)** "Events covered in paragraph (b)(3)(v) of this section may include one or more procedural errors, equipment failures, and/or discovery of design, analysis, fabrication, construction, and/or procedural inadequacies. However, individual component failures need not be reported pursuant to paragraph (b)(3)(v) of this section if redundant equipment in the same system was operable and available to perform the required safety function."	**60 Day LER § 50.73(a)(2)(v)** "Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to: (A) Shut down the reactor and maintain it in a safe shutdown condition; (B) Remove residual heat; (C) Control the release of radioactive material; or (D) Mitigate the consequences of an accident." **§ 50.73(a)(2)(vi)** "Events covered in paragraph (a)(2)(v) of this section may include one or more procedural errors, equipment failures, and/or discovery of design, analysis, fabrication, construction, and/or procedural inadequacies. However, individual component failures need not be reported pursuant to paragraph (a)(2)(v) of this section if redundant equipment in the same system was operable and available to perform the required safety function."
Common Cause Inoperability of Independent Trains or Channels (See NUREG-1022 Section 3.2.8)	
	60 Day LER § 50.73(a)(2)(vii) "Any event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a single system designed to: (A) Shut down the reactor and maintain it in a safe shutdown condition; (B) Remove residual heat; (C) Control the release of radioactive material; or (D) Mitigate the consequences of an accident."

ATTACHMENT 1
REPORTABLE EVENTS
(Page 6 of 8)

Radioactive Release (See NUREG-1022 Section 3.2.9)	
	60 Day LER § 50.73(a)(2)(viii)(A) "Any airborne radioactive release that, when averaged over a time period of 1 hour, resulted in airborne radionuclide concentrations in an unrestricted area that exceeded 20 times the applicable concentration limits specified in appendix B to part 20, table 2, column 1." **60 Day LER § 50.73(a)(2)(viii)(B)** "Any liquid effluent release that, when averaged over a time period of 1 hour, exceeds 20 times the applicable concentrations specified in appendix B to part 20, table 2, column 2, at the point of entry into the receiving waters (i.e., unrestricted area) for all radionuclides except tritium and dissolved noble gases."
Internal Threat or Hampering (See NUREG-1022 Section 3.2.10)	
	60 Day LER § 50.73(a)(2)(x) "Any event that posed an actual threat to the safety of the nuclear power plant or significantly hampered site personnel in the performance of duties necessary for the safe operation of the nuclear power plant including fires, toxic gas releases, or radioactive releases."
Transport of a Contaminated Person Offsite (See NUREG-1022 Section 3.2.11)	
8 Hour Report § 50.72(b)(3)(xii) "Any event requiring the transport of a radioactively contaminated person to an offsite medical facility for treatment."	

ATTACHMENT 1
REPORTABLE EVENTS
(Page 7 of 8)

News Release or Notification of Other Government Agency (See NUREG-1022 Section 3.2.12)	
4 Hour Report § 50.72(b)(2)(xi) "Any event or situation, related to the health and safety of the public or onsite personnel, or protection of the environment, for which a news release is planned or notification to other government agencies has been or will be made. Such an event may include an onsite fatality or inadvertent release of radioactively contaminated materials."	
Loss of Emergency Preparedness Capabilities (See NUREG-1022 Section 3.2.13)	
8 Hour Report § 50.72(b)(3)(xiii) "Any event that results in a major loss of emergency assessment capability, offsite response capability, or offsite communications capability (e.g., significant portion of control room indication, emergency notification system, or offsite notification system)."	

ATTACHMENT 1
REPORTABLE EVENTS
(Page 8 of 8)

Single Cause that Could Have Prevented Fulfillment of the Safety Functions of Trains or Channels in Different Systems (See NUREG-1022 Section 3.2.14)	
	60 Day LER § 50.73(a)(2)(ix)(A) "Any event or condition that as a result of a single cause could have prevented the fulfillment of a safety function for two or more trains or channels in different systems that are needed to: (1) Shut down the reactor and maintain it in a safe shutdown condition; (2) Remove residual heat; (3) Control the release of radioactive material; or (4) Mitigate the consequences of an accident." **§ 50.73(a)(2)(ix)(B)** "Events covered in paragraph (ix)(A) of this section may include cases of procedural error, equipment failure, and/or discovery of a design, analysis, fabrication, construction, and/or procedural inadequacy. However, licensees are not required to report an event pursuant to paragraph (ix)(A) of this section if the event results from: (1) A shared dependency among trains or channels that is a natural or expected consequence of the approved plant design; or (2) Normal and expected wear or degradation."

INSTRUCTIONS	CONTINGENCY ACTIONS

4.2 Subsequent Operator Actions

4.2.1 General Actions

NOTE

- This procedure is written based on the following assumptions:
  - A FULL actuation of at least one train has occurred.
  - The unit is in MODE 1, 2, or 3.
  - SIAS is **NOT** blocked.

  This procedure is **NOT** appropriate for only a partial ESFAS actuation, such as an inadvertent actuation of a single ESFAS relay.
- Attachment 1, General Information, provides additional reference information that may be helpful in the implementation of this AOP.

☐ **1.** **VERIFY** procedure applicability as indicated by both conditions met:

- Unit is in MODE 1, 2, or 3.
- SIAS is **NOT** blocked.

1.1 **GO TO** Low Mode AOP for current plant conditions.

☐ **2.** IF any train of the following ESFAS signals is actuated:

- MSIS
- SIAS

THEN **PERFORM** the following:

A. **TRIP** reactor.

B. **GO TO** 2-EOP-01, Standard Post Trip Actions.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.4 Recovery From Inadvertent RAS

☐ **1.** **VERIFY** proper RAS actuation of affected train per Table 2.

Table 2
RAS Safeguards Alignment Verification

Train	Component	Component Description	Position/ Status	Switch	✓
A	MV-07-2A	SUCT FROM CNTMT SUMP A TRAIN	OPEN	AUTO	
A	MV-07-1A	SUCTION FROM RWT A TRAIN	CLOSED	AUTO	
A	None	2A LPSI Pump	STOPPED	AUTO	
A	V3495	MINIMUM FLOW HEADER A ISOLATION VALVE	CLOSED	N/A	
A	V3659	MINIMUM FLOW HEADER A ISOLATION VALVE	CLOSED	N/A	
B	MV-07-2B	SUCT FROM CNTMT SUMP B TRAIN	OPEN	AUTO	
B	MV-07-1B	SUCTION FROM RWT B TRAIN	CLOSED	AUTO	
B	None	2B LPSI Pump	STOPPED	AUTO	
B	V3496	MINIMUM FLOW HEADER B ISOLATION VALVE	CLOSED	N/A	
B	V3660	MINIMUM FLOW HEADER B ISOLATION VALVE	CLOSED	N/A	

☐ **2.** **INVESTIGATE** root cause and **INITIATE** corrective actions as applicable.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.4 Recovery From Inadvertent RAS (continued)

☐ **3.** **RESET** RAS as follows:

A. **PLACE** RAS manual actuation handswitch in RESET.

B. **VERIFY** S-9, RAS CHANNEL A/B ACTUATION, is CLEAR.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.4 Recovery From Inadvertent RAS (continued)

NOTE

The containment sump suction valve shall be fully closed prior to opening the RWT suction valve to prevent cross-connecting the sump to the RWT.

☐ **4.** **RESTORE** affected train RAS components in the following order:

Train	Component	Component Description	Position/ Status	Switch
A	MV-07-2A	SUCT FROM CNTMT SUMP A TRAIN	CLOSED	AUTO
A	MV-07-1A	SUCTION FROM RWT A TRAIN	OPEN	AUTO
A	V3495	MINIMUM FLOW HEADER A ISOLATION VALVE	OPEN	CLOSE then LOCKED OPEN (Key 49)
A	V3659	MINIMUM FLOW HEADER A ISOLATION VALVE	OPEN	CLOSE then LOCKED OPEN (Key 196)
A	None	2A LPSI Pump	OFF	AUTO
B	MV-07-2B	SUCT FROM CNTMT SUMP B TRAIN	CLOSED	AUTO
B	MV-07-1B	SUCTION FROM RWT B TRAIN	OPEN	AUTO
B	V3496	MINIMUM FLOW HEADER B ISOLATION VALVE	OPEN	CLOSE then LOCKED OPEN (Key 50)
B	V3660	MINIMUM FLOW HEADER B ISOLATION VALVE	OPEN	CLOSE then LOCKED OPEN (Key 194)
B	None	2B LPSI Pump	OFF	AUTO

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.4 Recovery From Inadvertent RAS (continued)

☐ **5.** **FILL** and **VENT** affected train ECCS pump suction piping per 2-0420060, Venting of the Emergency Core Cooling and Containment Spray Systems.

☐ **6.** IF any ECCS pump control switches were placed in STOP per Section 4.2.1, Step 5, THEN **RETURN** their control switches to AUTO.

☐ **7.** **RETURN TO** Section 4.2.1, Step 8.

1.0 PURPOSE

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1.0 PURPOSE (continued)

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1.0 PURPOSE (continued)

11. (continued)

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12. Unanalyzed Condition - NRC reporting is required by 10 CFR 50.72(b)(3)(ii)(B)/50.73(a)(2)(ii)(B), for any identified degraded or non-conforming condition that results in the plant being sufficiently outside the bounds described in the Final Safety Analysis Report that safety is no longer assured. These conditions are generally identified through engineering evaluations in accordance with EN-AA-203-1001, “Operability Determinations/Functionality Assessments.” It should be noted that a loss of TS function is not reported under this criterion, so the majority of these reports will come from non-TS SSCs being found out of service. Examples include Fire Protection barriers, which could result in loss of Safe Shutdown capability, but are not in TS.

2.0 TERMS AND DEFINITIONS

None

ATTACHMENT 1
REPORTABLE EVENTS
(Page 1 of 8)

Declaration of an Emergency Class (See NUREG-1022 Section 3.1.1)	
1 Hour Report § 50.72(a)(1)(i) "The declaration of any of the Emergency Classes specified in the licensee's approved Emergency Plan."	
Plant Shutdown Required by Technical Specifications (See NUREG-1022 Section 3.2.1)	
4 Hour Report § 50.72(b)(2)(i) "The initiation of any nuclear plant shutdown required by the plant's Technical Specifications."	**60 Day LER § 50.73(a)(2)(i)(A)** "The completion of any nuclear plant shutdown required by the plant's Technical Specifications."
Operation or Condition Prohibited by Technical Specifications (See NUREG-1022 Section 3.2.2)	
	60 Day LER § 50.73(a)(2)(i)(B) "Any operation or condition which was prohibited by the plant's Technical Specifications except when: (1) The Technical Specification is administrative in nature; (2) The event consisted solely of a case of a late surveillance test where the oversight was corrected, the test was performed, and the equipment was found to be capable of performing its specified safety functions; or (3) The Technical Specification was revised prior to discovery of the event such that the operation or condition was no longer prohibited at the time of discovery of the event."

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Deviation from Technical Specifications Authorized under § 50.54(x) (See NUREG-1022 Section 3.2.3)	
1 Hour Report§ 50.72(b)(1) "... any deviation from the plant's Technical Specifications authorized pursuant to § 50.54(x) of this part."	**60 Day LER § 50.73(a)(2)(i)(C)** "Any deviation from the plant's Technical Specifications authorized pursuant to § 50.54(x) of this part."
Degraded or Unanalyzed Condition (See NUREG-1022 Section 3.2.4)	
8 Hour Report § 50.72(b)(3)(ii) "Any event or condition that results in:	**60 Day LER 50.73(a)(2)(ii)** "Any event or condition that resulted in:
(A) The condition of the nuclear power plant, including its principal safety barriers, being seriously degraded; or (B) The nuclear power plant being in an unanalyzed condition that significantly degrades plant safety."	(A) The condition of the nuclear power plant, including its principal safety barriers, being seriously degraded; or (B) The nuclear power plant being in an unanalyzed condition that significantly degraded plant safety."
External Threat or Hampering (See NUREG-1022 Section 3.2.5)	
	60 Day LER § 50.73(a)(2)(iii) "Any natural phenomenon or other external condition that posed an actual threat to the safety of the nuclear power plant or significantly hampered site personnel in the performance of duties necessary for the safe operation of the nuclear power plant."

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System Actuation
(See NUREG-1022 Section 3.2.6)

4 Hour Report § 50.72(b)(2)(iv)(A) "Any event that results or should have resulted in emergency core cooling system (ECCS) discharge into the reactor coolant system as a result of a valid signal except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation."

4 Hour Report § 50.72(b)(2)(iv)(B) "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."

8 Hour Report § 50.72(b)(3)(iv)(A) "Any event or condition that results in valid actuation of any of the systems listed in paragraph (b)(3)(iv)(B) of this section, except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation."

60 Day LER § 50.73(a)(2)(iv)(A) "Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section, except when:

(1) The actuation resulted from and was part of a pre-planned sequence during testing or reactor operation; or
(2) The actuation was invalid and;
(i) Occurred while the system was properly removed from service; or
(ii) Occurred after the safety function had been already completed.

As indicated in 10 CFR 50.73(a)(1), in the case of an invalid actuation reported under 10 CFR 50.73(a)(2)(iv)(A) other than actuation of the RPS when the reactor is critical, the licensee may, at its option, provide a telephone notification to the NRC Operations Center within 60 days after discovery of the event instead of submitting a written LER.

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REPORTABLE EVENTS
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8 Hour Report § 50.72(b)(3)(iv)(B) "The systems to which the requirements of paragraph (b)(3)(iv)(A) of this section apply are:	**§ 50.73(a)(2)(iv)(B)** "The systems to which the requirements of paragraph (a)(2)(iv)(A) of this section apply are:
(1) Reactor protection system (RPS) including: reactor scram and reactor trip. [5]	(1) Reactor protection system (RPS) including: reactor scram or reactor trip.
(2) General containment isolation signals affecting containment isolation valves in more than one system or multiple main steam isolation valves (MSIVs).	(2) General containment isolation signals affecting containment isolation valves in more than one system or multiple main steam isolation valves (MSIVs).
(3) Emergency core cooling systems (ECCS) for pressurized water reactors (PWRs) including: high-head, intermediate-head, and low-head injection systems and the low pressure injection function of residual (decay) heat removal systems.	(3) Emergency core cooling systems (ECCS) for pressurized water reactors (PWRs) including: high-head, intermediate-head, and low-head injection systems and the low pressure injection function of residual (decay) heat removal systems.
(4) ECCS for boiling water reactors (BWRs) including: high-pressure and low-pressure core spray systems; high-pressure coolant injection system; low pressure injection function of the residual heat removal system.	(4) ECCS for boiling water reactors (BWRs) including: high-pressure and low-pressure core spray systems; high-pressure coolant injection system; low pressure injection function of the residual heat removal system.
(5) BWR reactor core isolation cooling system; isolation condenser system; and feedwater coolant injection system.	(5) BWR reactor core isolation cooling system; isolation condenser system; and feedwater coolant injection system.
(6) PWR auxiliary or emergency feedwater system.	(6) PWR auxiliary or emergency feedwater system.
(7) Containment heat removal and depressurization systems, including containment spray and fan cooler systems	(7) Containment heat removal and depressurization systems, including containment spray and fan cooler systems.
(8) Emergency ac electrical power systems, including: emergency diesel generators (EDGs); hydroelectric facilities used in lieu of EDGs at the Oconee Station; and BWR dedicated Division 3 EDGs.	(8) Emergency ac electrical power systems, including: emergency diesel generators (EDGs); hydroelectric facilities used in lieu of EDGs at the Oconee Station; and BWR dedicated Division 3 EDGs.
[5] Actuation of the RPS when the reactor is critical is reportable under § 50.72(b)(2)(iv)(B)	(9) Emergency service water systems that do not normally run and that serve as ultimate heat sinks.

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Event or Condition that Could Have Prevented Fulfillment of a Safety Function (See NUREG-1022 Section 3.2.7)	
8 Hour Report § 50.72(b)(3)(v) "Any event or condition that at the time of discovery could have prevented the fulfillment of the safety function of structures or systems that are needed to: (A) Shut down the reactor and maintain it in a safe shutdown condition; (B) Remove residual heat; (C) Control the release of radioactive material; or (D) Mitigate the consequences of an accident." **8 Hour Report § 50.72(b)(3)(vi)** "Events covered in paragraph (b)(3)(v) of this section may include one or more procedural errors, equipment failures, and/or discovery of design, analysis, fabrication, construction, and/or procedural inadequacies. However, individual component failures need not be reported pursuant to paragraph (b)(3)(v) of this section if redundant equipment in the same system was operable and available to perform the required safety function."	**60 Day LER § 50.73(a)(2)(v)** "Any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to: (A) Shut down the reactor and maintain it in a safe shutdown condition; (B) Remove residual heat; (C) Control the release of radioactive material; or (D) Mitigate the consequences of an accident." **§ 50.73(a)(2)(vi)** "Events covered in paragraph (a)(2)(v) of this section may include one or more procedural errors, equipment failures, and/or discovery of design, analysis, fabrication, construction, and/or procedural inadequacies. However, individual component failures need not be reported pursuant to paragraph (a)(2)(v) of this section if redundant equipment in the same system was operable and available to perform the required safety function."
Common Cause Inoperability of Independent Trains or Channels (See NUREG-1022 Section 3.2.8)	
	60 Day LER § 50.73(a)(2)(vii) "Any event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a single system designed to: (A) Shut down the reactor and maintain it in a safe shutdown condition; (B) Remove residual heat; (C) Control the release of radioactive material; or (D) Mitigate the consequences of an accident."

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REPORTABLE EVENTS
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Radioactive Release (See NUREG-1022 Section 3.2.9)	
	60 Day LER § 50.73(a)(2)(viii)(A) "Any airborne radioactive release that, when averaged over a time period of 1 hour, resulted in airborne radionuclide concentrations in an unrestricted area that exceeded 20 times the applicable concentration limits specified in appendix B to part 20, table 2, column 1." **60 Day LER § 50.73(a)(2)(viii)(B)** "Any liquid effluent release that, when averaged over a time period of 1 hour, exceeds 20 times the applicable concentrations specified in appendix B to part 20, table 2, column 2, at the point of entry into the receiving waters (i.e., unrestricted area) for all radionuclides except tritium and dissolved noble gases."
Internal Threat or Hampering (See NUREG-1022 Section 3.2.10)	
	60 Day LER § 50.73(a)(2)(x) "Any event that posed an actual threat to the safety of the nuclear power plant or significantly hampered site personnel in the performance of duties necessary for the safe operation of the nuclear power plant including fires, toxic gas releases, or radioactive releases."
Transport of a Contaminated Person Offsite (See NUREG-1022 Section 3.2.11)	
8 Hour Report § 50.72(b)(3)(xii) "Any event requiring the transport of a radioactively contaminated person to an offsite medical facility for treatment."	

ATTACHMENT 1
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News Release or Notification of Other Government Agency (See NUREG-1022 Section 3.2.12)	
4 Hour Report § 50.72(b)(2)(xi) "Any event or situation, related to the health and safety of the public or onsite personnel, or protection of the environment, for which a news release is planned or notification to other government agencies has been or will be made. Such an event may include an onsite fatality or inadvertent release of radioactively contaminated materials."	
Loss of Emergency Preparedness Capabilities (See NUREG-1022 Section 3.2.13)	
8 Hour Report § 50.72(b)(3)(xiii) "Any event that results in a major loss of emergency assessment capability, offsite response capability, or offsite communications capability (e.g., significant portion of control room indication, emergency notification system, or offsite notification system)."	

ATTACHMENT 1
REPORTABLE EVENTS
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Single Cause that Could Have Prevented Fulfillment of the Safety Functions of Trains or Channels in Different Systems (See NUREG-1022 Section 3.2.14)	
	60 Day LER § 50.73(a)(2)(ix)(A) "Any event or condition that as a result of a single cause could have prevented the fulfillment of a safety function for two or more trains or channels in different systems that are needed to: (1) Shut down the reactor and maintain it in a safe shutdown condition; (2) Remove residual heat; (3) Control the release of radioactive material; or (4) Mitigate the consequences of an accident." **§ 50.73(a)(2)(ix)(B)** "Events covered in paragraph (ix)(A) of this section may include cases of procedural error, equipment failure, and/or discovery of a design, analysis, fabrication, construction, and/or procedural inadequacy. However, licensees are not required to report an event pursuant to paragraph (ix)(A) of this section if the event results from: (1) A shared dependency among trains or channels that is a natural or expected consequence of the approved plant design; or (2) Normal and expected wear or degradation."

88. 026 G2.4.46 Containment Spray / Ability to verify that the alarms are consistent with the plant conditions

Given the following conditions:

00:00:00	Unit 2 tripped due to a LOCA SIAS has actuated CSAS has actuated
03:00:00	2-EOP-03, LOCA, Check if Containment Spray can be terminated, is in progress
03:30:00	RAS actuates Annunciator S-27, 2A CS Pump Running HDR Press Low Alarms PIS-07-3A, CNTMT Spray Header A Press is oscillating between 60 and 90 psig

Which ONE of the following completes the statements below?

At time 03:00:00, in accordance with 2-EOP-03, Containment Pressure MUST be less than a MAXIMUM of ____(1)____ for Containment Spray to be TERMINATED.

At time 03:30:00, in accordance with 2-EOP-03, ____(2)____ must be secured.

A.	(1)	3.5
	(2)	CS pumps ONLY
B.	(1)	3.5
	(2)	CS and HPSI pumps
C.	(1)	5.0
	(2)	CS pumps ONLY
D.	(1)	5.0
	(2)	CS and HPSI pumps

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 is correct: IAW step 43.B, Containment Pressure is less than 3.5 psig and stable or lowering. Part 2 is correct: IAW step 41.C Stop ALL CS Pumps. **SRO Bases:** This evaluation step is deep within the actions for addressing a LOCA, understanding the diagnostics for sump blockage, and the required strategy for addressing the blockage while maintaining cooling flow to the reactor core. These actions are not major event mitigating strategies for the procedure.
B.	Incorrect:	Part 1 is correct: See analysis A. Part 2 is incorrect: It is plausible that the applicant believe that due to the indications of degraded ECCS pump suction that both the CS and HPSI pumps are required to be secured when the EOP only directs securing the CS pumps.
C.	Incorrect:	Part 1 is incorrect: This is plausible if the applicant has a misconception on what the CNTMT Pressure setpoint is for securing the Containment Spray (The setpoint on Unit 1 is 5 psig) Part 2 is correct see explanation A.
D.	Incorrect:	Part 1 is incorrect: See analysis C. Part 2 is incorrect: See analysis B.

Question Number: 88

Tier: 2 Group: 1

K/A: 026 G2.4.46 Containment Spray / Ability to verify that the alarms are consistent with the plant conditions

Importance Rating: 4.2 4.2

10 CFR Part 55: (CFR 41.10 / 43.5 / 45.3 / 45.12)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know how annunciator S-27 impacts plant operations

Technical Reference: 2-EOP-03, LOCA

Proposed references to be provided: None

Learning Objective: PSL OPS 0702210-5

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

NOTE

Erratic amps, flow or discharge pressure may be an indication of Containment Sump strainer blockage. Based upon containment sump strainer configuration, sump blockage may affect either train individually or both trains simultaneously.

*	**40.**	**MONITOR** for loss of ECCS pump suction:	
	A.	**VERIFY** RAS is ACTUATED.	**A.1** **GO TO** Section 4.0, Step 41.
	B.	**VERIFY** DEGRADING pump suction as indicated by <u>any</u> of the following conditions MET: • Erratic HPSI or CS flow • Erratic HPSI or CS amps • Erratic HPSI or CS discharge pressure	**B.1** **GO TO** Section 4.0, Step 41.
	C.	**STOP** <u>all</u> CS pumps.	

INSTRUCTIONS	CONTINGENCY ACTIONS

4.0 OPERATOR ACTIONS (continued)

40. (continued)

D. **VERIFY** HPSI pump parameters improve.

D.1 **PERFORM** all of the following:

1. **THROTTLE** CLOSED SI flow while ensuring greater than 114 gpm.

2. IF HPSI pump parameters are still UNACCEPTABLE, THEN **STOP** affected HPSI pump.

3. IF HPSI pump parameters are ACCEPTABLE, THEN slowly **RAISE** SI flow to achieve the maximum possible (less than 685 gpm) and **CONTINUE** to monitor.

E. **NOTIFY** the TSC of containment sump blockage.

F. **GO TO** 2-EOP-15, Functional Recovery.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.0 OPERATOR ACTIONS (continued)

* **43.** **CHECK** if containment spray can be terminated:

A. **VERIFY** at least one CS pump is operating.

A.1 **GO TO** Section 4.0, Step 44.

B. **VERIFY** all of the following conditions are MET:

- Containment pressure is less than 3.5 psig AND stable or lowering
- Containment Spray is **NOT** required for Containment cooling
- The Hydrazine Tank has been pumped into the Containment, AND Containment Spray is **NOT** required for iodine removal

B.1 **GO TO** Section 4.0, Step 44.

C. **RESET** Containment Spray ONE train at a time per Appendix P, Restoration of Components Actuated by ESFAS.

INSTRUCTIONS		CONTINGENCY ACTIONS
4.0	**OPERATOR ACTIONS (continued)**	
* **11.**	**ENSURE** Containment isolation and Containment cooling as follows:	
A.	**VERIFY** one of the following conditions is MET: • Containment pressure is greater than 5.0 psig • Containment radiation greater than 10 R/hr • SIAS is ACTUATED	**A.1** **GO TO** Section 4.0, Step 12.
B.	**VERIFY** CIAS is ACTUATED.	**B.1** **PERFORM** the following: **1.** Manually **ACTUATE** CIAS. **2.** **START/ALIGN** CIAS components per Table 2, Containment Isolation Actuation Signal.

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 8 of 11)

7. CONTAINMENT ISOLATION

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
Either Section A or Section B will satisfy this safety function		
A. Secondary Plant Activity	Less than alarm value AND stable or lowering trends on Condenser Air Ejector, Blowdown and Main Steamline Radiation Monitors	
	OR	
	Surveys indicate normal levels AND stable or lowering trends	
	AND	
Containment Pressure	Less than 5.0 psig	
	AND	
CIS Radiation Monitors	Less than alarm value AND stable or lowering	
OR		

(continued on next page)

89. 059 G2.1.7 Main Feedwater / Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.

Given the following conditions:

- Unit 1 is at 100% power
- Annunciator Q-38, MFIV HCV-09-7 N2 Press Low/DC Failure
- HCV-09-7, MFIV, RED indicating light is LIT
- NPO reports PI-09-13 N2 Hdr to 1A MFIV N2 Accum Press reads 288 psig

Which ONE of the following completes the statements below?

In accordance with ADM-11.16, Transient Procedure Use and Adherence, HCV-09-7 ____(1)____ OPERABLE.

IF the N2 pressure LOWERED to 0 psig, the MFIV will FAIL ____(2)____.

A.	(1)	is
	(2)	AS-IS
B.	(1)	is
	(2)	CLOSED
C.	(1)	is NOT
	(2)	AS-IS
D.	(1)	is NOT
	(2)	CLOSED

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 is correct: The MFIV is OPERABLE due to the accumulator pressure being > 277 psig as described in ADM-11.16, 4.5.9.3 Part 2 is correct: The MFIVs fail AS-IS as N2 is the motive force for both opening and closing, therefore the valve will not move. SRO Bases: ADM-11.16, 3/4.7.1.6 Main Feedwater Isolation Valves (Unit 1) **A.** While **NOT** specifically addressed in Unit 1 Technical Specifications, the Main Feedwater Isolation Valve (MFIV) is an ESFAS actuated component and on the Essential Equipment list. The Unit 1 Main Feed Isolation valves are **NOT** Containment Isolation Valves OR a Containment Leakage Path (reference CR 2008-743 disposition). **B.** If N2 pressure is less than 277 psig, the MFIV may **NOT** be able to perform its design function. If this occurs, or a Unit 1 MFIV is inoperable for any other reason, then apply the Unit 2 Technical Specification 3.7.1.6 72 hour Action Statement and submit a 3 day Condition Report.
B.	Incorrect:	Part 1 is correct: See analysis A. Part 2 is incorrect: But plausible since the MFIVs close to isolate the flowpath to containment on a SIAS and MSIS actuation, the applicant may think this is a Containment Isolation valve and Containment Isolation Valves normally fail in the closed position.
C.	Incorrect:	Part 1 is incorrect: The MFIV is OPERABLE due to the accumulator pressure being > 277 psig as described in ADM-11.16, 4.5.9.3, it is plausible that the applicant not know that setpoint for which operability is determined for the accumulator. Part 2 is correct: See analysis A
D.	Incorrect:	Part 1 is incorrect: See analysis C. Part 2 is incorrect: See analysis B.

Question Number: 89

Tier: 2 Group: 1

K/A: 059 G2.1.7 Main Feedwater / Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.

Importance Rating: 4.4 4.7

10 CFR Part 55: (CFR: 41.5 / 43.5 / 45.12 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know how parameters effect operability with regards to MFW

Technical Reference: ADM-11.16

Proposed references to be provided: None

Learning Objective: PSL OPS 0702301-18

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

4.5.9 Operational Guidance for Section 3/4.7 (continued)

1. (continued)

C. After Mode 3 entry, testing of the 1C/2C AFW Pump must commence when the steam generators reach full pressure (900 psia), and within 24 hours.

D. Failure of the 1C/2C AFW Pump within this 24 hour period is the same as any other failure and results in entry into the 72 hour Tech Spec LCO at the time of discovery. Tech Spec 3.7.1.2 does **NOT** allow an upward mode change (LCO 3.0.4.b is **NOT** applicable) while in the action statement.

E. Failure to meet the 72 hour LCO requires a cooldown to Mode 4.

F. (Unit 1 only) AFW Tech Spec Action Statement needs to be entered if either 1AB crosstie breaker UV devices fail.

2. 3/4.7.1.3 Condensate Storage Tank

While **NOT** specifically addressed in the Unit 2 Technical Specifications, per Unit 2 Design Basis Document, 130,500 gallons of water in Unit 2 CST is reserved for the unlikely event that a vertical tornado missile ruptures Unit 1 CST rendering it unavailable. Additionally 13,433 gallons of water is determined to be unusable in the Unit 2 CST, resulting in a total of 143,933 gallons (15.31 ft) being required in Unit 2 CST to support Unit 1. If Unit 1 is in Mode 1-3 and Unit 2 is in Mode 4-6 or defueled, maintain Unit 2 CST greater than 18.5 ft to ensure the required minimum is maintained. (Calc 129154-M-0018)

3. 3/4.7.1.6 Main Feedwater Isolation Valves (Unit 1)

A. While **NOT** specifically addressed in Unit 1 Technical Specifications, the Main Feedwater Isolation Valve (MFIV) is an ESFAS actuated component and on the Essential Equipment list. The Unit 1 Main Feed Isolation valves are **NOT** Containment Isolation Valves OR a Containment Leakage Path (reference CR 2008-743 disposition).

B. If N2 pressure is less than 277 psig, the MFIV may **NOT** be able to perform its design function. If this occurs, or a Unit 1 MFIV is inoperable for any other reason, then apply the Unit 2 Technical Specification 3.7.1.6 72 hour Action Statement and submit a 3 day Condition Report.

Feedwater Flow (FW), Leading Edge Flowmeter (LEFM)

The LEFM System is a mass flow (FW flow) rate measurement system. Two LEFM (Metering Section) assemblies, one per FW header, are welded into the main FW piping upstream of the flow venturis. There are four transmitter enclosures locally mounted near the LEFM Metering Sections with two associated CPU enclosures wall mounted in the Control Room. Each LEFM assembly has 2 transmitters (ultrasonic) each made up of 4 upstream transducers and 4 downstream transducers, 2 pressure transmitters, and 2 RTDs. The ultrasonic transducers measure the difference of transit time between the upstream and downstream ultrasonic pulses to calculate average volumetric flow and mean fluid sound velocity (used to derive fluid temperature). The pressure transmitter output is used with temperature to determine fluid density and mass flow is determined by multiplying volumetric flow and density. The RTD input is used to arbitrate between hot and cold water fluid sound velocity since fluid sound velocities above 165°F cannot be discriminated from sound velocoties below165°F. The LEFM System outputs (FW mass flow rate and temperature), are used in the secondary calorimetric calculation of thermal power in DCS (Refer to Figures 25 A, B, C). More LEFM information can be found in Steam Generator and Feedwater Control System text PSL OPS 0711408.

Unit 1 Main Feedwater Isolation Valves

The Unit 1 main feedwater isolation valves (MFIVs), HCV-09-7 and HCV-09-8, are fast closure pneumatic piston actuated valves. There is one MFIV in each steam generator feed line just before the pipe enters the containment. HCV-09-07 & HCV-09-08 are nitrogen to open and close gate valves. Refer to Figure 26. Opening and closing nitrogen is directed to each MFIV from a nitrogen accumulator via two 125 VDC three-way solenoids (safety-related DC) and four three-way pilot poppet valves. The solenoid valves control the positioning of the three-way poppet valves which in turn port N_2 to open and close the MFIV. Energizing either one of the solenoids will cause the MFIV to go closed in 4-14.8 seconds. This ensures that the MFIV will close within the allowed main steam line break containment analysis time of 20 seconds after SIAS. Upon loss of power to both solenoids, with nitrogen available, the MFIV will fail open. Upon loss of nitrogen, the MFIV will fail as is. Backup nitrogen is supplied by nitrogen bottles. There are four N_2 bottles for each accumulator. Three bottles are connected to each N_2 supply header and one is a spare. The A3/B3 N_2 bottles are normally isolated.

(Refer to the table below for guidance on N_2 supply pressures)

UNIT 1 - MAIN FEEDWATER ISOLATION VALVE
PNEUMATIC ACTUATOR ("A" MFIV SHOWN IN OPEN POSITION)

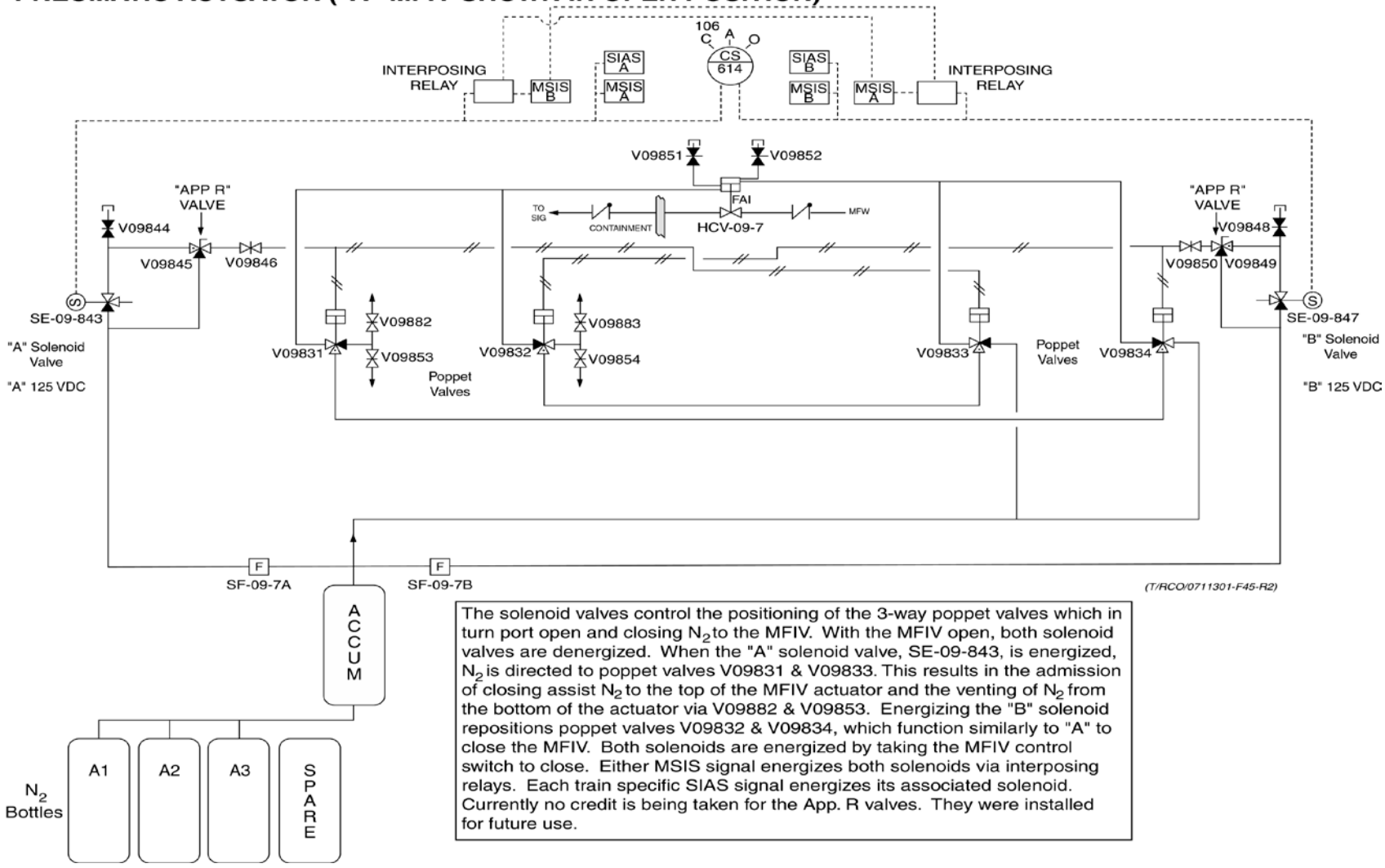

Figure 26

Unit 1 MFIVs

- **Nitrogen system includes nitrogen accumulator, two 125VDC solenoids, 3-way pilot poppet valves, and backup nitrogen cylinders.**

- **Accumulator pressure**
  - **Normal 300 psig.**
  - **Relief setpoint is 350 psig.**
  - **MFIV is inoperable if pressure < 277 psig**

- **The MFIVs have a mechanical stop slightly before the full closed position to prevent seat damage. Hence, these valves can NOT be credited for isolation for equipment clearance order (ECO) purposes.**

Unit 1 MFIVs EO-10, EO-3o EO-18k, EO-18n

- There is one MFIV in each S/G feed line just before the pipe enters the containment.
- The check valves upstream of the MFIVs, the MFIVs, and all feed piping inside the containment are safety related and Seismic Class I.
- MFIVs are designed to close in 4-14.8 seconds which ensures that the MFIV will close within the allowed main steam line break CNTMT analysis time of 20 seconds after SIAS.
- Valves fail as is on loss of nitrogen pressure and fail open on loss of power

90.

103 G2.2.38 Containment / Knowledge of conditions and limitations in the facility license.

Which ONE of the following completes the statements below?

Unit 2 Containment **DESIGN** temperature is ____(1)____.

This is based on a ____(2)____ Break Accident inside Containment.

A.	(1)	230 °F
	(2)	Feed Line
B.	(1)	230 °F
	(2)	Steam Line
C.	(1)	264 °F
	(2)	Feed Line
D.	(1)	264 °F
	(2)	Steam Line

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is incorrect: The temperature basis is 264 °F but this plausible because the Containment Temperature and Pressure Safety Function is 230°F Part 2 is incorrect: Steam line breaks and Feed Line breaks are both considered ESDE in the EOPs. It is plausible that the applicant believe that the water from the feed line will add more energy to the containment than a steam line break and therefore select it as the correct choice.
B.	Incorrect:	Part 1 is incorrect: See explanation A. Part 2 is correct: IAW TECHNICAL SPECIFICATIONS BASES ATTACHMENT 8 OF ADM-25.04 CONTAINMENT SYSTEMS ST. LUCIE UNIT 2, The DBA for this is Steam Line Break per the bases 3.6, **3/4.6.1.5 AIR TEMPERATURE** The limitation on containment average air temperature ensures that The peak containment vessel temperature does not exceed the Containment vessel design temperature of 264 °F during steam line break and loss of coolant accident conditions and is consistent with the safety analyses.
C.	Correct:	Part 1 is correct: IAW U2 TS 5.2.2 , **DESIGN PRESSURE AND TEMPERATURE** The steel reactor containment building is designed and shall be maintained for a maximum internal pressure of 44 psig and a temperature of 264 °F. Part 2 is incorrect: See explanation A
D.	Correct:	Part 1 is correct: See explanation C. Part 2 is correct: See explanation B.

Question Number: 90

Tier: 2 Group: 1

K/A: 103 G2.2.38 Containment / Knowledge of conditions and limitations in the facility license.

Importance Rating: 3.6 4.5

10 CFR Part 55: (CFR: 41.7 / 41.10 / 43.1 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know the design basis for the Containment

Technical Reference: TS BASES 3 / 4.6

Proposed references to be provided: None

Learning Objective: PSL OPS 0702600-2

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

5.0 DESIGN FEATURES

5.1 SITE LOCATION

EXCLUSION AREA

The St. Lucie nuclear units are located on Hutchinson Island in St. Lucie County, about halfway between the cities of Fort Pierce and Stuart on the east coast of Florida. The radius of the exclusion area is 0.97 miles from the center of the St. Lucie Plant. The low population zone (LPZ) includes that area within one mile of the center of the St. Lucie Plant.

5.2 CONTAINMENT

CONFIGURATION

5.2.1 The reactor containment building is a steel building of cylindrical shape, with a dome roof and having the following design features:

a. Nominal inside diameter = 140 feet.

b. Nominal inside height = 232 feet.

c. Net free volume = 2.506×10^6 cubic feet.

d. Nominal thickness of vessel walls = 2 inches.

e. Nominal thickness of vessel dome = 1 inch.

f. Nominal thickness of vessel bottom = 2 inches.

5.2.1.2 SHIELD BUILDING

a. Minimum annular space = 4 feet.

b. Annulus nominal volume = 543,000 cubic feet.

c. Nominal outside height (measured from top of foundation mat to the top of the dome) = 228.5 feet.

d. Nominal inside diameter = 148 feet.

e. Cylinder wall minimum thickness = 3 feet.

f. Dome minimum thickness = 2.5 feet.

g. Dome inside radius = 112 feet.

DESIGN PRESSURE AND TEMPERATURE

5.2.2 The steel reactor containment building is designed and shall be maintained for a maximum internal pressure of 44 psig and a temperature of 264°F.

3/4.6 CONTAINMENT SYSTEMS (continued)

BASES (continued)

3/4.6.1 CONTAINMENT VESSEL (continued)

3/4.6.1.3 CONTAINMENT AIR LOCKS

The limitations on closure and leak rate for the containment air locks are required to meet the restrictions on CONTAINMENT INTEGRITY and containment leak rate. Surveillance testing of the air lock seals provides assurance that the overall air lock leakage will not become excessive due to seal damage during the intervals between air lock leakage tests.

3/4.6.1.4 INTERNAL PRESSURE

The limitations on containment internal pressure ensure that (1) the containment structure is prevented from exceeding its design negative pressure differential with respect to the annulus atmosphere of 0.7 psi and (2) the containment peak pressure does not exceed the design pressure of 44 psig during loss of coolant accident conditions.

The maximum peak pressure expected to be obtained from a loss of coolant accident is 43.48 psig. The limit of 0.4 psig for initial positive containment pressure will limit the maximum peak pressure to less than the design pressure of 44 psig and is consistent with the safety analyses.

3/4.6.1.5 AIR TEMPERATURE

The limitation on containment average air temperature ensures that the peak containment vessel temperature does not exceed the containment vessel design temperature of 264°F during steam line break and loss of coolant accident conditions and is consistent with the safety analyses.

3/4.6.1.6 CONTAINMENT VESSEL STRUCTURAL INTEGRITY

The limitation ensures that the structural integrity of the containment steel vessel will be maintained comparable to the original design standards for the life of the facility. Structural integrity is required to ensure that the vessel will withstand the maximum pressure of 43.48 psig in the event of the limiting design basis loss of coolant accident. A visual inspection in accordance with the Containment Leakage Rate Testing Program is sufficient to demonstrate this capability.

ATTACHMENT 1
SAFETY FUNCTION STATUS CHECK SHEET
(Page 9 of 10)

8. CONTAINMENT TEMPERATURE AND PRESSURE

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √

- Any of Conditions 1, 2, 3 or 4, will satisfy this safety function.
- Hydrogen criterion may be omitted until hydrogen analyzer is in service.

Condition 1

A. Containment Temperature	Less than 230°F	
		AND
B. Containment Pressure	Less than 5.4 psig	
		AND
C. Hydrogen Concentration	Less than 0.5%	

OR

Condition 2

A. TWO Containment Spray Headers	Flow in each header at least 2700 gpm	
		AND
B. Containment Pressure	Less than 42 psig	
		AND
C. Hydrogen Concentration	Less than 3.0%	

OR

(continued on next page)

Design Bases

EO-2

- Criteria 16 – Containment Design
  - Reactor containment and associated systems shall be designed to establish an essentially leak tight barrier against the uncontrolled release of radioactivity to the environment and to assure that the containment design conditions important to safety are not exceeded for as long as postulated accident conditions require.
    - Per Technical Specifications, the CNTMT vessel is designed and shall be maintained for a maximum internal pressure of 44 psig and a temperature of 264°F.

DESIGN PRESSURE AND TEMPERATURE EO-4

- Meet General Design Criteria of 10CFR50

44 psig design pressure

264 degrees Fahrenheit

What's Normal?

EO-4

- For containment, normal temperature is a little above ambient, but required to be **< 120 degrees F**.
- For containment pressure:
  - U1: -0.7 to 0.5 psig
  - U2: -0.368 to 0.4 psig

91. 001 A2.06 Control Rod Drive / Ability to (a) predict the impacts of the following malfunction or operations on the CRDS- and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Effects of xenon on reactivity

Given the following conditions:

00:00:00	Unit 1 has been at 50% for the previous 7 days to repair the 1A MFP
04:00:00	Unit 1 raised power to 90% Group 7 CEAs are at 131 inches withdrawn
07:01:00	Group 7 CEAs are moved for ASI control The following alarms occur: K-26 , CEDS TROUBLE / CONTINOUS GRIPPER VOLTAGE HIGH I&C Reports that Group 7 CEA #1 ACTM TRBL alarm is FAST flashing and has a missing phase from the power switch

Which ONE of the following completes the statements below?

Assuming NO operator action, between time 04:00:00 and 07:00:00, ____(1)____ reactivity will be added to the core due to the change in Xenon concentration.

In accordance with TS 3.1.3.1, Full Length CEA position and ADM-11.16, Transient Procedure Use and Adherence, the affected CEA ____(2)____ required to be declared INOPERABLE.

A.	(1)	positive
	(2)	is
B.	(1)	positive
	(2)	is NOT
C.	(1)	negative
	(2)	is
D.	(1)	negative
	(2)	is NOT

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: It is plausible that the applicant have a misconception about the production of Xenon and xenon burnout and how it effects reactivity in the core. Part 2 incorrect: IAW ADM-11.16, 4.5.3.3.B, CEA control malfunctions that result in the inability to move a CEA (e.g., CEA lift rod failure), but do NOT impact tripability, do NOT result in CEA inoperability. This conclusion is consistent with the NRC's positions in Regulatory Issue Summary (RIS), which provides guidance on operability determinations, and is consistent with the Basis for NUREG-1432 which state that, between required performances of the S.R., "if a CEA(s) is discovered to be immovable, but remains trippable, the CEA is considered to be OPERABLE."
B.	Correct:	Part 1 correct: As power is raised from 50 % to 90 % xenon burnout increases from higher power levels which will add positive reactivity to the core. Part 2 correct: IAW ADM-11.16, 4.5.3.3.B, CEA control malfunctions that result in the inability to move a CEA (e.g., CEA lift rod failure), but do NOT impact tripability, do NOT result in CEA inoperability. This conclusion is consistent with the NRC's positions in Regulatory Issue Summary (RIS), which provides guidance on operability determinations, and is consistent with the Basis for NUREG-1432 which state that, between required performances of the S.R., "if a CEA(s) is discovered to be immovable, but remains trippable, the CEA is considered to be OPERABLE."
C.	Incorrect:	Part 1 correct: See analysis B Part 2 incorrect: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 correct: See analysis D.

Question Number: 91

Tier: 2 Group: 2

K/A: 001 A2.06 Control Rod Drive / Ability to (a) predict the impacts of the following malfunction or operations on the CRDS- and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Effects of xenon on reactivity

Importance Rating: 3.4 3.7

10 CFR Part 55: (CFR: 41.5/43.5/45.3/45.13)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to predict the impact of the malfunction and use TS to mitigate

Technical Reference: TS 3.1.3.1, ADM-11.16

Proposed references to be provided: None

Learning Objective: PSL OPS 0702859 - 3

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

CAUSES: Either of the following, indicating an ACTM Module malfunction:

- Timer Failure Alarm (TFA) indicating neither a high nor low pulse is available during an insert or withdraw demand to the UG or LG coil for a specified time period.
- High Voltage Alarm (HVA) provided for an uncontrollable high voltage condition.

CEDS TROUBLE/ CONTINUOUS GRIPPER VOLTAGE HIGH

K-26

DEVICE:	SETPOINT:	LOCATION:
ACTM Module	Multiple	CEDS Logic Cabinets
TFA	Timer Failure Alarm	ACTM Module
HVA	Uncontrollable High Voltage	ACTM Module

ALARM CONFIRMATION

1. ACTM local indication.

OPERATOR ACTIONS

CAUTION

Actions of 1-AOP-66.03, CEDS Trouble Abnormal Operations, must be performed within ten minutes of receiving this annunciator to prevent damage to upper gripper coils.

1. **GO TO** 1-AOP-66.03, CEDS Trouble Abnormal Operations.
2. **NOTIFY** I&C.

REFERENCES: CWD 8770-B-327 SH 430, 1074

REACTIVITY CONTROL SYSTEMS

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

FULL LENGTH CEA POSITION

LIMITING CONDITION FOR OPERATION

3.1.3.1 The CEA Block Circuit and all full length (shutdown and regulating) CEAs shall be OPERABLE with each CEA of a given group positioned within 7.5 inches (indicated position) of all other CEAs in its group.

APPLICABILITY: MODES 1* and 2*.

ACTION:

a. With one or more full length CEAs inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.

b. With the CEA Block Circuit inoperable, within 6 hours either:

1. With one CEA position indicator per group inoperable, take action per Specification 3.1.3.3, or

2. With the group overlap and/or sequencing interlocks inoperable, maintain CEAs in groups 3, 4, 5 and 6 fully withdrawn and withdraw the CEAs in group 7 to less than 5% insertion and place and maintain the CEA drive system mode switch in either the "Manual" or "Off" position, or

3. Be in at least HOT STANDBY.

c. With one full length CEA inoperable due to causes other than addressed by Action a above, but within its above specified alignment requirements and either fully withdrawn or within the long term steady state insertion limits if in CEA group 7, operation in MODES 1 and 2 may continue.

d. With one or more full length CEAs misaligned from any other CEAs in its group by more than 7.5 inches but less than 15 inches, operation in MODES 1 and 2 may continue, provided that within one hour the misaligned CEA(s) is either:

1. Restored to OPERABLE status within its above specified alignment requirements, or

* See Special Test Exceptions 3.10.2 and 3.10.5.

2. Declared inoperable and satisfy SHUTDOWN MARGIN requirements of Specification 3.1.1.1. After declaring the CEA inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6 for up to 7 days per occurrence with a total accumulated time of $\leq$ 14 days per calendar year provided all of the following conditions are met:

   a) Within 1 hour, the remainder of the CEAs in the group with the inoperable CEA shall be aligned to within 7.5 inches of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown on COLR Figure 3.1-2; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.

   b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

   Otherwise, be at least HOT STANDBY within the next 6 hours.

e. With one full length CEA misaligned from any other CEA in its group by 15 or more inches, operation in MODES 1 and 2 may continue provided that the misaligned CEA is positioned within 7.5 inches of other CEAs in its group in accordance with the time constraints shown in COLR Figure 3.1-1a.

f. With one full length CEA misaligned from any other CEA in its group by 15 or more inches beyond the time constraints shown in COLR Figure 3.1-1a, reduce power to $\leq$ 70% of RATED THERMAL POWER prior to completing ACTION f.1 or f.2.

   1. Restored the CEA to OPERABLE status within its specified alignment requirements, or

   2. Declare the CEA inoperable and satisfy the SHUTDOWN MARGIN requirements of Specification 3.1.1.1. After declaring the CEA inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6 provided:

      a) Within 1 hour, the remainder of the CEAs in the group with the inoperable CEA shall be aligned to within 7.5 inches of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown on COLR Figure 3.1-2; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.

FULL LENGTH CEA POSITION (continued)

LIMITING CONDITION FOR OPERATION (continued)

b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

Otherwise, be at least HOT STANDBY within the next 6 hours.

g. With more than one full length CEA inoperable or misaligned from any other CEA in its group by 15 inches (indicated position) or more, be in HOT STANDBY within 6 hours.

h. With one full length CEA inoperable due to causes other than addressed by ACTION a above, and inserted beyond the long term steady state insertion limits but within its above specified alignment requirements, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full-length CEA shall be determined to be within 7.5 inches (indicated position) of all other CEAs in its group in accordance with the Surveillance Frequency Control Program except during time intervals when the Deviation Circuit and/or CEA Block Circuit are inoperable, then verify the individual CEA positions at least once per 4 hours.

4.1.3.1.2 Each full length CEA not fully inserted shall be determined to be OPERABLE by inserting it at least 7.5 inches in accordance with the Surveillance Frequency Control Program.

4.1.3.1.3 The CEA Block Circuit shall be demonstrated OPERABLE in accordance with the Surveillance Frequency Control Program by a functional test which verifies that the circuit prevents any CEA from being misaligned from all other CEAs in its group by more than 7.5 inches (indicated position).

4.1.3.1.4 The CEA Block Circuit shall be demonstrated OPERABLE by a functional test which verifies that the circuit maintains the CEA group overlap and sequencing requirements of Specification 3.1.3.6 and that the circuit prevents the regulating CEAs from being inserted beyond the Power Dependent Insertion Limit of COLR Figure 3.1-2:

*a. Prior to each entry into MODE 2 from MODE 3, except that such verification need not be performed more often than once per 92 days, and

b. In accordance with the Surveillance Frequency Control Program.

* The licensee shall be excepted from compliance during the startup test program for an entry into MODE 2 from MODE 3 made in association with a measurement of power defect.

4.5.3 Operational Guidance for Section 3/4.1 (continued)

2. (continued)

D. T.S. 3.1.2.8 has a requirement to ensure that two of the following four borated water sources are operable:

- 1(2) A BAMT
- 1(2) B BAMT
- Combined BAMT Levels
- RWT

If using the combined BAMT level option, the RWT must be the second borated water source.

E. Boric Acid Makeup Tank (BAMT) batching/dilutions

- Due to the resultant change in boric acid concentration caused by the addition of boric acid of an unknown concentration (or just water), a BAMT should be declared INOPERABLE prior to batching. Compliance with TS 3.1.2 using the other BAMT and the Refueling Water Tank should be confirmed in advance of declaring the affected BAMT INOPERABLE.
- Once the batch is complete, OPERABILITY of the BAMT should be confirmed by performing 1/2-OSP-02.07, Boration Flowpaths and Sources.
- Document performance of the batching evolution in the Narrative Logs.

3. 3/4.1.3 Movable Control Assemblies

A. With the CEA Block Circuit inoperable, with one CEA position indicator per group inoperable and directed to take action per T.S. 3.1.3.3 by the performance of action b.1, then S.R.4.1.3.1.1 no longer applies.

4.5.3 Operational Guidance for Section 3/4.1 (continued)

3. (continued)

B. CEA control malfunctions that result in the inability to move a CEA (e.g., CEA lift rod failure), but do **NOT** impact tripability, do **NOT** result in CEA inoperability. This conclusion is consistent with the NRC's positions in Regulatory Issue Summary (RIS), which provides guidance on operability determinations, and is consistent with the Basis for NUREG-1432 which state that, between required performances of the S.R., "if a CEA(s) is discovered to be immovable, but remains trippable, the CEA is considered to be OPERABLE."

C. Failure to satisfactorily complete 1/2-OSP-66.01, Control Element Assembly Exercise for a single CEA, does **NOT** result in the CEA Block Circuit being declared inoperable. The unsatisfactory performance, or exceeding the surveillance periodicity, will result in the CEA being declared inoperable and only the action for Tech Spec 3.1.3.1.c (Unit 1) or Tech Spec 3.1.3.1.h (Unit 2), will be entered. The associated actions for a single CEA inoperability, including required compensatory surveillances, shall be followed. This is limited to a single CEA inoperability.

Increase in Reactor Power

- Reactor power raised from 50% to 100% power (up power transient)
- Xenon burnout increases from higher power level
- Decay of xenon remains constant
- Immediate increase in direct production of Xe-135 occurs (5% of production)
- Concentration of xenon in core initially decreases

Increase in Reactor Power

- 95% of xenon production is from Iodine-135 decay, 6.5 hour half-life, increased xenon production is delayed
- After roughly 4-6 hours (power level dependent):
  - Rate of production of xenon from iodine and fission equals rate of removal of xenon by burnup and decay
  - Xenon reaches a minimum and begins to build to equilibrium
  - Equilibrium will be reached in 20-30 hours
- Most rapid possible burnout of xenon occurs when a reactor is started up and operated at full power while a maximum peak xenon condition exists
- Power increases can also be made so gradually that no dip in xenon occurs

Increase in Reactor Power

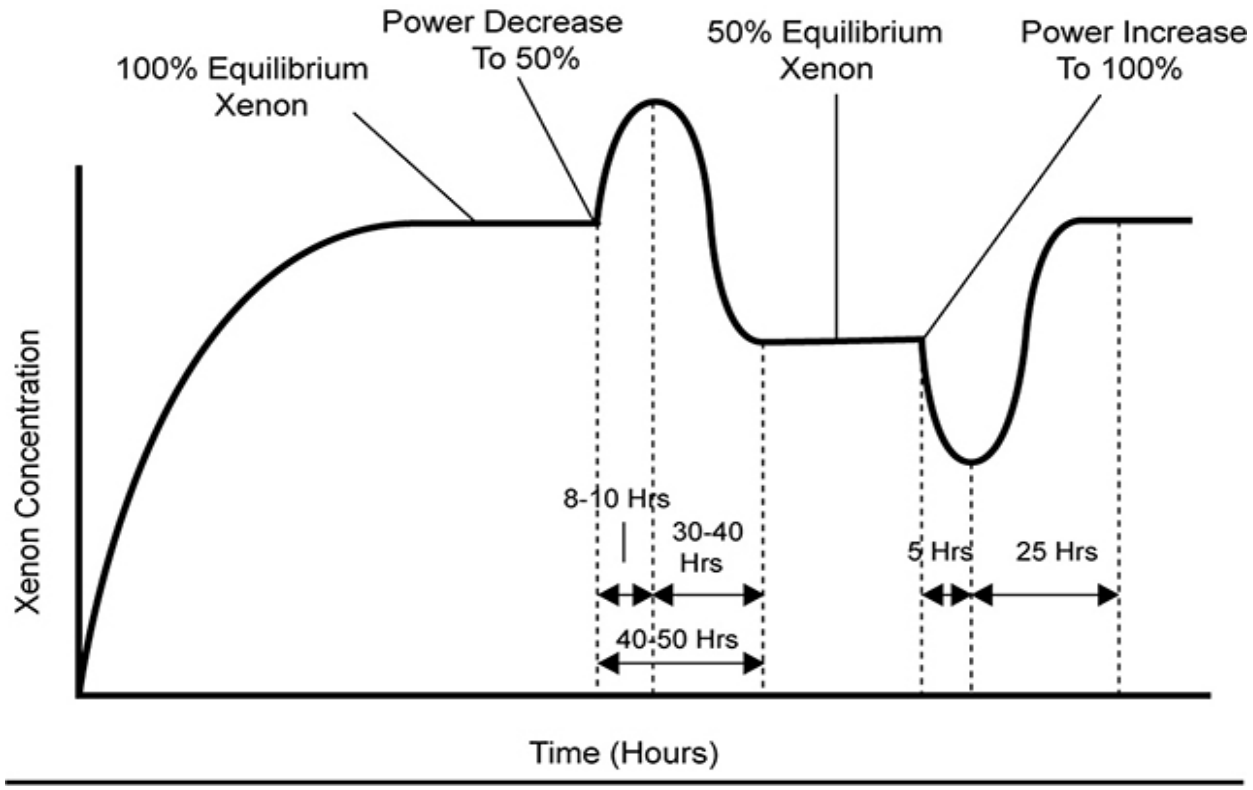

Figure: Xenon-135 Variations During Power Changes

Rod Insertion Limits

Axial Flux Difference (AFD)

- ΔΦ or ΔI - difference in power production between the upper and lower half of the core as indicated by the delta between the power range upper and lower detectors
- Power Range detectors are Ion Chambers and produce a current (I) output proportional to neutron Φ

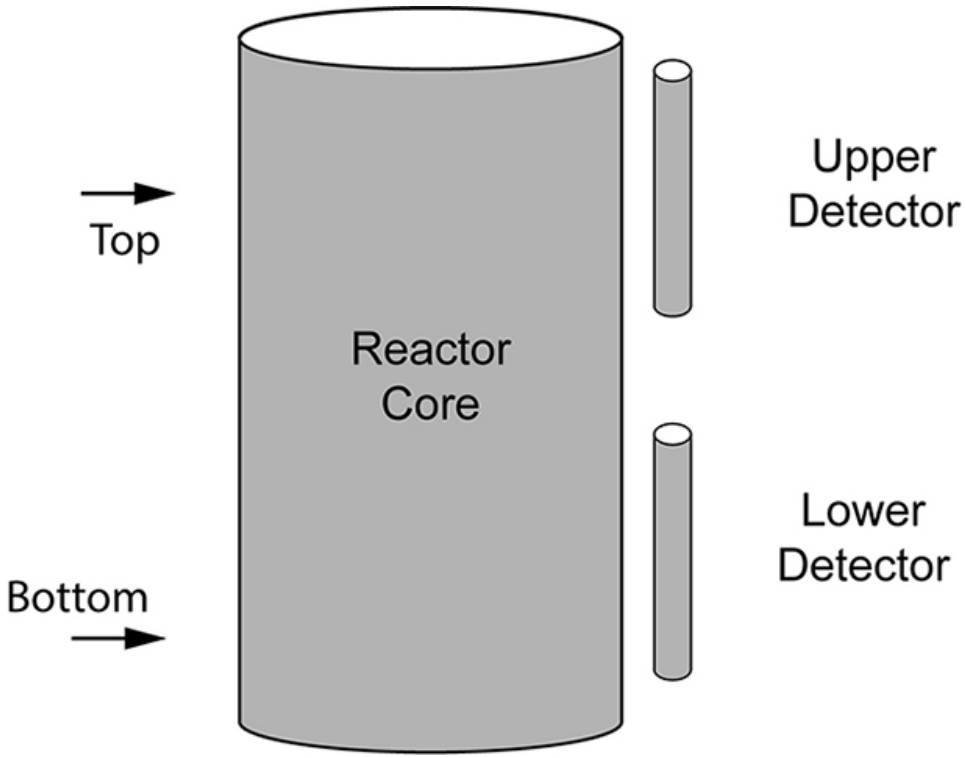

Figure: Upper and Lower Power Range Neutron Detector Locations

Rod Insertion Limits

Axial Flux Distribution - Axial Flux Difference

- Difference is also proportional to difference in axial neutron flux between upper and lower halves of core:

$$\Delta\Phi = \Phi_{top} - \Phi_{bottom}$$

- For detectors, change in flux can be equated to change in the ion chamber detector current:

$$\Delta\Phi = \Phi_{top} - \Phi_{bottom}$$

Rod Insertion Limits

Axial Flux Distribution - Axial Flux Difference

- AFD must be maintained in specified band during reactor operation to ensure more uniform axial flux distribution across core ⇒ preventing high peak power in either top or bottom of core (Technical Specifications)
  - High peak power results in high fission product concentration in that location
  - Decay heat generated by fission products could overheat fuel during loss of coolant accident
- Control rod position used to maintain AFD within allowed operating range during reactor operations
- Under most operating conditions, AFD limitation more restrictive than rod insertion limits

92. 016 G2.2.3 Non-Nuclear Instrumentation / (multi-unit license) Knowledge of the design, procedural and operational differences between units

Given the following conditions:

- Unit 1 is at 100% power

Subsequently:

- LIC-9013A, S/G Level Channel fails LOW
- 1-AOP-99.01, Loss of Tech Spec Instrumentation has been entered
- LOW LVL SG (RPS) has been placed in BYPASS

Which ONE of the following describes the required action(s) and the Tech Spec implication for continued operation?

1-AOP-99.01, requires placing ____(1)____ in BYPASS.

In accordance with TS 3.3.1.1, RPS Instrumentation, with the LOW LVL SG (RPS) remaining in BYPASS, Unit operation ____(2)____ be continued until the next cold shutdown.

A.	(1)	AFAS-1 ONLY
	(2)	can
B.	(1)	AFAS-1 ONLY
	(2)	can NOT
C.	(1)	AFAS-1 and AFAS-2
	(2)	can
D.	(1)	AFAS-1 and AFAS-2
	(2)	can NOT

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 is correct: See Explanation B Part 2 is incorrect. It is plausible because on Unit 2 this is allowed where on Unit 1 it must be placed in trip to continue operation until the next cold shutdown.
B.	Correct:	Part 1 is correct. 1-AOP-99.01 Step 4.2.10.2: Has the operator perform ONE of the following: Bypass affected BTU or Trip Affected BTU for LIC-9103 ONLY perform on AFAS-1. Part 2 is correct: Tech Spec 3.3.1.1, Table 3.3-1 RPS Instrumentation, Functional Unit Action 2. 7.c SG Level Low is covered by Action 14a/b/c. Action 14 has a 48 hour action to restore operability due to being energize to actuate bistables. If operability is not restored in 48 hours, it must be placed in trip then continued unit operation is allowed. The question is not evaluating the applicants knowing of when to take action, but if long term continued operation is allowed.
C.	Incorrect:	Part 1 incorrect but plausible: The applicant may believe that bypassing both AFAS-1 AND AFAS-2 is required because SG Pressure or Feed Header pressure instruments require that both AFAS-1 and AFAS-2 are bypassed. SG Level allows bypassing only the affected train. Part 2 correct: See Explanation A
D.	Incorrect:	Part 1 is incorrect: See Explanation C Part 2 is correct: See Explanation B

.

Question Number: 92

Tier: 2 Group: 2

K/A: 016 G2.2.3 Non-Nuclear Instrumentation / (multi-unit license) Knowledge of the design, procedural and operational differences between units

Importance Rating: 3.8 3.9

10 CFR Part 55: (CFR: 41.5 / 41.6 / 41.7 / 41.10 / 45.12)

10CFR55.43.b: 10CFR55.43.b(5)

K/A Match: K/A is matched because the applicant is required to know the actions contained the AOP and the Tech Spec implications.

Technical Reference: 1-AOP-99.01, Loss of Tech Spec Instrumentation
TS 3.3.2.1 Table 3.3-3 Action 14

Proposed references to be provided: None

Learning Objective: PSL OPS 0702404-11-13

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: New question for the 2019 NRC Exam

Comments:

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.10 S/G Level Channel Failure

☐ **1.** **CIRCLE** affected instrument and channel:

- LIC-9013 A / B / C / D
- LIC-9023 A / B / C / D

NOTE

- Bypassing AFAS will require AFAS Keyring 192 (five keys).
- It is preferable to leave the AFAS BTUs in BYPASS. (Section 6.1.3, Management Directive 1)
- An AFAS channel in the TRIPPED condition is limited to 48 hours per Tech Spec 3.3.2.1 Table 3.3-3. (Section 6.1.3, Management Directive 1)

☐ **2.** **PERFORM** one of the following for the affected BTU listed:

- LOW LVL SG (RPS) (Key 84)
- For LIC-9013 only AFAS-1
- For LIC-9023 only AFAS-2

A. **BYPASS** affected BTU using keyswitch.

B. **TRIP** affected BTU per Attachment 3, Tripping and Restoring Protection Bistables.

INSTRUCTIONS **CONTINGENCY ACTIONS**

4.2.10 S/G Level Channel Failure (continued)

☐ **3.** **PLACE** S/G HI LEVEL OVERRIDE keyswitch for affected channel in BYPASS:
(rear of RTGB-102)

- Channel A (Key 15)
- Channel B (Key 16)
- Channel C (Key 17)
- Channel D (Key 18)

INSTRUMENTATION

3/4.3.2 ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.2.1 The Engineered Safety Feature Actuation System (ESFAS) instrumentation channels and bypasses shown in Table 3.3-3 shall be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.3-4.

APPLICABILITY: As shown in Table 3.3-3.

ACTION:

a. With an ESFAS instrumentation channel trip setpoint less conservative than the value shown in the Allowable Values column of Table 3.3-4, declare the channel inoperable and apply the applicable ACTION requirement of Table 3.3-3 until the channel is restored to OPERABLE status with the trip setpoint adjusted consistent with the Trip Setpoint value.

b. With an ESFAS instrumentation channel inoperable, take the ACTION shown in Table 3.3-3.

SURVEILLANCE REQUIREMENTS

4.3.2.1.1 Each ESFAS instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations during the modes and at the frequencies shown in Table 4.3-2.

4.3.2.1.2 The logic for the bypasses shall be demonstrated OPERABLE during the at power CHANNEL FUNCTIONAL TEST of channels affected by bypass operation. The total bypass function shall be demonstrated OPERABLE in accordance with the Surveillance Frequency Control Program during CHANNEL CALIBRATION testing of each channel affected by bypass operation.

4.3.2.1.3 The ENGINEERED SAFETY FEATURES RESPONSE TIME of each ESFAS function shall be demonstrated to be within the limit in accordance with the Surveillance Frequency Control Program. Each test shall include at least one channel per function.

TABLE 3.3-3

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
1. SAFETY INJECTION (SIAS)					
a. Manual (Trip Buttons)	2	1	2	1, 2, 3, 4	8
b. Containment Pressure – High	4	2	3	1, 2, 3	9
c. Pressurizer Pressure – Low	4	2	3	1, 2, 3(a)	9
2. CONTAINMENT SPRAY (CSAS)					
a. Manual (Trip Buttons)	2	1	2	1, 2, 3, 4	8
b. Containment Pressure – High-High	4	2(b)	3	1, 2, 3	10a, 10b, 10c
3. CONTAINMENT ISOLATION (CIS)					
a. Manual (Trip Buttons)	2	1	2	1, 2, 3, 4	8
b. Containment Pressure – High	4	2	3	1, 2, 3	9
c. Containment Radiation – High	4	2	3	1, 2, 3, 4	9
d. SIAS	---------- (See Functional Unit 1 above) ----------				
4. MAIN STEAM LINE ISOLATION (MSIS)					
a. Manual (Trip Buttons)	2/steam generator	1/steam generator	2/operating steam generator	1, 2, 3, 4	8
b. Steam Generator Pressure – Low	4/steam generator	2/steam generator	3/steam generator	1, 2, 3(c)	9

TABLE 3.3-3 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
5. CONTAINMENT SUMP RECIRCULATION (RAS)					
a. Manual RAS (Trip Buttons)	2	1	2	1, 2, 3, 4	8
b. Refueling Water Tank - Low	4	2	3	1, 2, 3	13
6. LOSS OF POWER					
a. 4.16 kv Emergency Bus Under-voltage (Loss of Voltage)	2/Bus	2/Bus	1/Bus	1, 2, 3	12
b. 4.16 kv Emergency Bus Under-voltage (Degraded Voltage)	2/Bus	2/Bus	1/Bus	1, 2, 3	12
c. 480 V Emergency Bus Under-voltage (Degraded Voltage)	2/Bus	2/Bus	1/Bus	1, 2, 3	12
7. AUXILIARY FEEDWATER (AFAS)					
a. Manual (Trip Buttons)	4/SG	2/SG	4/SG	1, 2, 3	11
b. Automatic Actuation Logic	4/SG	2/SG	3/SG	1, 2, 3	11
c. SG Level (1A/1B) - Low	4/SG	2/SG	3/SG	1, 2, 3	14a, 14b, 14c
8. AUXILIARY FEEDWATER ISOLATION					
a. SG 1A – SG 1B Differential Pressure	4/SG	2/SG	3/SG	1, 2, 3	14a, 14b, 14c
b. Feedwater Header 1A – 1B Differential Pressure	4/SG	2/SG	3/SG	1, 2, 3	14a, 14c

TABLE 3.3-3 (continued)

TABLE NOTATION

ACTION 13 - With the number of OPERABLE channels one less than the Total Number of Channels, operation may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in either the bypassed or tripped condition within 1 hour. If OPERABILITY can not be restored within 48 hours, be in at least HOT STANDBY within 6 hours and in HOT SHUTDOWN within the following 6 hours.

b. The Minimum Channels OPERABLE requirement is met; however, one additional channel may be bypassed for up to 2 hours while performing tests and maintenance on that channel provided the other inoperable channel is placed in the tripped condition.

ACTION 14 - With the number of channels OPERABLE one less than the Total Number of Channels, operation may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in either the bypassed or tripped condition within 1 hour. If an inoperable SG level channel can not be restored to OPERABLE status within 48 hours, then AFAS-1 or AFAS-2 as applicable in the inoperable channel shall be placed in the bypassed condition. If an inoperable SG DP or FW Header DP channel can not be restored to OPERABLE status within 48 hours, then both AFAS-1 and AFAS-2 in the inoperable channel shall be placed in the bypassed condition. The channel shall be returned to OPERABLE status no later than during the next COLD SHUTDOWN.

b. Within 1 hour, all functional units receiving an input from the inoperable channel are also bypassed or tripped.

c. With the number of channels OPERABLE one less than the Minimum Channels OPERABLE, operation may proceed provided one of the inoperable channels has been bypassed and the other inoperable channel has been placed in the tripped condition within 1 hour. Restore one of the inoperable channels to OPERABLE status within 48 hours or be in at least HOT STANDBY within 6 hours and in HOT SHUTDOWN within the following 6 hours.

3/4.3 INSTRUMENTATION

3/4.3.1 REACTOR PROTECTIVE INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.1 As a minimum, the reactor protective instrumentation channels and bypasses of Table 3.3-1 shall be OPERABLE.

APPLICABILITY: As shown in Table 3.3-1.

ACTION:

As shown in Table 3.3-1.

SURVEILLANCE REQUIREMENTS

4.3.1.1 Each reactor protective instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations for the MODES and at the frequencies shown in Table 4.3-1.

4.3.1.2 The logic for the bypasses shall be demonstrated OPERABLE prior to each reactor startup unless performed during the preceding 92 days. The total bypass function shall be demonstrated OPERABLE in accordance with the Surveillance Frequency Control Program during CHANNEL CALIBRATION testing of each channel affected by bypass operation.

4.3.1.3 The REACTOR TRIP SYSTEM RESPONSE TIME of each reactor trip function shall be demonstrated to be within its limit in accordance with the Surveillance Frequency Control Program. Neutron detectors are exempt from response time testing. Each test shall include at least one channel per function.

TABLE 3.3-1

REACTOR PROTECTIVE INSTRUMENTATION

	FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
1.	Manual Reactor Trip	4 4	2 2	4 4	1, 2 3*, 4*, 5*	1 5
2.	Variable Power Level – High	4	2(a)(d)	3	1, 2	2
3.	Pressurizer Pressure – High	4	2	3	1, 2	2
4.	Thermal Margin/Low Pressure	4	2(a)(d)	3	1, 2	2
5.	Containment Pressure – High	4	2	3	1, 2	2
6.	Steam Generator Pressure – Low	4/SG	2/SG(b)	3/SG	1, 2	2
7.	Steam Generator Pressure Difference – High	4	2(a)(d)	3	1, 2	2
8.	Steam Generator Level – Low	4/SG	2/SG	3/SG	1, 2	2
9.	Local Power Density – High	4	2(c)(d)	3	1	2
10.	Loss of Component Cooling Water to Reactor Coolant Pumps	4	2	3	1, 2	2
11.	Reactor Protection System Logic	4	2	3	1, 2 3*, 4*, 5*	2 5
12.	Reactor Trip Breakers	4	2(f)	4	1, 2 3*, 4*, 5*	4 5
13.	Wide Range Logarithmic Neutron Flux Monitor					
	a. Startup and Operating – Rate of Change of Power – High	4	2(e)(g)	3	1, 2	2
	b. Shutdown	4	0	2	3, 4, 5	3
14.	Reactor Coolant Flow – Low	4/SG	2/SG(a)(d)	3/SG	1, 2	2
15.	Loss of Load (Turbine Hydraulic Fluid Pressure – Low)	4	2(c)	3	1	2

TABLE 3.3-1 (Continued)

TABLE NOTATION

* With the protective system trip breakers in the closed position, the CEA drive system capable of CEA withdrawal, and fuel in the reactor vessel.

(a) Trip may be manually bypassed below 0.5% of RATED THERMAL POWER in conjunction with (d) below; bypass shall be automatically removed when Wide Range Logarithmic Neutron Flux power is greater than or equal to 0.5% of RATED THERMAL POWER.

(b) Trip may be manually bypassed below 705 psig; bypass shall be automatically removed at or above 705 psig.

(c) Trip may be bypassed below 15% of RATED THERMAL POWER; bypass shall be automatically removed when Power Range Neutron Flux power is greater than or equal to 15% of RATED THERMAL POWER.

(d) Trip may be bypassed during testing pursuant to Special Test Exception 3.10.3.

(e) Trip may be bypassed below 10^{-4}% and above 15% of RATED THERMAL POWER; bypass shall be automatically removed when Wide Range Logarithmic Neutron Flux power is $\geq$ 10^{-4}% and Power Range Neutron Flux power $\leq$ 15% of RATED THERMAL POWER.

(f) Each channel shall be comprised of two trip breakers; actual trip logic shall be one-out-of-two taken twice.

(g) There shall be at least two decades of overlap between the Wide Range Logarithmic Neutron Flux Monitoring Channels and the Power Range Neutron Flux Monitoring Channels.

ACTION STATEMENTS

ACTION 1 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and/or open the protective system trip breakers.

TABLE 3.3-1 (Continued)

ACTION STATEMENTS

ACTION 2 - a. With the number of channels OPERABLE one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may continue provided the inoperable channel is placed in the bypassed or tripped condition within 1 hour. The channel shall be returned to OPERABLE status no later than during the next COLD SHUTDOWN.

b. With the number of channels OPERABLE one less than the Minimum Channels OPERABLE, STARTUP and/or POWER OPERATION may continue provided the following conditions are satisfied:

1. Verify that one of the inoperable channels has been bypassed and place the other inoperable channel in the tripped condition within 1 hour.

2. All functional units affected by the bypassed/tripped channel shall also be placed in the bypassed/tripped condition.

With a channel process measurement circuit that affects multiple functional units inoperable or in test, bypass or trip all associated functional units as listed below:

Process Measurement Circuit	Functional Unit Bypassed
1. Safety Channel – Nuclear Instrumentation	
Wide Range	Rate of Change of Power – High (RPS)
Linear Range	Variable Power Level – High (RPS) Local Power Density – High (RPS) Thermal Margin/Low Pressure (RPS)
2. Pressurizer Pressure -	Pressurizer Pressure – High (RPS) Thermal Margin/Low Pressure (RPS) Pressurizer Pressure – Low (ESF)
3. Containment Pressure -	Containment Pressure – High (RPS) Containment Pressure – High (ESF)
4. Steam Generator Pressure -	Steam Generator Pressure – Low (RPS) Thermal Margin/Low Pressure (RPS) AFAS-1 and AFAS-2 (AFAS) Steam Generator Pressure – Low (ESF)
5. Steam Generator Level -	Steam Generator Level – Low (RPS) If SG-2A, then AFAS-1 (AFAS) If SG-2B, then AFAS-2 (AFAS)

93. 045 A2.17 Ability to (a) predict the impacts of the following malfunctions or operation on the MT/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Malfunction of electrohydraulic control

Given the following conditions:

00:00:00	Unit 2 is at 100% power 2A DEH Pump is Running 2B DEH Pump is in STANDBY
00:00:30	The following annunciators are received: D-56, DEH Reservoir Level Low-Low D-57, DEH Reservoir Level High/Low
00:01:00	D-47, DEH Pump Disch Press High/Low PI-22-34, EH Fluid is 1500 psig and slowly LOWERING NPO Reports a DEH leak in the Turbine Building Mezzanine
00:15:00	The DEH Leak has been isolated NWE estimates 115 gallons of **HYDRAULIC FLUID** has leaked out and is contained to the Turbine Building Mezzanine and 19' 5" level

Which ONE of the following completes the statements below?

At time 00:01:00, ____(1)____ DEH pump(s) will be running.

In accordance with ADM-27.20, Oil Spill Emergency Response, this ____(2)____ a reportable quantity.

(REFERENCE PROVIDED)

A.	(1)	ONLY 1
	(2)	is
B.	(1)	ONLY 1
	(2)	is NOT
C.	(1)	BOTH
	(2)	is

D.	(1)	BOTH
	(2)	is NOT

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 correct: see explanation B. Part 2 incorrect: is reportable is plausible because if the applicant selects the 1st criteria the volume leaked is greater than 100 gallons on an impervious surface which would be reportable.
B.	Correct:	Part 1 is correct: The standby DEH pump normally starts on DEH pressure < 1550 psig, but due to the Low-Low Level lockout is present as indicated by D-56, the auto start is blocked. Part 2 is correct: Per ADM-27.20, Attachment 1, Step 6 it is not reportable because Hydraulic Fluid falls into 2nd criteria.
C.	Incorrect:	Part 1 incorrect: Plausible because the standby DEH pump normally starts on DEH pressure < 1550 psig, but due to the Low-Low Level lockout is present as indicated by D-56, the auto start is blocked. Part 2 incorrect: See explanation A.
D.	Incorrect:	Part 1 incorrect: Plausible because the standby DEH pump normally starts on DEH pressure < 1550 psig, but due to the Low-Low Level lockout is present as indicated by D-56, the auto start is blocked. Part 2 correct: See explanation B.

Question Number: 93

Tier: 2 Group: 2

K/A: 045 A2.17 Ability to (a) predict the impacts of the following malfunctions or operation on the MT/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Malfunction of electrohydraulic control

Importance Rating: 2.7 2.9

10 CFR Part 55: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to predict the response of the DEH system and use procedures to mitigate the event

Technical Reference: ADM-27.20

Proposed references to be provided: ADM-27.20, Attachment 1, Steps 5 and 6

Learning Objective: PSL OPS 0702409 - 4

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

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Reportable Oil Spill Checklist
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NOTE

- **Spills to Navigable Waters require Immediate FDEP notification**
- Navigable waters include the Barge Slip, Big Mud Creek, Indian River Lagoon, and the Atlantic Ocean
- Do not use dispersants in response to an oil spill.
- The East, West, South and Southeast Stormwater basins are part of the St. Lucie stormwater drainage system and are not considered navigable waters. The plant's intake and discharge canals are not considered navigable waters. Reportability criteria for spills to the stormwater drainage system or cooling canal are based on volume of oil spilled.

5. REPORTABILITY - 1st Criteria

Definition Petroleum: Gasoline, Diesel, and Used Oil

A. Is the spill entirely contained inside a building and there is no release to the environment? YES / NO

B. Is there a visible sheen on **Navigable Waters** (**Report within 15 minutes**)? YES / NO

C. Was 25 gallons or more of petroleum spilled on a pervious surface? YES / NO

D. Was 100 gallons or more of petroleum spilled on an impervious surface? YES / NO

E. Was 500 gallons or more of petroleum spilled inside an impervious containment structure from a registered storage tank? (Vehicular Gas Tank, Vehicular Diesel Tank, Used Oil Tank, TLO Storage Tanks, UMF generator Tank, RCA Used Oil Tank) YES / NO

F. Was the spill / emergency determined to be beyond the capability of on-site personnel? (Refer to step 3 in this checklist)
YES / NO

G. Was the incident a threat to human health or the environment off-site? YES / NO

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Reportable Oil Spill Checklist
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5. (continued)

H. If the answer to A is yes or the answers to B-G are no, then the spill / release is not reportable.

I. If the answer to A is no and any answer to B-G is yes, then the spill / release is reportable.

6. REPORTABILITY - 2nd Criteria

Definition NON petroleum: Mineral oil *, TLO, Hydraulic fluid

Deminimus Discharge: Requires complete removal of contamination within 30 days of discovery of the discharge. A Deminimus discharge is defined as a discharge that is removed from the soil, sediment, surface water, and ground water to clean up, target levels or background concentrations within 30 days of discovery.

Is Deminimus discharge? YES / NO

If the answer is NO, then incident is Reportable.

* Mineral oil discharge remediation is dependent on the PCB content of the oil. Mineral oil with a PCB content equal to or greater than 50 ppm fall under the criteria in 40 CFR Section 761.125(b) while mineral oil discharges of less than 50 ppm falls under Chapter 62-780. The FDEP has also approved a specific protocol, the Mineral Oil Dielectric Fluid (MODEF) protocol which can be used for spills pertaining to mineral oil discharges of less than 50 ppm PCBs. Specific criteria must be met to use the protocol. Listed below are the response protocols for Emergency and non-emergency responses for this MODEF protocol.

Emergency responses: Must be initiated in within 48 hours from the time of the spill. All visibly impacted soil must be excavated, followed by the excavation of a 1 foot vertical and horizontal buffer. Must be backfilled with clean fill. No sampling required. Additionally, all impacted solid surfaces that are stained with oil must be rinsed and all rinse water must be captured and properly disposed and or recycled.

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6. (continued)

TLO / Hydraulic fluid discharges are reportable if 30 days has passed since the discovery of the spill and the impacted area cannot meet the sampling criteria stated in 62.780 FAC.

Non-emergency responses: Remediation activities must be completed in 30 days. If the spill is less than 25 gallons and has not reached ground water, follow instructions from "emergency response" listed above. If the spill greater than 25 gallons or detected in the ground water, sampling for Total Recoverable Petroleum Hydrocarbons is required to verify that the remaining soil is below cleanup target levels.

The following documentation is required for both emergency and non-emergency spills from F.A.C. Rule 62-780.500(7). All documentation must be kept for at least 5 years, including all disposal manifests.

- Date of discharge or date of discovery of discharge
- Location of discharge
- A statement regarding whether the MODEF release is believed to have resulted from a PCB-contaminated electrical equipment as defined in 40 CFR part 761, based on company knowledge, records search, screening, etc.
- Estimate of quality of MODEF released.
- Estimate of free MODEF collected is any.
- Estimate of volume of impacted soil excavated or groundwater recovered; and
- Name and address of facility where free MODEF, impacted soil or ground water was disposed or treated, including disposal and/or treatment manifests or certifications.

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6. (continued)

- For non-emergency cleanups greater than 25 gallons
  - Narrative description or illustration indicating where discharge occurred;
  - Narrative description or illustration where samples were taken;
  - Screening method used:
  - TRPH information and a description of any physical obstacles, if applicable; preventing removal to levels below the lower of the direct exposure or leachability soil cleanup target level for TRPH (or 5 mg/L for groundwater), or an alternative number agreed to with the department;
  - Narrative description or illustration of the limits of the excavation.

(1) Complete an Oil Spill Report Summary in a Condition Report (CR). _____

(2) Contact FPL Environmental Services department to notify them of the situation (see Attachment 3). _____

a. **An oil spill to navigable waters shall be reported within 15 minutes of discovery**; other oil spills within one business day. _____

b. Environmental Services should be consulted to ensure the required regulatory notifications are made. _____

(3) If Environmental Services can not be contacted, the OSS shall make the required notifications as noted on Attachment 2. At a minimum the following shall be included in the report:

a. Name and telephone number of the person making the report. _____

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6. I. (3) (continued)

b. Name and address of the facility. _____

c. Time and type of incident (e.g., release, fire) _____

d. Name and quantity of material(s) involved, to the extent known. _____

e. Extent of injuries, if any. _____

f. Possible hazards to human health or the environment outside the facility. _____

g. Statement of whether federal or state assistance will be required. _____

(4) Notify the SM to notify the Vice President- St. Lucie Plant, the Shift Technical Advisor (STA), and the Nuclear Division Duty Officer (NDDO). _____

(5) SARA / CERCLA releases of radionuclides shall be reported by the Nuclear Chemistry Supervisor in accordance with Nuclear Chemistry Procedures. _____

(6) Notify Plant Licensing Department. _____

a. Plant Licensing will determine if the incident is a threat to employee or public safety or a threat to the environment. YES / NO

b. If the answer to 6a is yes, then Plant Licensing shall notify the Nuclear Regulatory Commission within four hours.

(7) Were any animals or birds injured? YES / NO

If the answer is yes notify Land Utilization during work hours: 772-467-7453
during other hours: 800-447-2433 #8983

DEH Pump Control Switch (EO-4a, EO-4b)

- Four position spring return to auto switch located on RTGB-101[201].
  - **START**
  - **AUTO**
    - Standby Pump starts if DEH supply pressure is <1550 psig (EO-22b)
    - Continues to run until manually stopped.
  - **STOP**
    - Stops running pump
    - Since switch is spring return to Auto, Pump can restart on low pressure
  - **PULL TO LOCK**
    - Defeats Auto Start

DEH Pumps

- Test Pushbutton on RTGB 101 [201].
  - Starts standby pump
- LOW-LOW Level Lockout (EO-22g)
  - LS-22-2, 7 5/8”
  - Blocks AUTO start of both DEH pumps
    - Manual start remains functional
  - Annunciator input (Ann D-58)
  - Uses 125 VDC
    - Loss of DC actuates lockout also
  - Blue indicating light behind RTGB-101[201].
  - Lockout must be manually reset behind RTGB.

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NOTE

- **Spills to Navigable Waters require Immediate FDEP notification**
- Navigable waters include the Barge Slip, Big Mud Creek, Indian River Lagoon, and the Atlantic Ocean
- Do not use dispersants in response to an oil spill.
- The East, West, South and Southeast Stormwater basins are part of the St. Lucie stormwater drainage system and are not considered navigable waters. The plant's intake and discharge canals are not considered navigable waters. Reportability criteria for spills to the stormwater drainage system or cooling canal are based on volume of oil spilled.

5. REPORTABILITY - 1st Criteria

Definition Petroleum: Gasoline, Diesel, and Used Oil

A. Is the spill entirely contained inside a building and there is no release to the environment? YES / NO

B. Is there a visible sheen on **Navigable Waters** (**Report within 15 minutes**)? YES / NO

C. Was 25 gallons or more of petroleum spilled on a pervious surface? YES / NO

D. Was 100 gallons or more of petroleum spilled on an impervious surface? YES / NO

E. Was 500 gallons or more of petroleum spilled inside an impervious containment structure from a registered storage tank? (Vehicular Gas Tank, Vehicular Diesel Tank, Used Oil Tank, TLO Storage Tanks, UMF generator Tank, RCA Used Oil Tank) YES / NO

F. Was the spill / emergency determined to be beyond the capability of on-site personnel? (Refer to step 3 in this checklist)
YES / NO

G. Was the incident a threat to human health or the environment off-site? YES / NO

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5. (continued)

H. If the answer to A is yes or the answers to B-G are no, then the spill / release is not reportable.

I. If the answer to A is no and any answer to B-G is yes, then the spill / release is reportable.

6. REPORTABILITY - 2nd Criteria

Definition NON petroleum: Mineral oil *, TLO, Hydraulic fluid

Deminimus Discharge: Requires complete removal of contamination within 30 days of discovery of the discharge. A Deminimus discharge is defined as a discharge that is removed from the soil, sediment, surface water, and ground water to clean up, target levels or background concentrations within 30 days of discovery.

Is Deminimus discharge? YES / NO

If the answer is NO, then incident is Reportable.

* Mineral oil discharge remediation is dependent on the PCB content of the oil. Mineral oil with a PCB content equal to or greater than 50 ppm fall under the criteria in 40 CFR Section 761.125(b) while mineral oil discharges of less than 50 ppm falls under Chapter 62-780. The FDEP has also approved a specific protocol, the Mineral Oil Dielectric Fluid (MODEF) protocol which can be used for spills pertaining to mineral oil discharges of less than 50 ppm PCBs. Specific criteria must be met to use the protocol. Listed below are the response protocols for Emergency and non-emergency responses for this MODEF protocol.

Emergency responses: Must be initiated in within 48 hours from the time of the spill. All visibly impacted soil must be excavated, followed by the excavation of a 1 foot vertical and horizontal buffer. Must be backfilled with clean fill. No sampling required. Additionally, all impacted solid surfaces that are stained with oil must be rinsed and all rinse water must be captured and properly disposed and or recycled.

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6. (continued)

TLO / Hydraulic fluid discharges are reportable if 30 days has passed since the discovery of the spill and the impacted area cannot meet the sampling criteria stated in 62.780 FAC.

Non-emergency responses: Remediation activities must be completed in 30 days. If the spill is less than 25 gallons and has not reached ground water, follow instructions from "emergency response" listed above. If the spill greater than 25 gallons or detected in the ground water, sampling for Total Recoverable Petroleum Hydrocarbons is required to verify that the remaining soil is below cleanup target levels.

The following documentation is required for both emergency and non-emergency spills from F.A.C. Rule 62-780.500(7). All documentation must be kept for at least 5 years, including all disposal manifests.

- Date of discharge or date of discovery of discharge
- Location of discharge
- A statement regarding whether the MODEF release is believed to have resulted from a PCB-contaminated electrical equipment as defined in 40 CFR part 761, based on company knowledge, records search, screening, etc.
- Estimate of quality of MODEF released.
- Estimate of free MODEF collected is any.
- Estimate of volume of impacted soil excavated or groundwater recovered; and
- Name and address of facility where free MODEF, impacted soil or ground water was disposed or treated, including disposal and/or treatment manifests or certifications.

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6. (continued)

- For non-emergency cleanups greater than 25 gallons
  - Narrative description or illustration indicating where discharge occurred;
  - Narrative description or illustration where samples were taken;
  - Screening method used:
  - TRPH information and a description of any physical obstacles, if applicable; preventing removal to levels below the lower of the direct exposure or leachability soil cleanup target level for TRPH (or 5 mg/L for groundwater), or an alternative number agreed to with the department;
  - Narrative description or illustration of the limits of the excavation.

(1) Complete an Oil Spill Report Summary in a Condition Report (CR). _____

(2) Contact FPL Environmental Services department to notify them of the situation (see Attachment 3). _____

a. **An oil spill to navigable waters shall be reported within 15 minutes of discovery**; other oil spills within one business day. _____

b. Environmental Services should be consulted to ensure the required regulatory notifications are made. _____

(3) If Environmental Services can not be contacted, the OSS shall make the required notifications as noted on Attachment 2. At a minimum the following shall be included in the report:

a. Name and telephone number of the person making the report. _____

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6. I. (3) (continued)

b. Name and address of the facility. _____

c. Time and type of incident (e.g., release, fire) _____

d. Name and quantity of material(s) involved, to the extent known. _____

e. Extent of injuries, if any. _____

f. Possible hazards to human health or the environment outside the facility. _____

g. Statement of whether federal or state assistance will be required. _____

(4) Notify the SM to notify the Vice President- St. Lucie Plant, the Shift Technical Advisor (STA), and the Nuclear Division Duty Officer (NDDO). _____

(5) SARA / CERCLA releases of radionuclides shall be reported by the Nuclear Chemistry Supervisor in accordance with Nuclear Chemistry Procedures. _____

(6) Notify Plant Licensing Department. _____

a. Plant Licensing will determine if the incident is a threat to employee or public safety or a threat to the environment. YES / NO

b. If the answer to 6a is yes, then Plant Licensing shall notify the Nuclear Regulatory Commission within four hours.

(7) Were any animals or birds injured? YES / NO

If the answer is yes notify Land Utilization during work hours: 772-467-7453
during other hours: 800-447-2433 #8983

94.

G2.1.30 Ability to locate and operate components, including local controls.

Given the following conditions:

- Unit 2 is experiencing a SBLOCA and LOOP
- The 2B EDG failed to start
- An ALERT has been declared in accordance with EPIP-01, Classification of Emergencies
- RAS has actuated
- MV-07-2A and MV-07-2B, Containment Sump Isolation Valves failed to OPEN

Which ONE of the following completes the statements below?

The Control Room will dispatch operators to the ____(1)____ to manually OPEN MV-07-2A and MV-07-2B.

If it is determined that a valve wrench is required, at a MINIMUM____(2)____ approval is required, in accordance with OP-AA-100-1000, Conduct of Operations.

A.	(1)	19.5 ft Piping Penetration Room
	(2)	Shift Manager
B.	(1)	19.5 ft Piping Penetration Room
	(2)	Unit Supervisor
C.	(1)	-0.5 ft Piping Tunnel
	(2)	Shift Manager
D.	(1)	-0.5 ft Piping Tunnel
	(2)	Unit Supervisor

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: These valves are physically located in the piping tunnel but it is plausible that the applicant have a misconception about the physical location of the valves. Part 2 correct: IAW OP-AA-100-1000, Att.6 step 18.A, SM approval is required to use a valve wrench.
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 incorrect: SM approval is required but it is plausible since direct SRO or Field supervisor oversight is required.
C.	Correct:	Part 1 correct: : These valves are physically located in the piping tunnel Part 2 correct: IAW OP-AA-100-1000, Att.6 step 18.A, SM approval is required to use a valve wrench.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 94

Tier: 3 Group:

K/A: G2.1.30 Ability to locate and operate components, including local controls.

Importance Rating: 4.4 4.0

10 CFR Part 55: (CFR: 41.7 / 45.7)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know the requirements for local operation of MOVs

Technical Reference: OP-AA-100-1000

Proposed references to be provided: None

Learning Objective: PSL OPS 0904724-3

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

ATTACHMENT 6
EQUIPMENT MANIPULATION AND STATUS CONTROL
(Page 11 of 13)

3.0 EXPECTATIONS (continued)

17. (continued)

F. The WCS or SRO designee has 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.

J. Prior to returning a Safety Related component to service after maintenance, REVIEW all outstanding Condition Reports against the affected Safety Related components that were initiated during the out of service period for Nonconforming Items. Nonconforming items **must** be evaluated and dispositioned prior to placing the affected component in service. The disposition, such as Use-As-Is, Reject, Repair, **or** Rework **shall** be identified and documented in the Condition Report. Personnel performing these dispositions **must** have demonstrated competence in the specific areas they are evaluating, have an adequate understanding of the requirements, and have access to pertinent background information. Nonconformance to design requirements dispositioned as Use-As-Is **or** Repair shall be subject to Design Control (i.e. EC required prior to operation) (Ref: AR 220601).

18. The following applies to the use of Valve Wrenches (also referred to as Torque Amplifying Devices or Cheater Bars):

A. Valve wrenches shall not be used on the following valves without Shift Manager approval, direct SRO or Field Supervisor oversight, and (in non-emergency conditions) Engineering/Maintenance determination of the maximum torque allowable and the technique of application if the valve could impact a safety or PRA function:

(1) MOVs,

(2) AOVs,

ATTACHMENT 6
EQUIPMENT MANIPULATION AND STATUS CONTROL
(Page 12 of 13)

3.0 EXPECTATIONS (continued)

18. A. (continued)

(3) Hydraulically operated valves,

(4) Diaphragm valves,

(5) Gear operator valves, or

(6) First off isolation valves (First isolation coming off an RCS Loop)

B. Control Room permission is required prior to the use of a Valve Wrench.

C. The following items shall be considered before the use of a valve wrench is authorized by the control room for use:

(1) Is the valve already in its required position?

(2) Potential effects of valve wrench use (e.g. damage to valve, rapid system effects, etc.)

(3) Does the system contain hazardous materials? (e.g. hydrogen, acid, or caustic)

(4) What is the differential pressure across the valve?

(5) Is the valve operated by reach rod or linkage?

(6) Is the valve back seated due to packing leakage? (will packing leakage start when the valve is positioned)

(7) Are there any new “pinch points” or other physical hazards introduced by the use of a valve wrench?

(8) What is the physical condition of the valve? Is a Valve Wrench going to allow operation or is Maintenance assistance required for repairs?

(9) Are there body position restraints introduced by the use of a Valve Wrench that may require Safety Department consultation?

(10) Does the valve have a gearbox or other component that would be affected by excessive force?

less than **37' 6"**. The RWT begins to overflow at ~38'. LIS-07-2C provides input to Annunciator S-39, RWT Level High-High, with a setpoint of **37' 9"**.

Overflow from the RWT is routed to catch basin then to storm drains. During normal operations, the highest capacity pump used to fill the RWT is the primary water pump at 300 gpm. The High-High level alarm, gives the operator at least 24 minutes to secure the primary water pump before the RWT overflows. LPSI Pumps can be used to transfer water from the Reactor Cavity to the RWT through V-3459, SDC Outlet Recirc To RWT [LCV-07-12, LPSI Dish To RWT]. When filling the RWT using LPSI pumps, the time between High-High level alarm and overflow is much less due to the higher flow rates of the LPSI Pumps. To prevent pumping water from the Reactor Cavity out the RWT overflow to the storm drains, the path from the LPSI Pumps is isolated at the High-High level [High level] setpoint.

The 305,600 [290,300] gallons of borated water introduced into the RCS by SIAS fills the containment to a level of 24'. The 24' elevation is approximately 32' above the suction nozzles of the ECCS pumps and provides the NPSH for pump operation during the recirculation mode.

The RWT is provided with TI-07-4 and TR-21-3 for temperature indication.

Motor operated isolation valves MV-07-1A and MV-07-1B are provided in suction lines from the RWT to the ECCS pumps. These normally open valves are powered from 480 V MCC A6 and MCC B6, respectively.

MV-07-2A and MV-07-2B isolate the containment sump from the ECCS pump suction lines. These normally closed valves are powered from 480 V MCC A6 and MCC B6, respectively.

High Pressure Safety Injection

The pumps are sized such that one pump will deliver saturated water at a rate sufficient to maintain the core flooded and match decay heat boil-off after RAS.

The HPSI System consists of two pumps with two separate suction headers from the

RAS EO-5b

- Actuated when RWT drops to 4' [6']
  - Stops LPSI Pumps.
  - Mini Flow Recircs receive a close signal.
  - Containment sump valves MV-07-2A and MV-07-2B open in 40[30] seconds.
  - RWT isolation valves MV-07-1A and MV-07-1B close in 90 seconds.

- **PRIOR** to reaching RAS setpoint:
  - Unit 1 only Lockout switch has to be taken to ON.
  - If CNTMT Spray Pumps are running, Unit 1 HPSI Pump suctions are manually aligned to CS downstream SDC HXs. This provides additional assurance that NPSH will be maintained after RAS.
- SITs are not affected.

95.

G2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management.

Which ONE of the following is the design bases event for Limiting Condition of Operation 3.1.1.1, Shutdown Margin?

A.	Excessive cooldown resulting from a Main Steam Break at end of core life from 0% power conditions.
B.	Excessive cooldown resulting from a Main Steam Break at beginning of core life from 100% power conditions.
C.	Positive reactivity addition resulting from a Rod Ejection event at end of core life from 100% power conditions.
D.	Positive reactivity addition resulting from a Rod Ejection event at beginning of core life from 0% power conditions.

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	This is the plant specific Tech Spec bases for the Shutdown Margin LCO. This defines which Reactivity Transient is the MOST severe in the design analysis. From 0% power, there is more mass in the SG. End of cycle conditions have the most negative MTC. Therefore, this reactivity transient is the most severe.
B.	Incorrect:	This is not correct due to MTC being less negative and there is less mass in the S/Gs for boil-off.
C.	Incorrect:	TS Bases for 3.1.3, The Power Dependent Insertion Limits of Specification 3.1.3.6 are provided to ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) the potential effects of a CEA ejection accident are limited to acceptable levels.
D.	Incorrect:	TS Bases for 3.1.3, The Power Dependent Insertion Limits of Specification 3.1.3.6 are provided to ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) the potential effects of a CEA ejection accident are limited to acceptable levels;

Question Number: 95

Tier: 3 Group:

K/A: G2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management.

Importance Rating: 4.3 4.6

10 CFR Part 55: (CFR: 41.1 / 43.6 / 45.6)

10CFR55.43.b: 10 CFR 55.43(b)(6)

K/A Match: K/A is matched because the applicant is required to know the basis for reactivity management

Technical Reference: TS Bases 3.4.1.1.1

Proposed references to be provided: None

Learning Objective: PSL OPS 0902723-2, 3

Cognitive Level:

Higher	
Lower	X

Question Source:

New	
Modified Bank	
Bank	X

Question History: BANK question for the 2019 NRC Exam

Comments: BANK question from 2014 NRC SRO Exam #94

BASES FOR SECTION 3/4.1

3/4.1 REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

A sufficient SHUTDOWN MARGIN ensures that 1) the reactor can be made subcritical from all operating conditions, 2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and 3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration, and RCS T_{avg}. The most restrictive condition occurs at EOL, with T_{avg} at no load operating temperature, and is associated with a postulated steam line break accident and resulting uncontrolled RCS cooldown. In the analysis of this accident, a minimum SHUTDOWN MARGIN as specified in the COLR for Specification 3.1.1.1 is required to control the reactivity transient. Accordingly, the SHUTDOWN MARGIN requirement is based upon this limiting condition and is consistent with FSAR safety analysis assumptions. At earlier times in core life, the minimum SHUTDOWN MARGIN required for the most restrictive conditions is less than that at EOL. With T_{avg} less than or equal to 200°F, the reactivity transients resulting from any postulated accident are minimal and a SHUTDOWN MARGIN as specified in the COLR for Specification 3.1.1.2 provides adequate protection.

3/4.1.1.3 BORATION DILUTION

A minimum flow rate of at least 3000 gpm provides adequate mixing, prevents stratification and ensures that reactivity changes will be gradual during boron concentration reductions in the Reactor Coolant System. A flow rate of at least 3000 gpm will circulate an equivalent Reactor Coolant System volume of 10,931 cubic feet in approximately 26 minutes. The reactivity change rate associated with boron concentration reductions will therefore be within the capability of operator recognition and control.

3/4.1 REACTIVITY CONTROL SYSTEMS (continued)

BASES (continued)

3/4.1.3 MOVABLE CONTROL ASSEMBLIES (continued)

Operability of at least two CEA position indicator channels is required to determine CEA positions and thereby ensure compliance with the CEA alignment and insertion limits. The CEA "Full In" and "Full Out" limits provide an additional independent means for determining the CEA positions when the CEAs are at either their fully inserted or fully withdrawn positions. Therefore, the ACTION statements applicable to inoperable CEA position indicators permit continued operations when the positions of CEAs with inoperable position indicators can be verified by the "Full In" or "Full Out" limits.

CEA positions and OPERABILITY of the CEA position indicators are required to be verified on a nominal basis of once per 12 hours with more frequent verifications required if an automatic monitoring channel is inoperable. These verification frequencies are adequate for assuring that the applicable LCOs are satisfied.

The maximum CEA drop time restriction is consistent with the assumed CEA drop time used in the safety analyses. Measurement with T_{avg} greater than or equal to 515°F and with all reactor coolant pumps operating ensures that the measured drop times will be representative of insertion times experienced during a reactor trip at operating conditions.

The LSSS setpoints and the power distribution LCOs were generated based upon a core burnup which would be achieved with the core operating in an essentially unrodded configuration. Therefore, the CEA insertion limit specifications require that during MODES 1 and 2, the full length CEAs be nearly fully withdrawn. The amount of CEA insertion permitted by the Long Term Steady State Insertion Limits of Specification 3.1.3.6 will not have a significant effect upon the unrodded burnup assumption but will still provide sufficient reactivity control. The Power Dependent Insertion Limits of Specification 3.1.3.6 are provided to ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) the potential effects of a CEA ejection accident are limited to acceptable levels; however, long-term operation at these insertion limits could have adverse effects on core power distribution during subsequent operation in an unrodded configuration.

96.

G2.2.25 / Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits

Which ONE of the following completes the statements below?

In accordance with ADM-25.04, Safety Limits and Limiting Safety Settings, the Variable Power Level – High trip setpoint is operator adjustable and can be set no higher than ____(1)____ above indicated thermal power.

This protects the reactor core during rapid positive reactivity excursions which are too rapid to be protected by ____(2)____.

A.	(1)	5.61 %
	(2)	Pressurizer Pressure High or Thermal Margin/Low Pressure
B.	(1)	5.61 %
	(2)	Rate of Change of Power – High Trip or Local Power Density
C.	(1)	9.61 %
	(2)	Pressurizer Pressure High or Thermal Margin/Low Pressure
D.	(1)	9.61 %
	(2)	Rate of Change of Power – High Trip or Local Power Density

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: 5.61% is plausible because when power is increased by 5.61% (operator adjustable) a warning light is lit to alert the operator to reset the VOPT during an up power. Part 2 correct: See explanation C.
B.	Incorrect:	Part 1 incorrect: See explanation A. Part 2 incorrect: The Rate of Change of Power-High trip is provided to protect the core during startup operations and its use serves as a backup to the administratively enforced startup rate limit. The trip is not credited in any design basis accident evaluated in UFSAR. The Local Power Density-High trip, functioning from AXIAL SHAPE INDEX monitoring, is provided to ensure that the peak local power density in the fuel which corresponds to fuel centerline melting will not occur as a consequence of axial power maldistributions.
C.	Correct:	Part 1 correct: The Variable Power Level High trip setpoint is operator adjustable and can be set no higher than 9.61% above the indicated THERMAL POWER level. Operator action is required to increase the trip setpoint as THERMAL POWER is increased. The trip setpoint is automatically decreased as THERMAL POWER decreases. The trip setpoint has a maximum value of 107.0% of RATED THERMAL POWER and a minimum setpoint of 15.0% of RATED THERMAL POWER. Adding to this maximum value the possible variation in trip point due to calibration and instrument errors, the maximum actual steadystate THERMAL POWER level at which a trip would be actuated is higher than 107% of RATED THERMAL POWER, which is the value used in the safety analysis Part 2 correct: A Reactor trip on Variable Overpower is provided to protect the reactor core during rapid positive reactivity addition excursions which are too rapid to be protected by a Pressurizer Pressure – High or Thermal Margin/Low Pressure Trip.
D.	Incorrect:	Part 1 correct: See explanation C Part 2 incorrect: See explanation B

Question Number: 96

Tier: 3 Group: _____

K/A: G2.2.25 / Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits

Importance Rating: 3.2 4.2

10 CFR Part 55: (CFR: 41.5 / 41.7 / 43.2)

10CFR55.43.b: 10 CFR 55.43(b)(2)

K/A Match: K/A is matched because the applicant is required to know the basis for the safety limits

Technical Reference: ADM-25.04, Attachment 1

Proposed references to be provided: None

Learning Objective: PSL OPS 0902713 - 3

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

2.2 LIMITING SAFETY SYSTEM SETTINGS

BASES

2.2.1 REACTOR TRIP SETPOINTS

The Reactor Trip Setpoints specified in Table 2.2-1 are the values at which the Reactor Trips are set for each functional unit. The Trip Setpoints have been selected to ensure that the reactor core and reactor coolant system are prevented from exceeding their Safety Limits during normal operation and design basis anticipated operational occurrences and to assist the Engineered Safety Features Actuation System in mitigating the consequences of accidents. Operation with a trip set less conservative than its Trip Setpoint but within its specified Allowable Value is acceptable on the basis that the difference between each Trip Setpoint and the Allowable Value is equal to or less than the drift allowance assumed for each trip in the safety analyses.

Manual Reactor Trip

The Manual Reactor Trip is a redundant channel to the automatic protective instrumentation channels and provides manual reactor trip capability.

Variable Power Level-High

A Reactor trip on Variable Overpower is provided to protect the reactor core during rapid positive reactivity addition excursions which are too rapid to be protected by a Pressurizer Pressure – High or Thermal Margin/Low Pressure Trip.

The Variable Power Level High trip setpoint is operator adjustable and can be set no higher than 9.61% above the indicated THERMAL POWER level. Operator action is required to increase the trip setpoint as THERMAL POWER is increased. The trip setpoint is automatically decreased as THERMAL POWER decreases. The trip setpoint has a maximum value of 107.0% of RATED THERMAL POWER and a minimum setpoint of 15.0% of RATED THERMAL POWER. Adding to this maximum value the possible variation in trip point due to calibration and instrument errors, the maximum actual steady-state THERMAL POWER level at which a trip would be actuated is higher than 107% of RATED THERMAL POWER, which is the value used in the safety analysis.

2.2 LIMITING SAFETY SYSTEM SETTINGS (continued)

BASES (continued)

2.2.1 REACTOR TRIP SETPOINTS (continued)

Pressurizer Pressure-High

The Pressurizer Pressure-High trip, in conjunction with the pressurizer safety valves and main steam line safety valves, provides Reactor Coolant System protection against overpressurization in the event of loss of load without reactor trip. This trip's setpoint is at less than or equal to 2375 psia which is below the nominal lift setting 2500 psia of the pressurizer safety valves and its operation minimizes the undesirable operation of the pressurizer safety valves.

Thermal Margin/Low Pressure

The Thermal Margin/Low Pressure trip is provided to prevent operation when the DNBR is less than the appropriate correlation limit for DNB-SAFDL, in conjunction with ESCU methodology.

The trip is initiated whenever the Reactor Coolant System pressure signal drops below either 1900 psia or a computed value as described below, whichever is higher. The computed value is a function of the higher of ΔT power or neutron power, reactor inlet temperature, the number of reactor coolant pumps operating and the AXIAL SHAPE INDEX. The minimum value of reactor coolant flow rate, the maximum AZIMUTHAL POWER TILT and the maximum CEA deviation permitted for continuous operation are assumed in the generation of this trip function. In addition, CEA group sequencing in accordance with Specifications 3.1.3.5 and 3.1.3.6 is assumed. Finally, the maximum insertion of CEA banks which can occur during any anticipated operational occurrence prior to a Power Level-High trip is assumed.

The Thermal Margin/Low Pressure trip setpoints are derived from the core safety limits through application of appropriate allowances for equipment response time, measurement uncertainties and processing error. The allowances include: a variable (power dependent) allowance to compensate for potential power measurement error, an allowance to compensate for potential temperature measurement uncertainty; an allowance to compensate for pressure measurement error; and an allowance to compensate for the time delay associated with providing effective termination of the occurrence that exhibits the most rapid decrease in margin to the safety limit.

2.2 LIMITING SAFETY SYSTEM SETTINGS (continued)

BASES (continued)

2.2.1 REACTOR TRIP SETPOINTS (continued)

Containment Pressure-High

The Containment Pressure-High trip provides assurance that a reactor trip is initiated prior to or concurrently with a safety injection (SIAS). This also provides assurance that a reactor trip is initiated prior to or concurrently with an MSIS.

Steam Generator Pressure-Low

The Steam Generator Pressure-Low trip provides protection against an excessive rate of heat extraction from the steam generators and subsequent cooldown of the reactor coolant. The setting of 626 psia is sufficiently below the full load operating point so as not to interfere with normal operation, but still high enough to provide the required protection in the event of excessively high steam flow.

Steam Generator Level-Low

The Steam Generator Level-Low trip provides protection against a loss of feedwater flow incident and assures that the design pressure of the Reactor Coolant System will not be exceeded due to loss of the steam generator heat sink. This specified setpoint provides allowance that there will be sufficient water inventory in the steam generator at the time of the trip to provide sufficient time for any operator action to initiate auxiliary feedwater before reactor coolant system subcooling is lost. This trip also protects against violation of the specified acceptable fuel design limits (SAFDL) for DNBR, offsite dose and the loss of shutdown margin for asymmetric steam generator transients such as the opening of a main steam safety valve or atmospheric dump valve. The trip setpoint is bounding relative to the accident and transient analyses which were performed using a lower, conservative trip setpoint.

2.2 LIMITING SAFETY SYSTEM SETTINGS (continued)

BASES (continued)

2.2.1 REACTOR TRIP SETPOINTS (continued)

Local Power Density-High

The Local Power Density-High trip, functioning from AXIAL SHAPE INDEX monitoring, is provided to ensure that the peak local power density in the fuel which corresponds to fuel centerline melting will not occur as a consequence of axial power maldistributions. A reactor trip is initiated whenever the AXIAL SHAPE INDEX exceeds the allowable limits of Figure 2.2-2. The AXIAL SHAPE INDEX is calculated from the upper and lower excore neutron detector channels. The calculated setpoints are generated as a function of THERMAL POWER level with the allowed CEA group position being inferred from the THERMAL POWER level. The trip is automatically bypassed below 15% power.

The maximum AZIMUTHAL POWER TILT and maximum CEA misalignment permitted for continuous operation are assumed in generation of the setpoints. In addition, CEA group sequencing in accordance with the Specifications 3.1.3.5 and 3.1.3.6 is assumed. Finally, the maximum insertion of CEA banks which can occur during any anticipated operational occurrence prior to a Power Level-High trip is assumed.

RCP Loss of Component Cooling Water

A loss of component cooling water to the reactor coolant pumps causes a delayed reactor trip. This trip provides protection to the reactor coolant pumps by ensuring that plant operation is not continued without cooling water available. The trip is delayed 10 minutes following a reduction in flow to below the trip setpoint and the trip does not occur if flow is restored before 10 minutes elapses. No credit was taken for this trip in the safety analysis. Its functional capability at the specified trip setting is required to enhance the overall reliability of the Reactor Protective System.

Rate of Change of Power-High

The Rate of Change of Power-High trip is provided to protect the core during startup operations and its use serves as a backup to the administratively enforced startup rate limit. The trip is not credited in any design basis accident evaluated in UFSAR Chapter 15; however, the trip is considered in the safety analysis in that the presence of this trip function precluded the need for specific analyses of other events initiated from subcritical conditions.

97. G2.2.38 Knowledge of conditions and limitations in the facility license.

Given the following conditions:

12/1/2017	08:00:00	Unit 1 is at 100% power The 1B Low Pressure Safety Injection (LPSI) pump was taken out of service for preventative maintenance
	08:00:01	Annunciator B-24, Emerg Dg 1A Fuel Stor Tk Level Low alarms
	08:05:00	The 1A Diesel Fuel Oil Storage Tank is at a level corresponding to 18,500 gallons

Which ONE of the following states the appropriate Tech Spec LCO(s) and action statement that applies?

TS 3.5.2, ECCS Subsystems _____.

(REFERENCE PROVIDED)

A.	Restore 1B LPSI pump to operable status no later than 0800 on 12/4/2017 ONLY
B.	Restore 1B LPSI pump to operable status no later than 0800 on 12/8/2017 ONLY
C.	AND TS 3.8.1.1.b, A.C. Sources; IMMEDIATELY declare the 1A LPSI pump inoperable and enter TS 3.0.3
D.	AND TS 3.8.1.1.b, A.C. Sources; restore 1B LPSI pump to operable status within 4 hours; otherwise enter TS 3.0.3

CORRECT ANSWER: D

DISTRACTOR ANALYSIS:		
A.	Incorrect:	The TSAS for 1 LPSI pp OOS (7 days) and the EDG is OOS due to low oil level
B.	Incorrect:	See explanation below
C.	Incorrect:	See explanation below
D.	Correct:	Enter TS 3.5.2 for the 1B LPSI pp @ 0800. Minimum Diesel FO storage tank is 19,000 gal so the EDG is inoperable. TS 3.8.1.1.b applies @ 0805. In addition to declaring the 1A EDG OOS, the operability of all A train systems that rely on the 1A EDG as a source of emergency power must be verified within 4 hours (i.e. 1A LPSI pp). In 4 hrs, the 1A LPSI must also be declared inoperable (due to the 1A EDG OOS) so with the 1B LPSI pp OOS, TS 3.0.3 must be applied or fix the 1B LPSI within 4 hrs

Question Number: 97

Tier: 2 Group: 1

K/A: G2.2.38 Knowledge of conditions and limitations in the facility license.

Importance Rating: 3.6 4.5

10 CFR Part 55: (CFR: 41.7 / 41.10 / 43.1 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(2)

K/A Match: K/A is matched because the applicant is required to know the condition in the facility license

Technical Reference: TS 3.5.2, 3.8.1.1.b and ADM-11.16

Proposed references to be provided: TS 3.5.2

Learning Objective: PSL OPS 0702501-17

Cognitive Level:

Higher	X
Lower	

Question Source:

New	
Modified Bank	
Bank	X

Question History: PSL BANK question for the 2019 NRC Exam

Comments:

EMERGENCY CORE COOLING SYSTEMS

ECCS SUBSYSTEMS - OPERATING

LIMITING CONDITION FOR OPERATION

3.5.2 Two independent ECCS subsystems shall be OPERABLE with each subsystem comprised of:

a. One OPERABLE high-pressure safety injection (HPSI) pump,

b. One OPERABLE low-pressure safety injection pump,

c. An independent OPERABLE flow path capable of taking suction from the refueling water tank on a Safety Injection Actuation Signal and automatically transferring suction to the containment sump on a Recirculation Actuation Signal, and

d. One OPERABLE charging pump*.

APPLICABILITY: MODES 1, 2 and 3**.

ACTION:

a. 1. With one ECCS subsystem inoperable only because its associated LPSI train is inoperable, restore the inoperable subsystem to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

2. With one ECCS subsystem inoperable for reasons other than condition a.1., restore the inoperable subsystem to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

b. In the event the ECCS is actuated and injects water into the Reactor Coolant System, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 90 days describing the circumstances of the actuation and the total accumulated actuation cycles to date.

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* One ECCS subsystem charging pump shall satisfy the flow path requirements of Specification 3.1.2.2.a or 3.1.2.2.d. The second ECCS subsystem charging pump shall satisfy the flow path requirements of Specification 3.1.2.2.b or 3.1.2.2.e.

** With pressurizer pressure $\geq$ 1750 psia.

ECCS SUBSYSTEMS - OPERATING

LIMITING CONDITION FOR OPERATION

3.5.2 Two independent ECCS subsystems shall be OPERABLE with each subsystem comprised of:

a. One OPERABLE high-pressure safety injection (HPSI) pump,

b. One OPERABLE low-pressure safety injection pump,

c. An independent OPERABLE flow path capable of taking suction from the refueling water tank on a Safety Injection Actuation Signal and automatically transferring suction to the containment sump on a Recirculation Actuation Signal, and

d. One OPERABLE charging pump*.

APPLICABILITY: MODES 1, 2 and 3**.

ACTION:

a. 1. With one ECCS subsystem inoperable only because its associated LPSI train is inoperable, restore the inoperable subsystem to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

2. With one ECCS subsystem inoperable for reasons other than condition a.1., restore the inoperable subsystem to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

b. In the event the ECCS is actuated and injects water into the Reactor Coolant System, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 90 days describing the circumstances of the actuation and the total accumulated actuation cycles to date.

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* One ECCS subsystem charging pump shall satisfy the flow path requirements of Specification 3.1.2.2.a or 3.1.2.2.d. The second ECCS subsystem charging pump shall satisfy the flow path requirements of Specification 3.1.2.2.b or 3.1.2.2.e.

** With pressurizer pressure ≥ 1750 psia.

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

OPERATING

LIMITING CONDITION FOR OPERATION

3.8.1.1 As a minimum, the following A.C. electrical power sources shall be OPERABLE:

a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system, and

b. Two separate and independent diesel generator sets each with:

1. Engine-mounted fuel tanks containing a minimum of 152 gallons of fuel,

2. A separate fuel storage system containing a minimum of 19,000 gallons of fuel, and

3. A separate fuel transfer pump.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one offsite circuit of 3.8.1.1.a inoperable, except as provided in Action f. below, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter. Restore the offsite circuit to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

b. With one diesel generator of 3.8.1.1.b inoperable, demonstrate the OPERABILITY of the A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter; and if the EDG became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned preventative maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE EDG by performing Surveillance Requirement 4.8.1.1.2.a.4 within 8 hours, unless it can be confirmed that the cause of the inoperable EDG does not exist on the remaining EDG*; restore the diesel generator to OPERABLE status within 14 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN. Additionally, within 4 hours from the discovery of concurrent inoperability of required redundant feature(s) (including the steam driven auxiliary feed pump in MODE 1, 2, and 3), declare required feature(s) supported by the inoperable EDG inoperable if its redundant required feature(s) is inoperable.

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* If the absence of any common-cause failure cannot be confirmed, this test shall be completed regardless of when the inoperable EDG is restored to OPERABILITY.

4.5.6 Operational Guidance for Section 3/4.4 (continued)

3. (continued)

F. With the Containment Atmosphere Radioactivity Monitors (gaseous and particulate) inoperable, operation may continue for up to 30 days provided at least one of the following occurs:

(1) RCS inventory balance performed at least once per 24 hours.

(2) Containment atmosphere grab samples are analyzed at least once per 24 hours.

(3) Plant management expectation is that an RCS inventory balance or grab samples shall be performed every 12 hours whenever the Containment Atmosphere Radioactivity Monitors are inoperable. Refer to TS 3.4.6.1.

4.5.7 Operational Guidance for Section 3/4.5

1. 3/4.5.2 and 3/4.5.3 ECCS System Operability

A. Following the completion of the EPU outages, the Technical Specifications for both units' ECCS systems (T.S. 3.5.2) were changed to require that one charging pump take a suction from a boric acid makeup tank via a boric acid makeup pump and V2514, and the other must take a suction from a Boric Acid Makeup Tank via a gravity feed valve. This is specified by the asterisk at the bottom of LCO 3.5.2 for both units. The RWT cannot be used as an ECCS suction source for the charging pumps since the isolation valve to the charging pumps from the RWT (V2504) is **NOT** automatic and does **NOT** open on SIAS. The refueling water tanks can only be used as a suction source to comply with the boration flow path specification (T.S. 3.1.2.2).

4.5.7 Operational Guidance for Section 3/4.5 (continued)

1. (continued)

B. ECCS System Operability

(1) Any loss of CCW flow to an ECCS Pump Cooler renders that ECCS pump inoperable (CR 2008-7988). When a CCW Heat Exchanger is isolated, the corresponding ECCS header should be declared out of service.

(2) Various testing is necessary and performed on the LPSI / SDC system each refueling outage. The following definitions shall be utilized for determining operability of the LPSI / SDC system during outages.

a. Operating

The LPSI system is aligned in the Shutdown Cooling alignment and the LPSI pump is running.

b. Operable

i. The SDC system is operating.

ii. The LPSI system is aligned in the SDC standby lineup.

iii. With LPSI / SDC testing in progress, it may be considered operable if it can be realigned to SDC from the Control Room, by procedure, with minimal local valve manipulations by a dedicated operator in the area of the valves to be manipulated.

(3) System must remain sufficiently full of water to perform its intended safety functions. The system may remain operable with some gas voids present. If gas is found in the system during venting or ultrasonic testing, initiate a AR-CR for Engineering to evaluate whether the location and quantity of gas adversely affects system operability under the Gas Accumulation Management Program (ADM-03.10).

4.5.10 Operational Guidance for Section 3/4.8

1. 3/4.8.1, 3/4.8.2, and 3/4.8.3 AC Sources, DC Sources, and Onsite Power Distribution Systems

A. Station Blackout Cross Tie

(1) While **NOT** specifically addressed in the Technical Specifications, the Station Blackout Cross tie is a component of the Risk Assessment Matrix. As such it is considered a risk significant component. The guidance of ADM-17.16, Implementation of the Configuration Risk Management Program, Section 6.1.20 should be used whenever a Station Blackout Cross tie breaker is removed from service.

B. Redundant Equipment Operability (Action 3.8.1.1.b)

(1) When a Diesel Generator is declared inoperable, Then one of the required activities is to verify that all required systems, subsystems, trains, components, and devices that depend on the remaining OPERABLE Diesel Generator as a source of emergency power are also OPERABLE. Redundant equipment is defined in the applicable Diesel Generator surveillance procedure.

(2) If a redundant feature is found inoperable, during the cross train equipment verification, within four (4) hours, restore the inoperable component, or declare the redundant component supported by the inoperable diesel inoperable, and enter that feature's TS LCO requirements.

(3) If a LCO for a system, subsystem, train, component, or device does **NOT** explicitly require the associated Diesel Generator to be operable to satisfy that LCO, Then:

a. Equipment is **NOT** inoperable solely due to Diesel Generator inoperability, when powered from the preferred off-site power source. As long as its required redundant counterpart is operable.

b. Therefore, when only a Diesel Generator is inoperable, it suffices to enter only the action 3.8.1.1.b.

98.

G2.3.11 Radiation Control / Ability to control radiation releases

Given the following conditions:

- Unit 1 is at 100% power
- Gaseous Release Permit # 19-12 was issued to authorize this release
- A gaseous release is in progress from the 1A Gas Decay Tank(GDT) in accordance with 1-NOP-06.20, Controlled Gaseous Batch Release to Atmosphere

Subsequently:

- Radiation Monitor Channel #42, Waste Gas Monitor fails HIGH

Which ONE of the following describes the MINIMUM required actions to properly complete the discharge from the 1A GDT, in accordance with 1-NOP-06.20?

A.	Restart the release using permit #19-12
B.	Issue a new release permit with independent samples and valve lineup verifications
C.	Complete an additional independent GDT release rate calculation, then restart the release using permit #19-12
D.	Complete an additional independent GDT grab sample, verifying tank activity has not changed, then restart the release using permit #19-12

CORRECT ANSWER: B

DISTRACTOR ANALYSIS:		
A.	Incorrect:	This would be correct if the release was terminated for reasons such as HVE-10A tripping, which will result in V6565 going closed. This will terminate the release. 1-AOP-25.02 will restart the standby fan. This will allow the release to be restarted without any additional requirements. 1-NOP-06.20, GDT Prerequisites state: IF Channel 42, Waste Gas Monitor is out of service, THEN PERFORM the following: ENSURE two independent radioactivity analyses of tank are attached to GRP. ENSURE two independent release rate calculations for tank are attached to GRP.ENSURE independent verification has been arranged for discharge valve lineup.
B.	Correct:	New release and independent sample and valve lineup is required. A new release permit shall be obtained before restarting any release that was terminated, manually OR automatically, due to a valid high radiation alarm not a fan trip due to the RM Ch#42 being out of service.
C.	Incorrect:	Completing a new independent release rate calculation is a prerequisite for performing the release but it is NOT required on the fan trip it would only be required if the release was terminated due to a high radiation alarm or failure due to the RM Ch#42 being out of service.
D.	Incorrect:	Periodic grab samples are not required, it would determine the radioactivity levels in the tank but this is a prerequisite for performing the release but it is NOT required on the fan trip it would only be required if the release was terminated due to a high radiation alarm or failure due to the RM Ch#42 being out of service.

Question Number: 98

Tier: 3 Group: _____

K/A: G2.3.11 Radiation Control / Ability to control radiation releases

Importance Rating: 3.8 4.3

10 CFR Part 55: (CFR 43.5)

10CFR55.43.b: 10CFR55.43.b(5)

K/A Match: K/A is matched because the applicant is required to be able to control a radioactive release.

Technical Reference: 1-NOP-06.20

Proposed references to be provided: None

Learning Objective: PSL OPS 0702856-07

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

2.1 Precautions (continued)

7. A containment purge batch release is defined as the first 10 hours of containment purge. After 10 hours, gaseous release permit is administratively terminated and activity discharged from containment is accounted for as a continuous release.

2.2 Limitations

1. A containment purge batch release AND a GDT release should **NOT** be performed at same time to prevent possibility of inadvertently exceeding release limits.

2. A new release permit shall be obtained before restarting following manually OR automatically terminated releases, due to a valid high radiation alarm.

3.0 PREREQUISITES AND INITIAL CONDITIONS

3.1 Prerequisites

3.1.1 GDT Release Prerequisites

1. IF performing a release on a GDT, THEN **PERFORM** the following:

A. **ENSURE** either of the following is performed on GDT contents: _____

- Sampled AND analyzed
- Post decay calculation made if the tank has been isolated since last sample

B. **ENSURE** a Gaseous Release Permit, similar to Attachment 5, Gaseous Release Permit - Unit 1, is issued AND approved per CY-SL-102-0105, Processing Gaseous Waste. _____

C. **ENSURE** US has authorized GDT release per Section III, Review-Approval (Prior To Release) of permit. _____

D. **ENSURE** a Containment Purge Batch Release is **NOT** in progress. _____

E. **VERIFY** Channel #42, Waste Gas Monitor, status from Equipment Out of Service Log.
(Section 7.1.3, Management Directive 2) _____

3.1.1 GDT Release Prerequisites (continued)

1. (continued)

F. IF Channel #42, Waste Gas Monitor is Out of Service, THEN **PERFORM** the following:

- **ENSURE** two independent radioactivity analyses of tank are attached to Gaseous Release Permit. _____
- **ENSURE** two independent release rate calculations for tank are attached to Gaseous Release Permit. _____
- **ENSURE** independent verification has been arranged for discharge valve lineup. _____

3.1.2 Containment Purge Prerequisites

1. IF performing a containment purge, THEN **PERFORM** the following:

A. **ENSURE** containment atmosphere has been sampled AND analyzed. _____

B. **ENSURE** a Gaseous Release Permit, similar to Attachment 5, Gaseous Release Permit - Unit 1, is issued per CY-SL-102-0105, Processing Gaseous Waste. _____

C. **ENSURE** US has authorized Containment Purge per Section III, Review-Approval (Prior To Release) of permit. _____

D. **ENSURE** a GDT release is **NOT** in progress. _____

E. **NOTIFY** Radiation Protection prior to commencing a containment purge. _____

F. **NOTIFY** Chemistry prior to commencing a containment purge. _____

4.1.1 Release of 1A GDT to Atmosphere (continued)

7. **VERIFY** the following valve positions:

Component Number	Component Description	Location	Position Required	Initial
V6745	THROTTLE VALVE UPSTREAM OF V6565 WASTE GAS STOP VALVE	RAB/1/N-RA2/E-RAB	CLOSED	
V6742	PRESS REG V6564 DWNSTRM ISOL	RAB/4/N-RA2/E-RAB	LOCKED CLOSED	
V6579	1A GAS DECAY TANK FROM WASTE GAS COMPR ISOL	RAB/9/N-RA2/E-RAB	CLOSED	
V06823	1A GAS DECAY TANK FROM WASTE GAS COMPR ISOL	RAB/12/N-RA2/E-RAB	CLOSED	
SH6588	N2 SPLY TO GDT 1A ISOL VLV	RAB/7/N-RA1Z/W-RAA	CLOSED	
V6584	1A GAS DECAY TANK OUTLET ISOL	RAB/15/N-RA2/E-RAB	CLOSED	
V06825	1A GAS DECAY TANK OUTLET ISOL	RAB/15/N-RA2/E-RAB	CLOSED	
V06824	1B GAS DECAY TANK OUTLET ISOL	RAB/15/N-RA2/E-RAB	CLOSED	
V6594	1B GAS DECAY TANK OUTLET ISOL	RAB/15/S-RA2/E-RAB	CLOSED	
V6703	1C GAS DECAY TANK OUTLET ISOL	RAB/15/N-RA3/E-RAB	CLOSED	
V06820	1C GAS DECAY TANK OUTLET ISOL	RAB/15/N-RA3/E-RAB	CLOSED	

8. **RECORD** GDT pressures in Attachment 4, GDT Pressure Log. (RAB/4/RA2/RAB)

9. **COMMENCE** gas release as follows:

A. **OPEN** V6584, PRIMARY ISOLATION VALVE FOR GAS DECAY TANK 1A OUTLET.

B. **OPEN** V06825, SECONDARY ISOLATION VALVE FOR GAS DECAY TANK 1A OUTLET.

C. **OPEN** V6565, WASTE GAS STOP VALVE. (RTGB 105)

10. IF Channel 42, Waste Gas Monitor, is Out of Service, THEN **PERFORM** Attachment 1, 1A GDT Independent Verification.

4.1.1 Release of 1A GDT to Atmosphere (continued)

NOTE

V6587, PRESSURE REG VALVE FOR GAS DECAY TANKS DISCHARGE TO PLANT VENT, controls discharge gas pressure at 10 psig as indicated on PI-6648, PRESSURE INDICATOR FOR GAS DECAY TANKS DISCHARGE.

CAUTION

V6745, THROTTLE VALVE UPSTREAM OF V6565 WASTE GAS STOP VALVE, should be opened slowly to prevent damage to FIT-6648, FLOW INDICATING TRANSMITTER FOR WASTE GAS FLOW DISCHARGE.

11. **OPEN** V6745, THROTTLE VALVE UPSTREAM OF V6565 WASTE GAS STOP VALVE, to meet either of the following conditions:

- Flow rate specified on Gaseous Release Permit, as observed on FIT-6648, FLOW INDICATING TRANSMITTER FOR WASTE GAS FLOW DISCHARGE, is obtained. (RAB/5/N-RA2/E-RAB)

- IF actual flow is less than flow rate specified on Gaseous Release Permit, THEN **ENSURE** V6745, THROTTLE VALVE UPSTREAM OF V6565 WASTE GAS STOP VALVE, is full OPEN.

12. **RECORD** the following at start of release:

- Start Date/Time _____

- PI-6650, 1A GAS DECAY TANK PRESS _____psig

- Discharge flow rate from FR-6648, FLOW RECORDER FOR WASTE GAS. (RTGB-105)

  FR-6648 _____ CFM

ATTACHMENT 1
1A GDT Independent Verification
(Page 1 of 1)

1. **PERFORM** independent verification of the following discharge lineup:

Component Number	Component Description	Location	Position Required	IV
V6742	PRESS REG V6564 DWNSTRM ISOL	RAB/4/N-RA2/E-RAB	LOCKED CLOSED	
V6579	1A GAS DECAY TANK FROM WASTE GAS COMPR ISOL	RAB/9/N-RA2/E-RAB	CLOSED	
V06823	1A GAS DECAY TANK FROM WASTE GAS COMPR ISOL	RAB/12/N-RA2/E-RAB	CLOSED	
SH6588	N2 SPLY TO GDT 1A ISOL VLV	RAB/7/N-RA1Z/W-RAA	CLOSED	
V6584	1A GAS DECAY TANK OUTLET ISOL	RAB/15/N-RA2/E-RAB	OPEN	
V06825	1A GAS DECAY TANK OUTLET ISOL	RAB/15/N-RA2/E-RAB	OPEN	
V06824	1B GAS DECAY TANK OUTLET ISOL	RAB/15/N-RA2/E-RAB	CLOSED	
V6594	1B GAS DECAY TANK OUTLET ISOL	RAB/15/S-RA2/E-RAB	CLOSED	
V6703	1C GAS DECAY TANK OUTLET ISOL	RAB/15/N-RA3/E-RAB	CLOSED	
V06820	1C GAS DECAY TANK OUTLET ISOL	RAB/15/N-RA3/E-RAB	CLOSED	
V6565	WASTE GAS STOP VALVE	RTGB-105	OPEN	

99.

G2.4.32 / Knowledge of operator response to loss of all annunciators.

Given the following conditions:

- Unit 2 is at 100% power performing a Rapid Downpower has just commenced to remove the 2B1 Circulating Water Pump from service
- A Loss of Annunciators occurs on RTGB 201 thru 206, Panels A thru S
- The crew entered 2-AOP-100.03, Partial or Complete Loss of Annunciators

Which ONE of the following completes the statements below?

A backup power supply ____(1)____ available.

In accordance with EPIP-01, Classification of Emergencies, the EC is required to declare an ____(2)____.

(REFERENCE PROVIDED)

A.	(1)	is
	(2)	Unusual Event
B.	(1)	is
	(2)	Alert
C.	(1)	is NOT
	(2)	Unusual Event
D.	(1)	is NOT
	(2)	Alert

CORRECT ANSWER: A

DISTRACTOR ANALYSIS:		
A.	Correct:	Part 1 correct: IAW Attachment 2, Step 3, align the backup power supply. Part 2 correct: This is an Unusual Event per SU3.
B.	Incorrect:	Part 1 correct: See analysis A. Part 2 incorrect: It is plausible that the applicant think that SA4 is the correct EAL due to the rapid downpower in progress, which does not meet the definition of significant transient.
C.	Incorrect:	Part 1 incorrect: But plausible, since Unit 1 does not have a backup power supply. Part 2 correct: See analysis A.
D.	Incorrect:	Part 1 incorrect: See analysis C. Part 2 incorrect: See analysis B.

Question Number: 99

Tier: 3 Group:

K/A: G2.4.32 / Knowledge of operator response to loss of all annunciators.

Importance Rating: 3.6 4.0

10 CFR Part 55: (CFR: 41.10 / 43.5 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know the response to a loss of all annunciators

Technical Reference: 2-AOP-100.03, EPIP-01

Proposed references to be provided: EPIP-01, Recognition category S tables. Pages 16-23

Learning Objective: PSL OPS 360703-1

Cognitive Level:

Higher	X
Lower	

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

RECOGNITION CATEGORY S

SYSTEM MALFUNCTIONS

Rec. Cat.	General Emergency	Site Area Emergency	Alert	Unusual Event
S – SYSTEM MALFUNCTIONS	**SG1 – Basis:** Loss of all AC power to emergency busses compromises all plant safety systems requiring electric power including decay heat removal, emergency core cooling, containment heat removal and the Ultimate Heat Sink. Prolonged loss of all AC power to emergency buses will lead to loss of fuel clad, RCS, and containment, thus warranting declaration of a General Emergency. The 4 hour restoration time is based on the Station Blackout Coping Analysis. This IC is specified to assure that in the unlikely event of a prolonged station blackout, timely recognition of the seriousness of the event occurs and that declaration of a General Emergency occurs as early as is appropriate, based on a reasonable assessment of the event trajectory. The likelihood of restoring at least one emergency bus should be based on a realistic appraisal of the situation since a delay in an upgrade decision based on only a chance of mitigating the event could result in a loss of valuable time in preparing and implementing public protective actions. In addition, under these conditions, fission product barrier monitoring capability may be degraded. Although it may be difficult to predict when power can be restored, the Emergency Coordinator needs a reasonable idea of how quickly to declare a General Emergency based on two major considerations: 1. Are there any present indications that core cooling is already degraded to the point that Loss or Potential Loss of Fission Product Barriers is IMMINENT? 2. If there are no present indications of such core cooling degradation, how likely is it that power can be restored in time to assure that a loss of two barriers with a potential loss of the third barrier can be prevented? Thus, indication of continuing core cooling degradation must be based on Fission Product Barrier monitoring with particular emphasis on Emergency Coordinator judgment as it relates to IMMINENT Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers.	**SS1 – Basis:** Loss of all AC power to emergency buses compromises all plant safety systems requiring electric power including decay heat removal, emergency core cooling, containment heat removal and the Ultimate Heat Sink. Prolonged loss of all AC power to emergency buses will lead to a loss of Fuel Clad, RCS and Containment, thus this event can escalate to a General Emergency. Fifteen minutes was selected as a threshold to exclude transient or momentary losses of off-site power. Escalation to General Emergency is via Fission Product Barrier Degradation or IC SG1, "Prolonged Loss of All Off-site Power and Prolonged Loss of All On-site AC Power."	**SA5 – Basis:** The condition indicated by this IC is the degradation of the off-site and on-site AC power systems such that any additional single failure would result in a station blackout. This condition could occur due to a loss of off-site power with a concurrent failure of all but one emergency generator to supply power to its emergency busses. Another related condition could be the loss of all off-site power and loss of on-site emergency generators with only one train of emergency busses being backfed from the unit main generator, or the loss of on-site emergency generators with only one train of emergency busses being backfed from off-site power. The subsequent loss of this single power source would escalate the event to a Site Area Emergency in accordance with SS1. Fifteen minutes was selected as a threshold to exclude transient or momentary losses of off-site power.	**SU1 – Basis:** Prolonged loss of off-site AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC power to emergency busses. Fifteen minutes was selected as a threshold to exclude transient or momentary losses of off-site power.
		SS2- Basis: Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed. A Site Area Emergency is indicated because conditions exist that lead to IMMINENT loss or potential loss of both fuel clad and RCS. Manual scram (trip) actions taken at the Reactor Turbine Generator Board (RTGB) are any set of actions by the reactor operator(s) at which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor. Automatic and manual actuation is not considered successful if action away from the Reactor Turbine Generator Board (RTGB) is required to trip the reactor. This EAL is still applicable even if actions taken away from the Reactor Turbine Generator Board (RTGB) are successful in shutting the reactor down because the design limits of the fuel may have been exceeded or because of the gross failure of the Reactor Protection System to shutdown the plant. Escalation of this event to a General Emergency would be due to a prolonged condition leading to an extreme challenge to either core-cooling or heat removal.	**SA2 – Basis:** Manual trip actions taken at the Reactor Turbine Generator Board (RTGB) are any set of actions by the Reactor Operator(s) which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor. This condition indicates failure of the automatic protection system to trip the reactor. This condition is more than a potential degradation of a safety system in that a front line automatic protection system did not function in response to a plant transient. Thus the plant safety has been compromised because design limits of the fuel may have been exceeded. An Alert is indicated because conditions may exist that lead to potential loss of fuel clad or RCS and because of the failure of the Reactor Protection System to automatically shutdown the plant. If manual actions taken at the Reactor Turbine Generator Board (RTGB) fail to shutdown the plant, the event would escalate to a Site Area Emergency.	**SU8 – Basis:** This IC addresses inadvertent criticality events. This IC indicates a potential degradation of the level of safety of the plant, warranting a Notification of Unusual Event (NOUE) classification. This IC excludes inadvertent criticalities that occur during planned reactivity changes associated with reactor startups (e.g., criticality earlier than estimated). The term “sustained“ is used in order to allow exclusion of expected short term positive startup rates from planned control rod movements such as shutdown bank withdrawal. These short term positive startup rates are the result of the increase in neutron population due to subcritical multiplication. Escalation would be by the Fission Product Barrier Table, as appropriate to the operating mode at the time of the event.
	SG2 – Basis: Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed and efforts to bring the reactor subcritical are unsuccessful. The extreme challenge to the ability to cool the core is intended to mean that the core exit temperatures are at or approaching 1200 oF or that the reactor vessel water level is below the top of active fuel and is addressed by the Core Heat Removal Safety Function. The inability to initially remove heat during the early stages of this sequence (if emergency feedwater flow is insufficient to remove the amount of heat required by design from at least one steam generator, an extreme challenge should be considered to exist) is addressed by the RCS Heat Removal Safety Function. In the event either of these challenges exists at a time that the reactor has not been brought below the power associated with the safety system design a core melt sequence exists. In this situation, core degradation can occur rapidly. For this reason, the General Emergency declaration is intended to be anticipatory of the fission product barrier table declaration to permit maximum off-site intervention time.	**SS3 – Basis:** Loss of all DC power compromises ability to monitor and control plant safety functions. Prolonged loss of all DC power will cause core uncovering and loss of containment integrity when there is significant decay heat and sensible heat in the reactor system. Fifteen minutes was selected to exclude transient or momentary power losses. Escalation to a General Emergency would occur by Abnormal Rad Levels/Radiological Effluent, Fission Product Barrier Table.	**DEFINITION BOX** **IMMINENT –** Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur. Where IMMINENT timeframes are specified, they shall apply.	

General Emergency	Site Area Emergency	Alert	Unusual Event	Recognition Category
SG1 Prolonged Loss of All Off-site and All On-Site AC Power to Emergency Busses. (GB) **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** **1.** Loss of all Off-site **AND** all On-site AC power to A3 4.16 KV **AND** B3 4.16 KV busses. **AND** **a. EITHER** of the following: **(1)** Restoration of at least one emergency bus in less than 4 hours is **NOT** likely **OR** **(2)** RCS and Core Heat Removal Safety function is **NOT** met.	**SS1** Loss of All Off-site and All On-Site AC Power to Emergency Busses for 15 minutes or longer. (GB) **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** ***Note*** *The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed, the applicable time.* **1.** Loss of all Off-site **AND a**ll On-site AC Power to A3 4.16 KV **AND** B3 4.16 KV busses for 15 minutes or longer	**SA5** AC Power Capability To Emergency Busses Reduced To A Single Power Source For 15 Minutes or Longer Such That Any Additional Single Failure Would Result In Station Blackout. **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Value:** ***Note*** *The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed the applicable time.* **1.** AC power capability to A3 4.16 KV **AND** B3 4.16 KV busses reduced to a single power source for 15 minutes or longer. **AND** **a. ANY** additional single power source failure will result in a Station Blackout.	**SU1** Loss of All Off-site AC Power to Emergency Busses for 15 Minutes or Longer. **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** ***Note*** *The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed the applicable time* **1.** Loss of all Off-site AC power to A3 4.16 KV **AND** B3 4.16 KV for 15 minutes or longer.	**AC POWER**
SG2 Automatic Trip and All Manual Actions Fail to Shutdown the Reactor **AND** Indication of an Extreme Challenge to the Ability to Cool the Core Exists. **Operating Mode Applicability:** **1, 2** **EAL Values:** **1.** Automatic trip failed to shutdown the reactor. **AND** **a. ALL** Manual actions failed to shutdown the reactor as indicated by: • Reactor power is **NOT** dropping to less than 5% power • All CEAs are **NOT** inserted **AND** **b. EITHER** of the following exist or have occurred due to continued power generation: **(1)** Core Heat Removal Safety Function **NOT** met. **OR** **(2)** RCS Heat Removal Safety Function **NOT** met.	**SS2** Automatic Trip Fails to Shutdown the Reactor **AND** Manual Actions Taken from the Reactor Turbine Generator Board (RTGB) are **NOT** Successful in Shutting Down the Reactor. **Operating Mode Applicability:** **1, 2** **EAL Values:** **1.** An automatic trip failed to shutdown the reactor **AND** **a.** Manual actions taken at the Reactor Turbine Generator Board (RTGB) **DO NOT** shutdown the reactor as indicated by: • Reactor power is **NOT** dropping to less than 5% power • **ALL** full strength CEAs are **NOT** inserted	**SA2** Automatic Trip Fails to Shutdown the Reactor **AND** the Manual Actions Taken from the Reactor Turbine Generator Board (RTGB) are Successful in Shutting Down the Reactor **Operating Mode Applicability:** **1, 2** **EAL Values:** **1.** An Automatic trip failed to shutdown the reactor **AND** **a.** Manual actions taken at the Reactor Turbine Generator Board (RTGB) successfully shutdown the reactor as indicated by **ALL** of the following: • Reactor power is dropping to less than 5% power • Negative start-up rate • **All** CEAs are inserted or boration in progress	**SU8** Inadvertent Criticality. **Operating Mode Applicability:** **3, 4** **EAL Values:** **1.** UNPLANNED sustained positive start-up rate observed on nuclear instrumentation.	**FAILURE OF RX PROTECTION / CRITICALITY**
GUIDANCE BOX FOR SG1, SS1 On-site AC power may be provided by the other Unit's Emergency Diesel Generator (EDG) by successful X-tie to either the A3 or B3 4.16 KV bus.	**SS3** Loss of All Vital DC Power for 15 Minutes or Longer. **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** ***Note*** *The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed, the applicable time.* **1.** Less than 112 VDC on 1[2]A, 1[2]B **AND** 1[2]AB Vital DC busses for 15 minutes or longer.		**DEFINITION BOX** **UNPLANNED –** A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.	**DC POWER**

S – SYSTEM MALFUNCTIONS

Rec. Cat.	General Emergency	Alert	Unusual Event	Unusual Event
S – SYSTEM MALFUNCTIONS	**Site Area Emergency** **SS6 – Basis:** This IC recognizes the threat to plant safety associated with complete loss of capability of the control room staff to monitor the plant response to a significant transient. "Planned" and “UNPLANNED” actions are not differentiated since the loss of instrumentation of this magnitude is of such significance during a transient that the cause of the loss is not an ameliorating factor. Quantification is arbitrary, however, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost but use the value as a judgment threshold for determining the severity of the plant conditions. It is also not intended that the Shift Supervisor be tasked with making a judgment decision as to whether additional personnel are required to provide increased monitoring of system operation. It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the Notification of Unusual Event (NOUE) is based on SU2 "Inability to Reach Required Shutdown Within Technical Specification Limits." A Site Area Emergency is considered to exist if the control room staff cannot monitor safety functions needed for protection of the public while a significant transient is in progress. 1[2]-AOP-100.03 details the safety annunciators on each Control Room panel. Indications needed to monitor safety functions necessary for protection of the public must include control room indications, computer generated indications and dedicated annunciation capability. "Compensatory indications" in this context are computer based information provided by Distributed Control System and the Qualified Safety Parameter Display System. This should include all computer systems available for this use depending on specific plant design and subsequent retrofits. Fifteen minutes was selected as a threshold to exclude transient or momentary power losses	**SA4 – Basis:** This IC is intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment during a significant transient. "Planned" loss of annunciators or indicators includes scheduled maintenance and testing activities. If approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. 1[2]-AOP-100.03 details the safety annunciators on each Control Room panel. It is not intended that the Unit Supervisor be tasked with making a judgment decision as to whether additional personnel are required to provide supplementary monitoring of system operation. It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the Notification of Unusual Event (NOUE) is based on SU2 "Inability to Reach Required Shutdown Within Technical Specification Limits." "Compensatory indications" in this context are computer based information provided by Distributed Control System and the Qualified Safety Parameter Display System. If both a major portion of the annunciation system and all computer monitoring are unavailable, the Alert is required. Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. This Alert will be escalated to a Site Area Emergency if the operating crew cannot monitor the transient in progress due to a concurrent loss of compensatory indications with a significant transient in progress during the loss of annunciation or indication.	**SU3 – Basis:** This IC and its associated EAL are intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment. Recognition of the availability of computer based indication provided by Distributed Control System and the Qualified Safety Parameter Display System. "Planned" loss of annunciators or indicators includes scheduled maintenance and testing activities. Quantification is arbitrary, however, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. 1[2]-AOP-100.03 details the safety annunciators on each Control Room panel. It is not intended that plant personnel perform a detailed count of the instrumentation lost but use the value as a judgment threshold for determining the severity of the plant conditions. It is recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the Notification of Unusual Event (NOUE) is based on SU2 "Inability to Reach Required Shutdown Within Technical Specification Limits." Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. This Notification of Unusual Event (NOUE) will be escalated to an Alert based on a concurrent loss of compensatory indications or if a significant transient is in progress during the loss of annunciation or indication. **SU5 – Basis:** This IC is included as a Notification of Unusual Event (NOUE) because it may be a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant. The 10 gpm value for the unidentified and pressure boundary leakage was selected as it is observable with normal control room indications. Lesser values must generally be determined through time-consuming surveillance tests (e.g., mass balances). Relief valve normal operation should be excluded from this IC. However, a relief valve that operates and fails to close per design should be considered applicable to this IC if the relief valve cannot be isolated. The EAL for identified leakage is set at a higher value due to the lesser significance of identified leakage in comparison to unidentified or pressure boundary leakage. In either case, escalation of this IC to the Alert level is via Fission Product Barrier Table. **SU4 – Basis:** This EAL is included because it is a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant. This threshold addresses coolant samples exceeding coolant Technical Specifications for transient iodine spiking limits. Escalation of this IC to the Alert level is via the Fission Product Barrier Table.	**SU2 – Basis:** Limiting Conditions of Operation (LCOs) require the plant to be brought to a required operating mode when the Technical Specification required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. In any case, the initiation of plant shutdown required by the site Technical Specifications requires a four hour report under 10 CFR 50.72 (b) Non-emergency events. The plant is within its safety envelope when being shut down within the allowable action statement time in the Technical Specifications. An immediate Notification of Unusual Event (NOUE) is required when the plant is not brought to the required operating mode within the allowable action statement time in the Technical Specifications. Declaration of a Notification of Unusual Event (NOUE) is based on the time at which the LCO-specified action statement time period elapses under the site Technical Specifications and is not related to how long a condition may have existed.

General Emergency	Site Area Emergency	Alert	Unusual Event	Recognition Category	

	SS6 Inability to Monitor a Significant Transient in Progress.
	(GB)
	Operating Mode Applicability: **1, 2, 3, 4**
	EAL Values:
	Note
	The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed, the applicable time.
	1. Loss of greater than approximately 75% of the following for 15 minutes or longer per 1[2]-AOP-100.03:
	a. Control Room Safety System annunciation.
	OR
	b. Control Room Safety System indication associated with the above annunciators.
	AND
	BOTH of the following apply:
	• **ANY** of the following:
	  • Electrical load rejection greater than 25% full electrical load
	  • Reactor Trip
	  • Safety Injection Actuation
	AND
	• Distributed Control System (DCS) **AND** Qualified Safety Parameter Display System (QSPDS) are unavailable.
		SA4 UNPLANNED Loss of Safety System Annunciation or Indication in the Control Room With Either (1) a Significant Transient in Progress, or (2)
		(GB) Compensatory Indicators Unavailable.
		Operating Mode Applicability: **1, 2, 3, 4**
		EAL Values:
		Note
		The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed, the applicable time.
		1. UNPLANNED loss of greater than approximately 75% of the following for 15 minutes or longer per 1[2]-AOP-100.03:
		a. Control Room Safety System annunciation.
		OR
		b. Control Room Safety System indication associated with the above annunciators.
		AND
		EITHER of the following apply:
		• **ANY** of the following:
		  • Electrical load rejection greater than 25% full electrical load
		  • Reactor Trip
		  • Safety Injection Actuation
		OR
		• Distributed Control System (DCS) **AND** Qualified Safety Parameter Display System (QSPDS) are unavailable.
			SU3 UNPLANNED Loss of Safety System Annunciation or Indication in the Control
			(GB) Room for 15 Minutes or Longer
			Operating Mode Applicability: **1, 2, 3, 4**
			EAL Values:
			Note
			The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed the applicable time.
			1. UNPLANNED loss of greater than approximately 75% of the following for 15 minutes or longer per 1[2]-AOP-100.03:
			a. Control Room Safety System annunciation.
			OR
			b. Control Room Safety System indication associated with the above annunciators.
				ANNUNCIATORS	S – SYSTEM MALFUNCTIONS

	GUIDANCE BOX FOR SS6, SA4, SU3 Safety System indication can not be lost without concurrent loss of Safety System annunciation.	**GUIDANCE BOX FOR SU5** See also 2. RCS Leak Rate in the Fission Product Barrier (FPB) Table.	**SU5** RCS Leakage. (GB) **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** **1.** Unidentified **OR** pressure boundary leakage greater than 10 gpm. **OR** **2.** Identified leakage greater than 25 gpm.	RCS LEAKAGE	
	DEFINITION BOX **UNPLANNED –** A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions. **RCS LEAK RATE** – Comprised of IDENTIFIED and UNIDENTIFIED LEAKAGE as defined by Technical Specifications. **UNIDENTIFIED LEAKAGE** – Leakage which is not IDENTIFIED LEAKAGE or CONTROLLED LEAKAGE. **CONTROLLED LEAKAGE –** Seal water flow supplied from the reactor coolant pump seals. **IDENTIFIED LEAKAGE:** **a.** Leakage (except CONTROLLED LEAKAGE) into closed systems, such as pump seal or valve packing leaks that are captured, and conducted to a sump or collecting tank, or **b.** Leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be PRESSURE BOUNDARY LEAKAGE, or **c.** Reactor Coolant System leakage through a steam generator to the secondary system (Primary-to-secondary leakage).	**GUIDANCE BOX FOR SU4** See also 2. Primary Coolant Activity in the Fission Product Barrier (FPB) Table.	**SU4** Fuel Clad Degradation. (GB) **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** **1.** Reactor Coolant sample activity value indicating fuel clad degradation greater than: **a.** 60.0 uCi/gm Dose Equivalent I-131 **OR** **b.** Specific activity greater than 518.9 uCi/gm Dose Equivalent Xe-133	FUEL CLAD	
			SU2 Inability to Reach Required Shutdown Within Technical Specification Limits. **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** **1.** Plant is **NOT** brought to required operating mode within Technical Specifications LCO Action Statement Time.	TECH SPECS	

Rec. Cat.	General Emergency	Site Area Emergency	Alert	Unusual Event
S – SYSTEM MALFUNCTIONS				**SU6 – Basis:** The purpose of this IC and its associated EALs is to recognize a loss of communications capability that either defeats the plant operations staff ability to perform routine tasks necessary for plant operations or the ability to communicate issues with off-site authorities. The loss of off-site communications ability is expected to be significantly more comprehensive than the condition addressed by 10 CFR 50.72. The availability of one method of ordinary off-site communications is sufficient to inform federal, state, and local authorities of plant problems. This EAL is intended to be used only when extraordinary means (e.g., relaying of information from radio transmissions, individuals being sent to off-site locations, etc.) are being used to make communications possible. The list for on-site communications loss encompasses the loss of all means of communications routinely used for operations. The list for off-site communications loss encompasses the loss of all means of communications routinely used for off-site emergency notifications.

General Emergency	Site Area Emergency	Alert	Unusual Event	Recognition Category	
			SU6 Loss of All On-site or Off-site Communications Capabilities. (GB) **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** **1.** Loss of **ALL** of the following on-site communication methods affecting the ability to perform routine operations: • Plant Page • Plant Radio • Commercial Phones***** **OR** **2.** Loss of **ALL** of the following off-site communication methods in **EITHER** box: **State and County Notifications** • Hot Ringdown (HRD) • Commercial phone***** • EMnet **OR** **NRC Notifications** • Emergency Notification System (ENS) • Commercial phone*****	COMMUNICATIONS	S – SYSTEM MALFUNCTIONS

GUIDANCE FOR SU6

***** Commercial phones include installed cell phones in the Control Room, but not personal cell phones.

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ATTACHMENT 2
Power Supplies
(Page 2 of 3)

3. IF cause of lost annunciator is failure of NORMAL power supply, THEN **PLACE** BACKUP supply in service as follows:

NOTE

The 4 bypass switches are located in Cable Spreading Room on west end of annunciator logic cabinets.

A. **IDENTIFY** bypass switch for affected panels from **Table 2**.

Table 2

AFFECTED ANNUNCIATOR PANELS	BYPASS SWITCH
A, B, C, D	INVERTER BYPASS LOGIC HOUSING 3
E, F, G, T, U, V, W, X	INVERTER BYPASS LOGIC HOUSING 2
P, Q, R, S	INVERTER BYPASS LOGIC HOUSING 4
H, J, K, L, M, N	INVERTER BYPASS LOGIC HOUSING 1

B. **PLACE** inverter to affected annunciator to BYPASS. (Key 213)

C. **TEST** affected annunciator panels from Control Room test panels.

4. **TEST** all reflash modules feeding annunciators on affected panels.

RECOGNITION CATEGORY S

SYSTEM MALFUNCTIONS

Rec. Cat.	General Emergency	Site Area Emergency	Alert	Unusual Event
S – SYSTEM MALFUNCTIONS	**SG1 – Basis:** Loss of all AC power to emergency busses compromises all plant safety systems requiring electric power including decay heat removal, emergency core cooling, containment heat removal and the Ultimate Heat Sink. Prolonged loss of all AC power to emergency buses will lead to loss of fuel clad, RCS, and containment, thus warranting declaration of a General Emergency. The 4 hour restoration time is based on the Station Blackout Coping Analysis. This IC is specified to assure that in the unlikely event of a prolonged station blackout, timely recognition of the seriousness of the event occurs and that declaration of a General Emergency occurs as early as is appropriate, based on a reasonable assessment of the event trajectory. The likelihood of restoring at least one emergency bus should be based on a realistic appraisal of the situation since a delay in an upgrade decision based on only a chance of mitigating the event could result in a loss of valuable time in preparing and implementing public protective actions. In addition, under these conditions, fission product barrier monitoring capability may be degraded. Although it may be difficult to predict when power can be restored, the Emergency Coordinator needs a reasonable idea of how quickly to declare a General Emergency based on two major considerations: 1. Are there any present indications that core cooling is already degraded to the point that Loss or Potential Loss of Fission Product Barriers is IMMINENT? 2. If there are no present indications of such core cooling degradation, how likely is it that power can be restored in time to assure that a loss of two barriers with a potential loss of the third barrier can be prevented? Thus, indication of continuing core cooling degradation must be based on Fission Product Barrier monitoring with particular emphasis on Emergency Coordinator judgment as it relates to IMMINENT Loss or Potential Loss of fission product barriers and degraded ability to monitor fission product barriers.	**SS1 – Basis:** Loss of all AC power to emergency buses compromises all plant safety systems requiring electric power including decay heat removal, emergency core cooling, containment heat removal and the Ultimate Heat Sink. Prolonged loss of all AC power to emergency buses will lead to a loss of Fuel Clad, RCS and Containment, thus this event can escalate to a General Emergency. Fifteen minutes was selected as a threshold to exclude transient or momentary losses of off-site power. Escalation to General Emergency is via Fission Product Barrier Degradation or IC SG1, "Prolonged Loss of All Off-site Power and Prolonged Loss of All On-site AC Power."	**SA5 – Basis:** The condition indicated by this IC is the degradation of the off-site and on-site AC power systems such that any additional single failure would result in a station blackout. This condition could occur due to a loss of off-site power with a concurrent failure of all but one emergency generator to supply power to its emergency busses. Another related condition could be the loss of all off-site power and loss of on-site emergency generators with only one train of emergency busses being backfed from the unit main generator, or the loss of on-site emergency generators with only one train of emergency busses being backfed from off-site power. The subsequent loss of this single power source would escalate the event to a Site Area Emergency in accordance with SS1. Fifteen minutes was selected as a threshold to exclude transient or momentary losses of off-site power.	**SU1 – Basis:** Prolonged loss of off-site AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete loss of AC power to emergency busses. Fifteen minutes was selected as a threshold to exclude transient or momentary losses of off-site power.
		SS2- Basis: Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed. A Site Area Emergency is indicated because conditions exist that lead to IMMINENT loss or potential loss of both fuel clad and RCS. Manual scram (trip) actions taken at the Reactor Turbine Generator Board (RTGB) are any set of actions by the reactor operator(s) at which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor. Automatic and manual actuation is not considered successful if action away from the Reactor Turbine Generator Board (RTGB) is required to trip the reactor. This EAL is still applicable even if actions taken away from the Reactor Turbine Generator Board (RTGB) are successful in shutting the reactor down because the design limits of the fuel may have been exceeded or because of the gross failure of the Reactor Protection System to shutdown the plant. Escalation of this event to a General Emergency would be due to a prolonged condition leading to an extreme challenge to either core-cooling or heat removal.	**SA2 – Basis:** Manual trip actions taken at the Reactor Turbine Generator Board (RTGB) are any set of actions by the Reactor Operator(s) which causes or should cause control rods to be rapidly inserted into the core and shuts down the reactor. This condition indicates failure of the automatic protection system to trip the reactor. This condition is more than a potential degradation of a safety system in that a front line automatic protection system did not function in response to a plant transient. Thus the plant safety has been compromised because design limits of the fuel may have been exceeded. An Alert is indicated because conditions may exist that lead to potential loss of fuel clad or RCS and because of the failure of the Reactor Protection System to automatically shutdown the plant. If manual actions taken at the Reactor Turbine Generator Board (RTGB) fail to shutdown the plant, the event would escalate to a Site Area Emergency.	**SU8 – Basis:** This IC addresses inadvertent criticality events. This IC indicates a potential degradation of the level of safety of the plant, warranting a Notification of Unusual Event (NOUE) classification. This IC excludes inadvertent criticalities that occur during planned reactivity changes associated with reactor startups (e.g., criticality earlier than estimated). The term “sustained“ is used in order to allow exclusion of expected short term positive startup rates from planned control rod movements such as shutdown bank withdrawal. These short term positive startup rates are the result of the increase in neutron population due to subcritical multiplication. Escalation would be by the Fission Product Barrier Table, as appropriate to the operating mode at the time of the event.
	SG2 – Basis: Under these conditions, the reactor is producing more heat than the maximum decay heat load for which the safety systems are designed and efforts to bring the reactor subcritical are unsuccessful. The extreme challenge to the ability to cool the core is intended to mean that the core exit temperatures are at or approaching 1200 oF or that the reactor vessel water level is below the top of active fuel and is addressed by the Core Heat Removal Safety Function. The inability to initially remove heat during the early stages of this sequence (if emergency feedwater flow is insufficient to remove the amount of heat required by design from at least one steam generator, an extreme challenge should be considered to exist) is addressed by the RCS Heat Removal Safety Function. In the event either of these challenges exists at a time that the reactor has not been brought below the power associated with the safety system design a core melt sequence exists. In this situation, core degradation can occur rapidly. For this reason, the General Emergency declaration is intended to be anticipatory of the fission product barrier table declaration to permit maximum off-site intervention time.	**SS3 – Basis:** Loss of all DC power compromises ability to monitor and control plant safety functions. Prolonged loss of all DC power will cause core uncovering and loss of containment integrity when there is significant decay heat and sensible heat in the reactor system. Fifteen minutes was selected to exclude transient or momentary power losses. Escalation to a General Emergency would occur by Abnormal Rad Levels/Radiological Effluent, Fission Product Barrier Table.	**DEFINITION BOX** **IMMINENT –** Mitigation actions have been ineffective, additional actions are not expected to be successful, and trended information indicates that the event or condition will occur. Where IMMINENT timeframes are specified, they shall apply.	

General Emergency	Site Area Emergency	Alert	Unusual Event	Recognition Category
SG1 Prolonged Loss of All Off-site and All On-Site AC Power to Emergency Busses. (GB) **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** **1.** Loss of all Off-site **AND** all On-site AC power to A3 4.16 KV **AND** B3 4.16 KV busses. **AND** **a. EITHER** of the following: **(1)** Restoration of at least one emergency bus in less than 4 hours is **NOT** likely **OR** **(2)** RCS and Core Heat Removal Safety function is **NOT** met.	**SS1** Loss of All Off-site and All On-Site AC Power to Emergency Busses for 15 minutes or longer. (GB) **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** ***Note*** *The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed, the applicable time.* **1.** Loss of all Off-site **AND a**ll On-site AC Power to A3 4.16 KV **AND** B3 4.16 KV busses for 15 minutes or longer	**SA5** AC Power Capability To Emergency Busses Reduced To A Single Power Source For 15 Minutes or Longer Such That Any Additional Single Failure Would Result In Station Blackout. **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Value:** ***Note*** *The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed the applicable time.* **1.** AC power capability to A3 4.16 KV **AND** B3 4.16 KV busses reduced to a single power source for 15 minutes or longer. **AND** **a. ANY** additional single power source failure will result in a Station Blackout.	**SU1** Loss of All Off-site AC Power to Emergency Busses for 15 Minutes or Longer. **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** ***Note*** *The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed the applicable time* **1.** Loss of all Off-site AC power to A3 4.16 KV **AND** B3 4.16 KV for 15 minutes or longer.	**AC POWER**
SG2 Automatic Trip and All Manual Actions Fail to Shutdown the Reactor **AND** Indication of an Extreme Challenge to the Ability to Cool the Core Exists. **Operating Mode Applicability:** **1, 2** **EAL Values:** **1.** Automatic trip failed to shutdown the reactor. **AND** **a. ALL** Manual actions failed to shutdown the reactor as indicated by: • Reactor power is **NOT** dropping to less than 5% power • All CEAs are **NOT** inserted **AND** **b. EITHER** of the following exist or have occurred due to continued power generation: **(1)** Core Heat Removal Safety Function **NOT** met. **OR** **(2)** RCS Heat Removal Safety Function **NOT** met.	**SS2** Automatic Trip Fails to Shutdown the Reactor **AND** Manual Actions Taken from the Reactor Turbine Generator Board (RTGB) are **NOT** Successful in Shutting Down the Reactor. **Operating Mode Applicability:** **1, 2** **EAL Values:** **1.** An automatic trip failed to shutdown the reactor **AND** **a.** Manual actions taken at the Reactor Turbine Generator Board (RTGB) **DO NOT** shutdown the reactor as indicated by: • Reactor power is **NOT** dropping to less than 5% power • **ALL** full strength CEAs are **NOT** inserted	**SA2** Automatic Trip Fails to Shutdown the Reactor **AND** the Manual Actions Taken from the Reactor Turbine Generator Board (RTGB) are Successful in Shutting Down the Reactor **Operating Mode Applicability:** **1, 2** **EAL Values:** **1.** An Automatic trip failed to shutdown the reactor **AND** **a.** Manual actions taken at the Reactor Turbine Generator Board (RTGB) successfully shutdown the reactor as indicated by **ALL** of the following: • Reactor power is dropping to less than 5% power • Negative start-up rate • **All** CEAs are inserted or boration in progress	**SU8** Inadvertent Criticality. **Operating Mode Applicability:** **3, 4** **EAL Values:** **1.** UNPLANNED sustained positive start-up rate observed on nuclear instrumentation.	**FAILURE OF RX PROTECTION / CRITICALITY**
GUIDANCE BOX FOR SG1, SS1 On-site AC power may be provided by the other Unit's Emergency Diesel Generator (EDG) by successful X-tie to either the A3 or B3 4.16 KV bus.	**SS3** Loss of All Vital DC Power for 15 Minutes or Longer. **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** ***Note*** *The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed, the applicable time.* **1.** Less than 112 VDC on 1[2]A, 1[2]B **AND** 1[2]AB Vital DC busses for 15 minutes or longer.		**DEFINITION BOX** **UNPLANNED –** A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions.	**DC POWER**

S – SYSTEM MALFUNCTIONS

Rec. Cat.	General Emergency	Alert	Unusual Event	Unusual Event
S – SYSTEM MALFUNCTIONS	**Site Area Emergency** **SS6 – Basis:** This IC recognizes the threat to plant safety associated with complete loss of capability of the control room staff to monitor the plant response to a significant transient. "Planned" and “UNPLANNED” actions are not differentiated since the loss of instrumentation of this magnitude is of such significance during a transient that the cause of the loss is not an ameliorating factor. Quantification is arbitrary, however, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. It is not intended that plant personnel perform a detailed count of the instrumentation lost but use the value as a judgment threshold for determining the severity of the plant conditions. It is also not intended that the Shift Supervisor be tasked with making a judgment decision as to whether additional personnel are required to provide increased monitoring of system operation. It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the Notification of Unusual Event (NOUE) is based on SU2 "Inability to Reach Required Shutdown Within Technical Specification Limits." A Site Area Emergency is considered to exist if the control room staff cannot monitor safety functions needed for protection of the public while a significant transient is in progress. 1[2]-AOP-100.03 details the safety annunciators on each Control Room panel. Indications needed to monitor safety functions necessary for protection of the public must include control room indications, computer generated indications and dedicated annunciation capability. "Compensatory indications" in this context are computer based information provided by Distributed Control System and the Qualified Safety Parameter Display System. This should include all computer systems available for this use depending on specific plant design and subsequent retrofits. Fifteen minutes was selected as a threshold to exclude transient or momentary power losses	**SA4 – Basis:** This IC is intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment during a significant transient. "Planned" loss of annunciators or indicators includes scheduled maintenance and testing activities. If approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. 1[2]-AOP-100.03 details the safety annunciators on each Control Room panel. It is not intended that the Unit Supervisor be tasked with making a judgment decision as to whether additional personnel are required to provide supplementary monitoring of system operation. It is further recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the Notification of Unusual Event (NOUE) is based on SU2 "Inability to Reach Required Shutdown Within Technical Specification Limits." "Compensatory indications" in this context are computer based information provided by Distributed Control System and the Qualified Safety Parameter Display System. If both a major portion of the annunciation system and all computer monitoring are unavailable, the Alert is required. Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. This Alert will be escalated to a Site Area Emergency if the operating crew cannot monitor the transient in progress due to a concurrent loss of compensatory indications with a significant transient in progress during the loss of annunciation or indication.	**SU3 – Basis:** This IC and its associated EAL are intended to recognize the difficulty associated with monitoring changing plant conditions without the use of a major portion of the annunciation or indication equipment. Recognition of the availability of computer based indication provided by Distributed Control System and the Qualified Safety Parameter Display System. "Planned" loss of annunciators or indicators includes scheduled maintenance and testing activities. Quantification is arbitrary, however, it is estimated that if approximately 75% of the safety system annunciators or indicators are lost, there is an increased risk that a degraded plant condition could go undetected. 1[2]-AOP-100.03 details the safety annunciators on each Control Room panel. It is not intended that plant personnel perform a detailed count of the instrumentation lost but use the value as a judgment threshold for determining the severity of the plant conditions. It is recognized that most plant designs provide redundant safety system indication powered from separate uninterruptible power supplies. While failure of a large portion of annunciators is more likely than a failure of a large portion of indications, the concern is included in this EAL due to difficulty associated with assessment of plant conditions. The loss of specific, or several, safety system indicators should remain a function of that specific system or component operability status. This will be addressed by the specific Technical Specification. The initiation of a Technical Specification imposed plant shutdown related to the instrument loss will be reported via 10 CFR 50.72. If the shutdown is not in compliance with the Technical Specification action, the Notification of Unusual Event (NOUE) is based on SU2 "Inability to Reach Required Shutdown Within Technical Specification Limits." Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. This Notification of Unusual Event (NOUE) will be escalated to an Alert based on a concurrent loss of compensatory indications or if a significant transient is in progress during the loss of annunciation or indication. **SU5 – Basis:** This IC is included as a Notification of Unusual Event (NOUE) because it may be a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant. The 10 gpm value for the unidentified and pressure boundary leakage was selected as it is observable with normal control room indications. Lesser values must generally be determined through time-consuming surveillance tests (e.g., mass balances). Relief valve normal operation should be excluded from this IC. However, a relief valve that operates and fails to close per design should be considered applicable to this IC if the relief valve cannot be isolated. The EAL for identified leakage is set at a higher value due to the lesser significance of identified leakage in comparison to unidentified or pressure boundary leakage. In either case, escalation of this IC to the Alert level is via Fission Product Barrier Table. **SU4 – Basis:** This EAL is included because it is a precursor of more serious conditions and, as result, is considered to be a potential degradation of the level of safety of the plant. This threshold addresses coolant samples exceeding coolant Technical Specifications for transient iodine spiking limits. Escalation of this IC to the Alert level is via the Fission Product Barrier Table.	**SU2 – Basis:** Limiting Conditions of Operation (LCOs) require the plant to be brought to a required operating mode when the Technical Specification required configuration cannot be restored. Depending on the circumstances, this may or may not be an emergency or precursor to a more severe condition. In any case, the initiation of plant shutdown required by the site Technical Specifications requires a four hour report under 10 CFR 50.72 (b) Non-emergency events. The plant is within its safety envelope when being shut down within the allowable action statement time in the Technical Specifications. An immediate Notification of Unusual Event (NOUE) is required when the plant is not brought to the required operating mode within the allowable action statement time in the Technical Specifications. Declaration of a Notification of Unusual Event (NOUE) is based on the time at which the LCO-specified action statement time period elapses under the site Technical Specifications and is not related to how long a condition may have existed.

General Emergency	Site Area Emergency	Alert	Unusual Event	Recognition Category	

	SS6 Inability to Monitor a Significant Transient in Progress.
	(GB)
	Operating Mode Applicability: **1, 2, 3, 4**
	EAL Values:
	Note
	The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed, the applicable time.
	1. Loss of greater than approximately 75% of the following for 15 minutes or longer per 1[2]-AOP-100.03:
	a. Control Room Safety System annunciation.
	OR
	b. Control Room Safety System indication associated with the above annunciators.
	AND
	BOTH of the following apply:
	• **ANY** of the following:
	  • Electrical load rejection greater than 25% full electrical load
	  • Reactor Trip
	  • Safety Injection Actuation
	AND
	• Distributed Control System (DCS) **AND** Qualified Safety Parameter Display System (QSPDS) are unavailable.
		SA4 UNPLANNED Loss of Safety System Annunciation or Indication in the Control Room With Either (1) a Significant Transient in Progress, or (2)
		(GB) Compensatory Indicators Unavailable.
		Operating Mode Applicability: **1, 2, 3, 4**
		EAL Values:
		Note
		The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed, the applicable time.
		1. UNPLANNED loss of greater than approximately 75% of the following for 15 minutes or longer per 1[2]-AOP-100.03:
		a. Control Room Safety System annunciation.
		OR
		b. Control Room Safety System indication associated with the above annunciators.
		AND
		EITHER of the following apply:
		• **ANY** of the following:
		  • Electrical load rejection greater than 25% full electrical load
		  • Reactor Trip
		  • Safety Injection Actuation
		OR
		• Distributed Control System (DCS) **AND** Qualified Safety Parameter Display System (QSPDS) are unavailable.
			SU3 UNPLANNED Loss of Safety System Annunciation or Indication in the Control
			(GB) Room for 15 Minutes or Longer
			Operating Mode Applicability: **1, 2, 3, 4**
			EAL Values:
			Note
			The Emergency Coordinator should not wait until the applicable time has elapsed, but should declare the event as soon as it is determined that the condition has exceeded, or will likely exceed the applicable time.
			1. UNPLANNED loss of greater than approximately 75% of the following for 15 minutes or longer per 1[2]-AOP-100.03:
			a. Control Room Safety System annunciation.
			OR
			b. Control Room Safety System indication associated with the above annunciators.
				ANNUNCIATORS	S – SYSTEM MALFUNCTIONS

	GUIDANCE BOX FOR SS6, SA4, SU3 Safety System indication can not be lost without concurrent loss of Safety System annunciation.	**GUIDANCE BOX FOR SU5** See also 2. RCS Leak Rate in the Fission Product Barrier (FPB) Table.	**SU5** RCS Leakage. (GB) **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** **1.** Unidentified **OR** pressure boundary leakage greater than 10 gpm. **OR** **2.** Identified leakage greater than 25 gpm.	RCS LEAKAGE	
	DEFINITION BOX **UNPLANNED –** A parameter change or an event that is not the result of an intended evolution and requires corrective or mitigative actions. **RCS LEAK RATE** – Comprised of IDENTIFIED and UNIDENTIFIED LEAKAGE as defined by Technical Specifications. **UNIDENTIFIED LEAKAGE** – Leakage which is not IDENTIFIED LEAKAGE or CONTROLLED LEAKAGE. **CONTROLLED LEAKAGE –** Seal water flow supplied from the reactor coolant pump seals. **IDENTIFIED LEAKAGE:** **a.** Leakage (except CONTROLLED LEAKAGE) into closed systems, such as pump seal or valve packing leaks that are captured, and conducted to a sump or collecting tank, or **b.** Leakage into the containment atmosphere from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be PRESSURE BOUNDARY LEAKAGE, or **c.** Reactor Coolant System leakage through a steam generator to the secondary system (Primary-to-secondary leakage).	**GUIDANCE BOX FOR SU4** See also 2. Primary Coolant Activity in the Fission Product Barrier (FPB) Table.	**SU4** Fuel Clad Degradation. (GB) **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** **1.** Reactor Coolant sample activity value indicating fuel clad degradation greater than: **a.** 60.0 uCi/gm Dose Equivalent I-131 **OR** **b.** Specific activity greater than 518.9 uCi/gm Dose Equivalent Xe-133	FUEL CLAD	
			SU2 Inability to Reach Required Shutdown Within Technical Specification Limits. **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** **1.** Plant is **NOT** brought to required operating mode within Technical Specifications LCO Action Statement Time.	TECH SPECS	

Rec. Cat.	General Emergency	Site Area Emergency	Alert	Unusual Event
S – SYSTEM MALFUNCTIONS				**SU6 – Basis:** The purpose of this IC and its associated EALs is to recognize a loss of communications capability that either defeats the plant operations staff ability to perform routine tasks necessary for plant operations or the ability to communicate issues with off-site authorities. The loss of off-site communications ability is expected to be significantly more comprehensive than the condition addressed by 10 CFR 50.72. The availability of one method of ordinary off-site communications is sufficient to inform federal, state, and local authorities of plant problems. This EAL is intended to be used only when extraordinary means (e.g., relaying of information from radio transmissions, individuals being sent to off-site locations, etc.) are being used to make communications possible. The list for on-site communications loss encompasses the loss of all means of communications routinely used for operations. The list for off-site communications loss encompasses the loss of all means of communications routinely used for off-site emergency notifications.

General Emergency	Site Area Emergency	Alert	Unusual Event	Recognition Category	
			SU6 Loss of All On-site or Off-site Communications Capabilities. (GB) **Operating Mode Applicability:** **1, 2, 3, 4** **EAL Values:** **1.** Loss of **ALL** of the following on-site communication methods affecting the ability to perform routine operations: • Plant Page • Plant Radio • Commercial Phones***** **OR** **2.** Loss of **ALL** of the following off-site communication methods in **EITHER** box: **State and County Notifications** • Hot Ringdown (HRD) • Commercial phone***** • EMnet **OR** **NRC Notifications** • Emergency Notification System (ENS) • Commercial phone*****	COMMUNICATIONS	S – SYSTEM MALFUNCTIONS

GUIDANCE FOR SU6

***** Commercial phones include installed cell phones in the Control Room, but not personal cell phones.

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100.

G2.4.43 / Knowledge of emergency communications systems and techniques.

Given the following conditions:

- A Probable Airborne Threat **SECURITY EVENT** is in progress
- An Alert has been declared in accordance with EPIP-01, Classification of Emergencies
- The Crew has entered 0-AOP-72.01, Response to Security Events

Which ONE of the following completes the statements below?

The PRIMARY method of STATE notification method is using the ____(1)____.

The NRC must be notified within a MAXIMUM of ____(2)____.

A.	(1)	EMNET
	(2)	15 minutes
B.	(1)	EMNET
	(2)	60 minutes
C.	(1)	Hot Ring Down Phone (HRD)
	(2)	15 minutes
D.	(1)	Hot Ring Down Phone (HRD)
	(2)	60 minutes

CORRECT ANSWER: C

DISTRACTOR ANALYSIS:		
A.	Incorrect:	Part 1 incorrect: EMNET is an option if the HRD is unavailable but 0-AOP-72.01, DIRECTS USING HRD TO CONTACT THE STATE. Part 2 correct: See analysis C.
B.	Incorrect:	Part 1 incorrect: See analysis A. Part 2 incorrect: This would be correct for non-security related events IAW EPIP-08.
C.	Correct:	Part 1 correct: **1.1 VALIDATE** authenticity of any airborne threat using either of the following: **A. NOTIFY** NRC Headquarters Operations Center using the NRC ENS telephone. (HRD) **B. NOTIFY** NRC Headquarters Operations Center using a commercial line to call xxxxxxxxx. Part 2 correct: in accordance with NRC Bulletin 2005-02, "The staff finds that a notification time period of approximately 15 minutes from discovery of a security-based event to the NRC notification would allow the NRC to more quickly notify other licensees and Federal Agencies".
D.	Incorrect:	Part 1 correct: See analysis C. Part 2 incorrect: See analysis b.

Question Number: 100

Tier: 3 Group:

K/A: G2.4.43 / Knowledge of emergency communications systems and techniques.

Importance Rating: 3.2 3.8

10 CFR Part 55: (CFR: 41.10 / 45.13)

10CFR55.43.b: 10 CFR 55.43(b)(5)

K/A Match: K/A is matched because the applicant is required to know the emergency communications systems and techniques.

Technical Reference: 0-AOP-72.01, EPIP-08

Proposed references to be provided: None

Learning Objective: PSL OPS 3602051 - 1

Cognitive Level:

Higher	
Lower	X

Question Source:

New	X
Modified Bank	
Bank	

Question History: NEW question for the 2019 NRC Exam

Comments:

INSTRUCTIONS	CONTINGENCY ACTIONS

4.0 OPERATOR ACTIONS

4.1 Immediate Operator Actions

None

4.2 Subsequent Operator Actions

NOTE

- The NRC considers continuous communication as a person in direct contact with them, on the phone, at all times.
- It is acceptable to maintain communication with only the NRC HQ Operations Center if multiple threat notification sources are received.
- The NRC recommends licensees reestablish communication with the NRC HQ Operations Center as soon as practical after an onsite aircraft impact, or within 5 minutes of the previously anticipated impact time if no impact occurs.

*	**1.** **VERIFY NO** airborne threat.	**1.1** **VALIDATE** authenticity of any airborne threat using either of the following: **A.** **NOTIFY** NRC Headquarters Operations Center using the NRC ENS telephone. **B.** **NOTIFY** NRC Headquarters Operations Center using a commercial line to call 301-816-5100.
		1.2 IF notified of an airborne threat, THEN **MAINTAIN** continuous communication with the threat notification source.

5.2 Nuclear Regulatory Commission (NRC) Notification

1. Time Limits

A. §2 Accelerated Notification – in accordance with NRC Bulletin 2005-02, "The staff finds that a notification time period of approximately 15 minutes from discovery of a security-based event to the NRC notification would allow the NRC to more quickly notify other licensees and Federal Agencies".

NOTE
(Non-Security Event)

Notification of the NRC is expected immediately after notification of State and local agencies. The one-hour time limit in 10 CFR 50.72 (a)(3) is to ensure timely NRC notification in cases where notification of State and local agencies is delayed or prolonged.

B. The licensee shall notify the NRC immediately after notification of the appropriate State or local agencies and not later than one hour after the time the licensee declares one of the Emergency Classes (10 CFR 50.72 (a)(3)).

2. Special Instructions

A. Initial notification to the NRC using the Emergency Notification System (ENS) (usually done from the Control Room) should use Attachment 3, NRC Reactor Plant Event Notification Worksheet.

B. At an Alert or higher emergency class, the NRC will want to establish an open line of communication with the Control Room, utilizing an ENS conference bridge tying in the licensee with NRC Headquarters and region personnel. Once the Technical Support Center (TSC) is operational, the Control Room should transfer responsibility for NRC communications to the TSC.

C. The Emergency Operations Facility (EOF) should join the TSC on the ENS conference bridge and take the lead for NRC communications.

D. The TSC and EOF should also utilize the Health Physics Network (HPN) line in a manner similar to the ENS (i.e., establish a conference bridge with the NRC).

E. Both the ENS and HPN Communicators in both facilities should keep logs of information transmitted and received from the NRC in accordance with procedures.

END OF SECTION 5.2

1.1 Discussion (continued)

7. (continued)

C. Emergency Follow-up Information Requests from State and local agencies.

1. Incoming calls should come via the SWO over the HRD phone. If the HRD is inoperable, the SWO may use commercial telephone or EMNET (emergency satellite phone). If an off-site authority contacts the plant without going through the SWO, request that they contact the SWO. SWO shall verify that the agency calling is a risk county or the Department of Health (DOH) and shall notify other county and state agencies of the updated information, thus reducing the number of calls that may be directed to the plant.

2. If the State or one of the Counties provides either the TSC or EOF with new or pertinent information, Then bring that information to the attention of the EC or EC Assistant / Logkeeper in the TSC or the RM or the RM OPS Advisor / Logkeeper in the EOF.

8. Protective Action Recommendations

A. Protective actions for the general public are ordinarily NOT required prior to declaration of a General Emergency. It is possible however, that due to unusually stable and constant meteorological conditions, protective actions could be recommended at a Site Area Emergency based on projected doses. This is the exception rather than the rule.

Protective actions for the general public are required to be recommended if a General Emergency is declared. Initial Protective Action Recommendations (PARs) are normally based on plant conditions. This would NOT be true if the General Emergency was declared based on off-site dose (either measured or projected) or a Security Emergency (per the Security Plan). The predetermined minimum PARs (based on plant conditions) are as given below.

Facility:	St. Lucie	Scenario No.:	1	Op-Test No.:	L-19-1
Examiners:		Operators:	SRO:		
			ATC:		
			BOP:		
Initial Conditions:	2-3% power, MOC, no scheduled surveillances, all Mode 1 preps complete				
Turnover:	2A Screen Wash Pump OOS, 2-NOP-21.15 INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green. A Reactor Start-up is in progress following a Forced Outage for Feed Water control Valve issues, on main feedwater and SBCS, raise reactor power to 10-15%.				
Critical Tasks:	1. RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain RCS pressure within the bounds of the RPS TM/LP (Variable) trip set points. Take action to close PCV-1100E prior to reaching RPS setpoint for reactor trip. 2. INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY-Safeguards Equipment that is essential to the maintenance of Safety Functions has NOT auto-actuated when it should have. Actuation of "B" Train of Containment Spray within 15 minutes of entering 2-EOP-03 to prevent unnecessary entry into Functional Recovery procedure and escalation of EAL to SAE (Loss of second Fission Product Barrier) due to inaction by the operators, or 15 minute post CSAS if after 2-EOP-03 entry.				

Event No.	Malf. No.	Event Type*	Event Description
1		R/ATC /SRO	Raise Power to 10-15%
2	1	C/ATC BOP/SRO TS/SRO	**Malf:** PCV-1100E fails open **Action:** Select PCV-1100F **T.S.** 3.2.5 DNB **CT-1:** Failure to control RCS pressure will result in reactor trip
3	2	I/BOP/SRO TS/SRO	**Malf:** RWT LEVEL LIS-07-2C fails Low **Action:** Bypass ESFAS bistables **T.S.** 3.3.2
4	3	I/ATC/SRO	**Malf:** PIC-2201 LD Pressure Controller Auto fails **Action:** Take **MANUAL** control of PIC-2201
5	4	C/ATC N/BOP/SRO TS/SRO	**Malf**: RCS leakage develops (≈20 gpm) **Action**: Quantify leakage and determine TS limit for RCS unidentified leak rate is exceeded and Shutdown the plant **T.S.** 3.4.6.2
6	5	M/ALL	**Malf:** LOCA Ramped in over 6 minutes **Action:** Trip RX, Perform 2-EOP-01, Diagnose LOCA and enter 2-EOP-03 On RX Trip 2-HVS-1A Containment Fan Cooler trips unrecoverable, On CSAS 2A CS pump shaft seizes
7	6	C/ATC/SRO	**Malf:** PCV-1100F fails open on RX trip **Action:** SECURE 2B1 RCP
8	7	C/BOP/SRO	**Malf:** A CSAS pump trips on high amps, B Train of CSAS fails to auto actuate **Action:** Manually actuate B Train of CSAS to get adequate flow. **CT-2** MANUALLY ACTUATE SAFEGUARDS EQUIPMENT
*	(N)ormal,	(R)eactivity,	(I)nstrument, (C)omponent, (M)ajor

Scenario 1 Summary

Event	Description
1	THIS IS A REACTIVITY EVENT; Raise Power to 10-15%. The SRO will direct the ATC and BOP to commence a unit up-power using the guidance of 2-GOP-201, "Reactor Plant Startup – Mode 2 to Mode 1" step 10.B The ATC will begin RCS dilution and withdraw CEAs, as directed, to raise reactor power. The BOP will operate the secondary plant parameters as directed. Crew will determine entry into Mode 1.
2	THIS IS A CRITICAL TASK; PCV-1100E Pressurizer Spray Control valve ramps open; The ATC will recognize RCS pressure lowering, identify the failure, report the condition, and select PCV-1100F Pressurizer Spray Control valve using the Spray valve selector switch on RTGB-203 as an Immediate Action and prior to RPS actuation on Low Pressurizer Pressure to close PCV-1100E. The SRO will implement 2-AOP-01.10, Pressurizer Pressure and Level, verify immediate operator actions were performed, implement section 4.2.4 and enter T.S. 3.2.5 for DNB when RCS is less than 2225 psia.
3	LIS-07-2C Refueling Water Tank Level Indicating Switch will fail low. The BOP/ATC will address the annunciators, verify the plant is stable, evaluate the indications and identify the failed instrument. The SRO will enter 2-AOP-99.01 Loss of Tech Spec Instrumentation, perform section 4.2.18 and enter T.S. 3.3.2. The crew will bypass the ESFAS BTU for LIS-07-2C using key 114 for the ESFAS cabinet door and key 131 for the BTU.
4	THIS IS A MANUAL CONTROL OF AN AUTO SYSTEM FAILURE; Letdown Pressure Controller PIC-2201 fails to operate in auto mode. ATC will address the annunciators, evaluate the letdown system, identify the failure, place PIC-2201 in manual mode, manually control letdown pressure and return to pre-failure values. The SRO will enter 2-AOP-02.03 Charging and Letdown and perform section 4.2.7.
5	An unidentified RCS leak of approximately 20 gpm will begin; The ATC will recognize pressurizer level lowering, letdown lowering, cavity leakage rising and RCS pressure lowering. Report the conditions and begin a leak rate calculation. The SRO will enter 2-AOP-01.08 RCS Leakage Abnormal Ops, quantify leakage and determine TS limit for RCS unidentified leak rate is exceeded and enter T.S. 3.4.6.2. The crew will then shut the reactor down using 2-AOP-22.01 Rapid Downpower (which will direct a reactor trip).
6	On RX trip a LOCA will be inserted on a 6 min ramp. The crew will evaluate plant parameters and determine that the unit is required to be tripped due to the inability to maintain RCS parameters within spec. The SRO will direct the ATC to trip the unit, perform 2-EOP-01 and diagnose a LOCA and transition to 2-EOP-03 LOCA. On reactor trip Containment cooling fan 2-HVS-1A will trip, on CSAS the 2A Containment Spray pump will experience a seized shaft.
7	On the RX trip PCV-1100F will fail open the ATC will identify the failure and take action to control spray flow by securing the 2B1 RCP which feeds the associated spray valve.
8	THIS IS A CRITICAL TASK; Upon Containment Spray actuation parameters reaching their setpoints, the A CSAS pump trips on high amps, the B train of CSAS does not actuate, the BOP will evaluate CSAS components and determine that B CSAS failed to actuate, take action to manually actuate B train CSAS and verify proper flow to the B spray header to prevent unnecessary entry into Functional Recovery procedure and escalation of EAL to SAE (Loss of second Fission Product Barrier) due to inaction by the operators, or 15 minute post CSAS if after 2-EOP-03 entry that causes Pp auto start failure & FCVs auto open to fail.
Termination Criteria	The scenario is to be terminated after the crew has begun a RCS cooldown and depressurization or at the Lead evaluators direction

SITE: ST. LUCIE **Revision #:** 0

LMS ID: N/A **LMS Rev. Date:** N/A

SEG TITLE: L-19-1 SCENARIO 1

SEG TYPE: ☐ Training ☒ Evaluation

PROGRAM: ☐ LOCT ☒ LOIT ☐ Other:

DURATION: 90 minutes

Developed by: _____ _____
Instructor/Developer Date

Reviewed by: _____ _____
Instructor (Instructional Review) Date

Validated by: _____ _____
SME (Technical Review) Date

Approved by: _____ _____
Training Supervision Date

Approved by: _____ _____
Training Program Owner (Line) Date

Scenario Outline

Facility:	St. Lucie	Scenario No.:	1	Op-Test No.:	L-19-1
Examiners:		Operators:	SRO:		
			ATC:		
			BOP:		

Initial Conditions: 2-3% power, MOC, no scheduled surveillances, all Mode 1 preps complete

Turnover: 2A Screen Wash Pump OOS, 2-NOP-21.15 INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green. A Reactor Start-up is in progress following a Forced Outage for Feed Water control Valve issues, on main feedwater and SBCS, raise reactor power to 10-12%.

Critical Tasks:

1. RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain RCS pressure within the bounds of the RPS TM/LP (Variable) trip set points. Take action to close PCV-1100E prior to reaching RPS setpoint for reactor trip.
2. INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY-Safeguards Equipment that is essential to the maintenance of Safety Functions has NOT auto-actuated when it should have. Actuation of "B" Train of Containment Spray within 15 minutes of entering 2-EOP-03 to prevent unnecessary entry into Functional Recovery procedure and escalation of EAL to SAE (Loss of second Fission Product Barrier) due to inaction by the operators, or 15 minute post CSAS if after 2-EOP-03 entry.

Event No.	Malf. No.	Event Type*	Event Description
1		R/ATC /SRO	Raise Power to 10-15%
2	1	C/ATC BOP/SRO TS/SRO	**Malf:** PCV-1100E fails open **Action:** Select PCV-1100F **T.S.** 3.2.5 DNB **CT-1:** Failure to control RCS pressure will result in reactor trip
3	2	I/BOP/SRO TS/SRO	**Malf:** RWT LEVEL LIS-07-2C fails Low **Action:** Bypass ESFAS bistables **T.S**. 3.3.2
4	3	I/ATC/SRO	**Malf:** PIC-2201 LD Pressure Controller Auto fails **Action:** Take **MANUAL** control of PIC-2201
5	4	C/ATC N/BOP/SRO TS/SRO	**Malf**: RCS leakage develops (≈20 gpm) **Action**: Quantify leakage and determine TS limit for RCS unidentified leak rate is exceeded and Shutdown the plant **T.S.** 3.4.6.2
6	5	M/ALL	**Malf:** LOCA Ramped in over 6 minutes **Action:** Trip RX, Perform 2-EOP-01, Diagnose LOCA and enter 2-EOP-03 On RX Trip 2-HVS-1A Containment Fan Cooler trips unrecoverable, On CSAS 2A CS pump shaft seizes
7	6	C/ATC/SRO	**Malf:** PCV-1100F fails open on RX trip **Action:** SECURE 2B1 RCP
8	7	C/BOP/SRO	**Malf:** A CSAS pump trips on high amps, B Train of CSAS fails to auto actuate **Action:** Manually actuate B Train of CSAS to get adequate flow. **CT-2** MANUALLY ACTUATE SAFEGUARDS EQUIPMENT

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

SIMULATOR EXERCISE GUIDE REQUIREMENTS

Terminal Objective Given specific plant conditions, the students will be able to mitigate events in accordance with plant procedures.

Enabling Objectives: None

Prerequisites:
1. Simulator
2. Applicants enrolled in Initial License Program

Training Resources:
1. Floor Instructor as Shift Technical Advisor
2. Simulator Booth Operator
3. NRC Evaluators

References:
1. 2-GOP-201, Reactor Plant Startup – Mode 2 to Mode 1
2. 2-AOP-01.10, Pressurizer Pressure and Level
3. 2-AOP-99.01, Loss of Tech Spec Instrumentation
4. 2-AOP-02.03, Charging and Letdown
5. 2-AOP-01.08, RCS Leakage Abnormal Operations
6. 2-AOP-22.01, Rapid Downpower
7. 2-EOP-01, Standard Post Trip Actions
8. 2-EOP-03, Loss of Coolant Accident
9. 2-EOP-99, Appendices / Figures / Tables /Data Sheets
10. Unit-2 Technical Specifications

Protected Content: **NONE**

Evaluation Method: Simulator performance will be evaluated in accordance with NUREG 1021 rev. 11.

Risk Significant Operator Actions:

UPDATE LOG: Indicate in the following table any minor changes or major revisions made to the material after initial approval.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER REVIEWER	DATE DATE

L-19-1 NRC SCENARIO 1 OVERVIEW/SEQUENCE OF EVENTS

The crew will assume the shift at 2-3% power with direction to raise power to 10-12% using 2-GOP-201 Reactor Plant Start-up Mode2-Mode1 starting at step 4.3.10.b.

After the required power change has been observed by the evaluators, PCV-1100E Pressurizer Spray Control valve opens causing RCS pressure to lower rapidly. The crew will select PCV-1100F using the Spray valve selector switch to force PCV-1100E closed, they will then enter 2-AOP-01.10 Pressurizer Pressure and Level and enter Tech Spec 3.2.5 for DNB. This event is a Critical task in that the crew will be required to close PCV-1100 and RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain RCS pressure within the bounds of the RPS TM/LP (Variable) trip set points.

When the plant has been stabilized RWT Level instrument LIS-07-2C fails Low, the crew will identify the failure and enter 2-AOP-99.01 Loss of Tech Spec Instrumentation and bypass the required channels of ESFAS and enter Tech Spec 3.3.2

After the crew brief, Letdown Pressure Controller PIC-2201 fails to operate in auto mode the crew will place PIC-2201 in manual mode, manually control letdown pressure and return to pre-failure values, enter 2-AOP-01.10 Pressurizer Pressure and Level.

When the plant has been stabilized an RCS leak of approximately 20 gpm will start, the crew will identify the failure, Quantify leakage, enter 2-AOP-01.08 RCS Leakage Abnormal and determine the Tech Spec limit for RCS unidentified leakage is exceeded. The SRO will recognize the current power level limits the crews options relating to reducing power and will direct a reactor trip or enter 2-AOP-22.01 Rapid Downpower to proceed to the step requiring a reactor trip to conform with Tech Spec 3.4.6.2 RCS Leakage

After the reactor trip a LOCA will Ramp in over 6 minutes and HVS-1A will trip, the crew will perform 2-EOP-01 Standard Post Trip Action and transition to 2-EOP-03 LOCA

Upon the Reactor trip PCV-1100F fails open causing rapid RCS depressurization, the crew will identify the failure and will be required to secure the 2B1 RCP to prevent any further RCS depressurization.

Upon Containment Spray Actuation the A CSAS pump will trip on high amps , the B Train of CSAS will fails to auto actuate requiring the crew to Manually actuate B Train of CSAS to get adequate Containment Spray flow

This event is a Critical task in that the crew will be required to INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY, Actuation of "B" Train of Containment Spray within 15 minutes of entering 2-EOP-03 to prevent unnecessary entry into Functional Recovery procedure and escalation of EAL to SAE (Loss of second Fission Product Barrier) due to inaction by the operators, or 15 minute post CSAS if after 2-EOP-03 entry.

Procedures Used	Tech Specs Entered
• 2-GOP-201, Reactor Plant Startup – Mode 2 to Mode 1 • 2-AOP-01.10, Pressurizer Pressure and Level • 2-AOP-99.01, Loss of Tech Spec Instrumentation • 2-AOP-02.03, Charging and Letdown • 2-AOP-01.08, RCS Leakage Abnormal Operations • 2-AOP-22.01, Rapid Downpower • 2-EOP-01, Standard Post Trip Actions • 2-EOP-03, Loss of Coolant Accident • 2-EOP-99, Appendices / Figures / Tables /Data Sheets • Unit-2 Technical Specifications	• 3.2.5 • 3.3.2 • 3.4.6.2

Scenario Setup and Booth Operator Instructions:

- **ENSURE** Examination Security has been established.
- **ENSURE** the Simulator is unloaded
- **ENSURE** IC #114 from Exam Flash drive is loaded as follows:
  - **Open**, folder L-19-1 NRC SCENARIO ICs
  - **Copy**, CY18B#114.ic and CY18B#114.rlp
  - **Open**, IC folder on simulator operator station desk top
  - **Paste**, CY18B#114.ic and CY18B#114.rlp into IC Master
  - **Open**, folder L-19-1 NRC SCENARIO ICs
  - **Copy**, xr114.dat
  - **Open**, IC folder on simulator operator station desk top
  - **Paste**, xr114.dat into IC Data
- **ENSURE** Lesson for SCENARIO 1 from Exam Flash drive is loaded as follows:
  - **Open**, folder L-19-1 S-1 lsn
  - **Copy**, L-19-1 S-1.lsn
  - **Open**, Lessons folder on simulator operator station desk top
  - **Paste**, L-19-1 S-1.lsn into the Instructor Lessons folder
- **LOAD** the Simulator
- **RESTORE** IC#114
  - **RUN** the Simulator
  - Place the 2A Screen wash pump off
  - Place a Clearance tag on the 2A Screen wash pump
    - Start the 2B Screen wash pump
  - ENSURE the A Train Protected sign and OLRM sign are placed RTGB-203.
  - ENSURE the GREEN OLRM sign is placed RTGB-203.
  - ENSURE the CHEMISTRY sheet for MOC is placed on the Unit Supervisor Desk.
  - **FREEZE** the simulator
- **OPEN** and **EXECUTE** L-19-1 S- 1.lsn
- **RUN** the Simulator and allow for stabilization
- **FREEZE** the simulator
- **UNFREEZE** the simulator prior to the candidates entering the simulator

Post scenario simulator restoration:

- **ENSURE** L-19-1 NRC SCENARIO 1.lsn are deleted from Simulator in accordance with Attachment 2 of Training Department Policy PSL-TRNG 142

BRIEF / TURNOVER INFORMATION

- Conduct simulator crew pre-scenario brief using TR-AA-L-19-10-1007-F06, Simulator Instructor Pre-Exercise Checklist.
- Brief the scenario evaluators
- Brief surrogates using TR-AA-L-19-10-1007-F11, Surrogate Brief Checklist, if necessary.
- Crew Shift Turnover Information: See Attached

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	1	
Event Description:	Raise Power to 10-12%					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

Booth Operator Instructions:

- **None**

Role Play:

- **If the crew is not moving forward with the power escalation, call as the SM and prompt to continue raising power to 10 – 12%.**
- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**
- **If calls are made for NPO support due to alarms on the 2A feedwater pump, then report back in 5 minutes that are no issues with the 2A feedwater pump.**

Indications:

Annunciators: L-12 SBCS AWP, G-10 2A Feedwater Pump trouble, K-17 Tavg/Tref Delta

2-GOP-201	**The following actions are taken from 2-GOP-201, Reactor Plant Startup – Mode 2 to Mode 1**	
4.6 Raising Reactor power		
SRO	**PERFORMS 4.3.10.b RAISE and MAINTAIN reactor power between 10% and 12%** RAISE reactor power at a sustained startup rate of less than .5 DPM	***SRO DIRECTS*** *the* ***ATC*** *to* ***RAISE*** *reactor power at a sustained startup rate of less than .5 DPM* ***ATC*** *Raises power using CEA motion on the lead group*
SRO	**Declares MODE 1 at 5% power**	***SRO Determines*** *Reactor power is > 5% and declares Mode 1entry* ***SRO DIRECTS*** *the* ***BOP*** *to announce Mode 1 entry over Gaitronics*
SRO	**PERFORMS STEP 4.6.9** STABILIZE reactor power indicated on the higher reading of RPS Nuclear or Delta-T power by one of the following: IF AFW is in service, THEN MAINTAIN reactor power between 10% and 12%	***SRO DIRECTS*** *the* ***ATC*** *to* ***MAINTAIN*** *reactor power between 10% and 12% indicated on the higher reading of RPS Nuclear or Delta-T power*

After required Power change has been observed at the Lead Evaluator's direction, PROCEED to Event 2.

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	2	
Event Description:	**PCV-1100E Pressurizer Spray Control valve ramps open**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
T.S. 3.2.5 DNB		THE FOLLOWING DNB-RELATED PARAMETERS SHALL BE MAINTAINED WITHIN THE LIMITS: B. PRESSURIZER PRESSURE* AS SHOWN ON TABLE 3.2-2 OF THE COLR, (2225 PSIA) ACTION: RESTORE PARAMETER WITHIN LIMITS WITHIN 2 HOURS OR REDUCE THERMAL POWER TO < 5% OF RATED THERMAL POWER WITHIN THE NEXT 4 HOURS	
CT-1		RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – MAINTAIN RCS PRESSURE WITHIN THE BOUNDS OF THE RPS TM/LP (VARIABLE) TRIP SET POINTS. TAKE ACTION TO CLOSE PCV-1100E PRIOR TO REACHING RPS SETPOINT FOR REACTOR TRIP.	
Note to Evaluator: PCV-1100E FAILS OPEN is a malfunction initiated from the Booth upon direction by the evaluator.			
Booth Operator Instructions: • **Upon cue from Lead Examiner, trigger Event 2: PCV-1100E FAILS OPEN** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**			
Indications: PCV-1100E indicates full open, pressurizer Pressure lowering rapidly **Annunciators:** **EXAMINER: The SRO may announce Multiple Alarms to direct the crew to systematically evaluate the plant status.**			
	ATC		**IDENTIFIES** main spray valve PCV-1100E is open and RCS pressure lowering rapidly, announces the failure to the SRO and states intended actions of taking Spray valve selector switch to 1100F position
	SRO		**DIRECTS** the ATC the place Spray valve selector switch to PCV-1100F position and verify PCV-1100E closes
	BOP		**EVALUATES** plant for being stable
	BOP		Acknowledge annunciators and communicates status IAW plant policies
	SRO		**ANNOUNCES** and enters 2-AOP-01.10, Pressurizer Pressure and Level
	SRO		**DIRECTS** actions of 2-AOP-01.10, Pressurizer Pressure and Level
2-AOP-01.10	**The following actions are taken from 2-AOP-01.10, Pressurizer Pressure and Level**		
4.1 Immediate Operator Actions:			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	2	
Event Description:	**PCV-1100E Pressurizer Spray Control valve ramps open**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC	**1. IF** at Normal Operating Pressure, THEN VERIFY PIC-1100X(Y), PRESSURIZER PRESSURE, stable	***1.1 CONTINGENCY ACTIONS*** *N/A*
	ATC	**2. VERIFY** selected Pressurizer pressure control channelPIC-1100X(Y), PRESSURE, NORMAL	***2.1 CONTINGENCY ACTIONS*** *N/A*
	SRO	**3.** IF either of the following conditions are met: ☐Pressurizer pressure is less than 2275 psia ☐Pressurizer pressure is lowering uncontrollably THEN **VERIFY** spray valves CLOSED: ☐PCV-1100E, SPRAY VALVE 2B2, status lights ☐PCV-1100F, SPRAY VALVE 2B1, status lights ☐TIA-1103, 2B1 SPRAY LINE (Water Temperature), and TIA-1104, 2B2 SPRAY LINE (Water Temperature), indicate approximately equal temperatures	***3.1 CONTINGENCY ACTIONS*** ***3.1*** *IF both PCV-1100E, SPRAY VALVE 2B2 and PCV-1100F, SPRAY VALVE 2B1, are OPEN, THEN:* ***A. PLACE*** *HIC-1100, PZR PRESSURE SPRAY CNTL VLV, in MANUAL* ***B. OPERATE*** *spray controller HIC-1100, PZR PRESSURE SPRAY CNTL VLV* ***C. OPERATE*** *Pressurizer Heaters as necessary* ***3.2 IF PCV-1100E, SPRAY VALVE 2B2, is OPEN, THEN PLACE Pressurizer spray valve selector switch in 1100F*** ***3.3*** *IF PCV-1100F, SPRAY VALVE 2B1, is OPEN, THEN* ***PLACE*** *Pressurizer spray valve selector switch in 1100E* ***The SRO DIRECTS*** *the ATC to PLACE Pressurizer spray valve selector switch in 1100F*
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
	SRO	**1. PERFORM** applicable section per Table 1.	***SRO EVALUATES*** *the indications determines the failure to be PCV-1100E and proceeds to section 4.2.4*
4.2.4 Pressurizer Spray or Auxiliary Spray Valves OPEN or Leaking:			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	2	
Event Description:	**PCV-1100E Pressurizer Spray Control valve ramps open**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**1.** IF either of the following conditions are met: ☐Pressurizer pressure is less than 2275 psia ☐Pressurizer pressure is lowering uncontrollably THEN **VERIFY** spray valves CLOSED: ☐PCV-1100E, SPRAY VALVE 2B2, status lights ☐PCV-1100F, SPRAY VALVE 2B1, status lights ☐TIA-1103, 2B1 SPRAY LINE(Water Temperature), and TIA-1104, 2B2 SPRAY LINE (Water Temperature), indicate approximately equal temperatures	***SRO DETERMINES*** *this step was performed in the immediate operator actions*
	SRO	**2. VERIFY** auxiliary spray valves are CLOSED: ☐SE-02-3, AUX SPRAY VALVE ☐SE-02-4, AUX SPRAY VALVE	***SRO VERIFIES*** *auxiliary spray valves are CLOSED*
	SRO	**3. VERIFY** Pressurizer pressure stable OR trending to Pressurizer pressure setpoint: ☐PR-1100, PRESSURE ☐PIC-1100X, PRESSURE ☐PIC-1100Y, PRESSURE	***SRO VERIFIES*** *Pressurizer pressure stable OR trending to Pressurizer pressure setpoint*
	SRO	**4. GO TO** Section 4.2.1, Step 2.	***SRO GOES*** *TO Section 4.2.1, Step 2.*
4.2.1 General Actions:			
	SRO	**2.** WHEN plant conditions have stabilized, THEN **REVIEW** Tech Specs for any required actions.	***SRO REVIEWS*** *Tech Specs for any required actions IF Pressurizer pressure reached ≤ 2225 psia the TS 3.2.5 for DNB will be addressed and the SM notified*
	SRO	**3.** WHEN Section 3.0, EXIT CONDITIONS, are met, THEN **EXIT** this procedure.	***SRO EXITS*** *the AOP*
	SRO	**Performs Crew Brief**	***SRO PERFORMs*** *crew brief on status of failed instrument, the Tech Spec entry and Notifies the SM*
At the Lead Evaluator's direction, PROCEED to Event 3.			

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #	3	
Event Description:	**LIS-07-2C Refueling Water Tank Level Indicating Switch will fail low**						
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior				

T.S. 3.3.2	THE ENGINEERED SAFETY FEATURES ACTUATION SYSTEM (ESFAS) INSTRUMENTATION CHANNELS AND BYPASSES SHOWN IN TABLE 3.3-3 SHALL BE OPERABLE WITH THEIR TRIP SETPOINTS SET CONSISTENT WITH THE VALUES SHOWN IN THE TRIP SETPOINT COLUMN OF TABLE 3.3-4.

Note to Evaluator: LIS-07-2C Refueling Water Tank Level Indicating Switch fails low is a malfunction initiated from the Booth upon direction by the evaluator.

Booth Operator Instructions:

- **Upon cue from Lead Examiner, trigger Event 3: LIS-07-2C Refueling Water Tank Level Indicating Switch will fail low**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications:

Annunciators: Q-2 ESFAS ATI Fault, S-19 RWT Level RAS Channel Trip

EXAMINER: The SRO may announce Multiple Alarms to direct the crew to systematically evaluate the plant status.

	BOP/ATC		**Acknowledges** annunciators and **Communicates** IAW plant policies
	BOP/ATC		**Diagnoses** that LIS-07-2C is failed low and **Communicates** status IAW plant policies
	BOP		**Complies** with ARPs for Q-2, S-19 and Communicates and/or takes action as directed by ARP
	SRO		**Diagnoses, Interprets,** that LIS-07-2C is failed low **Communicates** agreement with the ATCs diagnoses and **Directs** entry into 2-AOP-99.01 Loss of Tech Spec Instrumentation
	SRO		**Updates** crew and **Enters** 2-AOP-99.01, Loss of Tech Spec Instrumentation
	SRO		**Directs** actions of 2-AOP-99.01, Loss of Tech Spec Instrumentation
	SRO		**Notifies** SM of entry into 2-AOP-99.01, Loss of Tech Spec Instrumentation

2-AOP-99.01	**The following actions are taken from 2-AOP-99.01, Loss of Tech Spec Instrumentation**

4.1 Immediate Operator Actions: NONE

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	3	
Event Description:	**LIS-07-2C Refueling Water Tank Level Indicating Switch will fail low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		4.2 Subsequent Operator Actions **4.2.1 General Actions:**	
		NOTE A TRANSMITTER failure can be discriminated from a METER failure by the presence of annunciators and protection and control actuations.	
	SRO	**1. CONFIRM** failed channel by any of the following methods: • Channel check comparison with redundant channels • Annunciators • Bistable or status lights • Any instrument-related testing or surveillance procedure in progress	***Interprets*** *the indications and determines the failure to be LIS-07-2C Refueling Water Tank Level Indicating Switch is failed low*
		NOTE BISTABLE TRIP UNIT is abbreviated as BTU in this AOP.	
	SRO	**2**. IF entering this procedure to restore an affected channel, THEN GO TO Section 4.2.1, Step 7.	***N/A***
	SRO	**3**. Using Attachment 5, Channel Failure Impact Table, PERFORM the following: **A.** LOCATE table row for affected instrument or channel.	***Locates*** *correct table row for LIS-07-2C Refueling Water Tank Level*
	SRO	**3**. Using Attachment 5, Channel Failure Impact Table, PERFORM the following: **B**. REFER TO applicable Tech Specs.	***Refers to applicable Tech Specs 3.3.2***
	SRO	**3**. Using Attachment 5, Channel Failure Impact Table, PERFORM the following: **C**. PERFORM applicable procedure section for affected instrument.	***PERFORMs*** *section 4.2.18 for LIS-07-2C failure*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	3	
Event Description:	**LIS-07-2C Refueling Water Tank Level Indicating Switch will fail low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**4**. Using Attachment 6, Instrumentation, for Tech Spec applicability.	***PERFORMs*** *Attachment 6, Instrumentation, for Tech Spec applicability.* ***DETERMINES*** *TS 3.3.2 is applicable*
4.2.18 RWT Level Channel Failure			
NOTE • Bypassing ESFAS BTUs will require Key 114 for ESFAS cabinet door. • The ESFAS bypass keyswitch and associated bistable trip unit are NOT in a true vertical alignment from each other in some cases. • Per ADM-11.16, Transient Procedure Use and Adherence, an RWT level channel in the TRIPPED condition shall be limited to 48 hours minus the time the channel has been in bypass.			
	SRO	**1. CIRCLE** affected instrument: ☐ LIS-07-2A ☐ LIS-07-2B ☐ LIS-07-2C ☐ LIS-07-2D	***PERFORMs*** *section 4.2.18 and CIRCLES affected instrument LIS-07-2C Refueling Water Tank Level*
	SRO	**2. PERFORM** one of the following for the affected BTUs listed: RAS (Key 131) **A. BYPASS** affected BTU using keyswitch. **B. TRIP** affected BTU per Attachment 3, Tripping and Restoring Protection Bistables.	***SRO DIRECTS*** *the* ***BOP*** *to* ***BYPASS*** *the affected BTU using keyswitch as follows;* • *RAS (Key 131)*
	BOP	Using 2-AOP-99.01 Loss of Tech Spec Instrumentation section **4.2.18 RWT Level Channel Failure** Step 2. and direction from the Unit Supervisor BYPASS affected BTUs using keyswitch	***PERFORMs*** *section 4.2.18 as directed by the SRO;* *Obtains keys, unlocks cabinets and inserts keys:131 for ESFAS* ***BOP*** *relieves the ATC*
	ATC	Using 2-AOP-99.01 Loss of Tech Spec Instrumentation section **4.2.18 RWT Level Channel Failure** Step 2. and direction from the Unit Supervisor BYPASS affected BTUs using keyswitch	***ATC PERFORMs*** *section 4.2.18 as directed by the Unit Supervisor;* *IVs inserted key: 131 for ESFAS and rotates key to bypass MC RAS* ***ATC Reports*** *to SRO that the affected BTU has been BYPASSED using keyswitch* ***ATC relieves*** *the BOP*

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #	3	
Event Description:	**LIS-07-2C Refueling Water Tank Level Indicating Switch will fail low**						
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior				

4.2.1 General Actions:			
	SRO	**5. INITIATE** work request for affected instrument or channel and **NOTIFY** I&C or EM as applicable.	***PERFORMS*** *section 4.2.1 Step 4 NOTIFIES I&C as applicable and Notifies the SM of the failure and the Tech Spec entry 3.3.20 Action 19*
	SRO	**6. DOCUMENT** problem as required: • EOOS Log • Condition report • Ops narrative log	***PERFORMS*** *section 4.2.1 Step 5 and Documents issue as appropriate in:* • *EOOS Log* • *Condition report* • *Ops narrative log*
	SRO	**7.** WHEN ready to restore affected channel, THEN **PERFORM** Attachment 2, Restoration of Tripped or Bypassed • Instrumentation Channels**.**	***IDENTIFIES*** *step as N/A*
	SRO	**8. VERIFY** Exit Conditions are met. **9. EXIT** this procedure.	***VERIFIES*** *Exit conditions are met by:* • *Applicable Tech Spec LCO action requirements have been implemented.* • *Affected channel has been bypassed or tripped as required by Tech Specs and exits 2-AOP-99.01*
	SRO	**Performs Crew Brief**	***SRO PERFORMs*** *crew brief on status of failed instrument, the Tech Spec entry and Notifies the SM*
At the Lead Evaluator's direction, PROCEED to Event 4.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	4	
Event Description:	**Letdown Pressure Controller PIC-2201 fails to operate in auto mode**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
			Note to Evaluator: PIC-2201 Letdown Pressure controller is a malfunction initiated from the Booth upon direction by the evaluator; this failure simulates a controller cycling erratically.
			Booth Operator Instructions: • **Upon cue from Lead Examiner, trigger Event 4: Letdown Pressure controller PIC-2201 Letdown Auto FAIL** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**
			Indications: Letdown flow swings and Pressurizer Level swings **Annunciators: M-5 Letdown Pressure**
	ATC		Identifies controller issue with PIC-2201 and recommends taking manual control
	SRO		Directs the ATC to take manual control of PIC-2201 maintain 430 PSI
	BOP		Acknowledge annunciators and communicates status IAW plant policies
	ATC		Evaluates plant for being stable
	BOP		Pulls ARP's and communicates/takes action as directed
	SRO		Announces and enters 2-AOP-02.03, Charging And Letdown
	SRO		Directs actions of 2-AOP-02.03, Charging And Letdown
2-AOP-02.03		**The following actions are taken from 2-AOP-02.03, Charging And Letdown**	
			4.1 Immediate Operator Actions: None applicable
			4.2 Subsequent Operator Actions **4.2.1 General Actions:**
	SRO	**1.** IF charging and letdown flow has been lost, THEN, **PERFORM** the following:	*Step is not applicable*
	SRO	**2.** **VERIFY** all applicable automatic actions have occurred. Attachment 1, Charging and Letdown Automatic Responses, contains a listing of expected automatic action	*Step is not applicable*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	4	
Event Description:	**Letdown Pressure Controller PIC-2201 fails to operate in auto mode**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**3.** IF charging and letdown flow has been lost, **THEN DETERMINE** the cause	*Step is not applicable*
	SRO	**4.** IF a charging system leak has occurred, THEN **ISOLATE** the leak and refer to applicable Technical Specifications for guidance	*Step is not applicable*
	SRO	**5. PERFORM** applicable section per Table 1	***SRO EVALUATES** the indications determines the failure to be PIC 2201 failed and proceeds to section 4.2.7 Letdown Pressure Control Malfunction*
4.2.6 General Actions: Letdown Pressure Control Malfunction			
	SRO	**1.** IF letdown pressure control is malfunctioning, THEN **PERFORM** the following: **A. VERIFY** the output of PIC-2201, LETDOWN PRESSURE, is responding as expected for current plant conditions **B. VERIFY** the selected pressure control valve is responding as expected to PIC-2201, LETDOWN PRESSURE, output	***SRO VERIFIES** that the ATC has PIC-2201 in manual and is controlling Letdown Pressure* ***SRO DIRECTS** system walk downs observing for leaks or lifting relief valves*
	SRO	**SRO VERIFIES** Normal Charging and Letdown parameters are established with Letdown Pressure stable	***SRO EXITS** this procedure*
	SRO	**Performs Crew Brief**	***SRO PERFORMs** crew brief on status of failed instrument and Notifies the SM*
At the Lead Evaluator's direction, PROCEED to Event 5.			

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

T.S. 3.4.6.2	REACTOR COOLANT SYSTEM OPERATIONAL LEAKAGE SHALL BE LIMITED TO: d. 10 GPM IDENTIFIED LEAKAGE FROM THE REACTOR COOLANT SYSTEM,... ACTION: B. WITH ANY REACTOR COOLANT SYSTEM OPERATIONAL LEAKAGE GREATER THAN ANY ONE OF THE LIMITS, EXCLUDING PRIMARY-TO-SECONDARY LEAKAGE, PRESSURE BOUNDARY LEAKAGE, AND LEAKAGE FROM REACTOR COOLANT SYSTEM PRESSURE ISOLATION VALVES, REDUCE THE LEAKAGE RATE TO WITHIN LIMITS WITHIN 4 HOURS OR BE IN AT LEAST HOT STANDBY WITHIN THE NEXT 6 HOURS AND IN COLD SHUTDOWN WITHIN THE FOLLOWING 30 HOURS.

Note to Evaluator: RCS leak of approximately 20 gpm is a malfunction initiated from the Booth upon direction by the evaluator the leak is located on the 2A1 cold leg using Leak Valve LV06.

Booth Operator Instructions:

- **Upon cue from Lead Examiner, trigger Event 5: Unidentified RCS leak of approximately 20 gpm**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications:

Charging and Letdown mismatch

RCS Pressure slowly lowering

Annunciators: N-46

EXAMINER: The SRO may announce Multiple Alarms to direct the crew to systematically evaluate the plant status.

	ATC		**DIAGNOSES** Charging and Letdown mismatch, RCS Pressure slowly lowering and Pressurizer level lowering and communicates observations to Unit Supervisor IAW plant policies.
	SRO/ATC		**DIAGNOSES, INTERPRETS, CONCURS** with the ATC observations and **DIRECTS** a Leak Rate Calculation to commence. **ATC PERFORMS** a Leak Rate Calculation

Appendix D	Operator Action					Form ES-D-2
Op Test No.: L-19-1	Scenario #	1	Event #	5		
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC		**ATC CALCULATES** leak rate as follows: • Verifies RCS temp stable • Records Pressurizer Level, VCT Level at one minute intervals • Calculates Deltas over time to ascertain the leak rate • Using VCT=33.8gal/% PZR=67.04 gal/% OR • Uses Charging/Letdown Mismatch **BOP CALCULATES** Confirmatory leak rate
	ATC,BOP		**ATC AND BOP COMMUNICATE** leak rate of approximately 20 gpm to the SRO
	SRO		**UPDATES** crew and enters 2-AOP-01.08, RCS Leakage Abnormal Operation
NOTE to Evaluator: The crew may implement 2-AOP-01.10, Pressurizer Pressure and Level, which is acceptable and will eventually guide them to into 2-AOP-01.08, RCS Leakage Abnormal Operation			
2-AOP-01.08	**The following actions are taken from 2-AOP-01.08, RCS Leakage Abnormal Operations**		
4.1 Immediate Operator Actions: NONE APPLICABLE			
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
	SRO	**Makes Notifications**	***SRO NOTIFIES SM*** *of entry into 2-AOP-01.08, RCS Leakage Abnormal Operation and request MM assistance*
	SRO	**STEP 1 ADD RCS** makeup per applicable section(s) of Table 1 as directed by US while **CONTINUING** with this AOP:	***SRO DIRECTS*** *start second Charging pump*
	SRO	**STEP 2 MAINTAIN RCS** level stable OR rising	***SRO DIRECTS*** *starting additional Charging pumps as needed*
	SRO	**STEP 3 Verify** pressurizer pressure stable within the required pressure bands	***SRO DIRECTS*** *manually OPERATE pressurizer heaters to maintain pressure*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE • **Thumb rule for estimating leak rate is that 1" level rise on LI-07-6, RX CAVITY LEVEL, on RTGB-205 is about 46 gallons.** • **A Hard Card is available at RTGB-205 for reference in estimating leak rate based on differences in VCT and pressurizer level.**	
	SRO	**STEP 4 DETERMINE RCS** leak rate by any of the following methods: ☐ **ESTIMATE** leak rate based on gross charging-letdown mismatch. ☐ IF desired, THEN **CONTROL** letdown flow in manual to aid in leak rate determination. ☐ **ESTIMATE** leak rate based on abnormal tank or sump level rise rates. ☐ **CALCULATE** leak rate per 2-OSP-01.03, Reactor Coolant System Inventory Balance. ☐ **ESTIMATE** leak rate based on differences in VCT and pressurizer level.	***SRO DIRECTS*** *Leak rate calculations*
		NOTE • **To aid in classifying RCS leaks for E-Plan purposes, Attachment 1, defines certain terms to ensure classifications are made consistently within this context.**	
	SRO	**STEP 5 VERIFY** all of the following conditions are met • **UNIDENTIFIED LEAKAGE** • **IDENTIFIED LEAKAGE** less than or equal to 10 gpm • **NO** secondary plant radiation alarms or rising trends on any of the following	***DETERMINES*** *that the Leakage is greater than 10 gpm and refers to tech spec 3.4.6.2. and notifies the SM to implement the E-Plan*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**STEP 5 IF** both conditions exist: ☐ Unit 2 is in MODE 1,2 or 3 ☐ SIAS not blocked **THEN PERFORM** Section 4.2.2, Actions for Modes 1 Through 3 With SIAS Available	***SRO Performs Section 4.2.2***
4.2.2 Actions for Modes 1 Through 3 With SIAS Available			
NOTE • **Section 4.2.2, Step 2.A through Section 4.2.2, Step 11 may be done in any order based on priorities determined in Section 4.2.2, Step 1. At US discretion, only steps applicable to the leak in progress need be performed.**			
	SRO	**STEP 1** At US discretion, **USE** Table 2 to prioritize order of performance of applicable leak identification and isolation steps:	***SRO EVALUATES*** *table 2 and proceeds to section4.2.2 step 2*
	SRO	**STEP 4.2.2.2 VERIFY** conditions INSIDE containment are NORMAL by inspecting the following containment parameters: ☐ Temperature and pressure ☐ Atmospheric radioactivity ☐ Area radiation ☐ Containment sump levels ☐ LIS-07-6, RX CAVITY LEVEL (RTGB-205) ☐ N-21, RX CAVITY SUMP LEVEL HIGH-HIGH, CLEAR ☐ N-46, RX CAVITY LEAKAGE HIGH, CLEAR	***SRO DETERMINES*** *that N-46, RX CAVITY LEAKAGE HIGH, is not CLEAR and goes to Contingency Actions to monitor containment parameters* ***SRO DIRECTS*** *at least one of the following valves is CLOSED: Due to reactor cavity sump level rising,* ☐ *LCV-07-11A, RX CAVITY SUMP* ☐ *LCV-07-11B, RX CAVITY SUMP* ***SRO*** *GOES TO Section 4.2.2, Step 13.*
	SRO	**STEP 13 IF** unit in **MODE 1 or 2, THEN VERIFY** continued operation is permitted by Tech Specs: ☐ 3.4.6.2, Reactor Coolant System Leakage ☐ 3.5.1, Safety Injection Tanks	***SRO DIRECTS*** *plant shutdown per 2-AOP-22.01, RAPID DOWNPOWER*

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE to EVALUATOR • **Due to the power level being less than 25% the crew may TRIP the unit upon entering 2-AOP-22.01 Rapid Down Power per step 4.2.26 which states "IF Reactor is to be tripped at current power level (20% to 25%) THEN PERFORM the following:** o **RECORD Main Gen. KW Hrs in the narrative logs as indicated on WHM/881, GENERATOR NO. 2 KWH.** o **TRIP reactor** o **TRIP turbine** o **EXIT to 2-EOP-01, Standard Post Trip Actions**	
		Booth Operator Instructions: • **NONE** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**	
		Indications: **Annunciators:**	
	SRO		**ANNOUNCES** and enters 2-AOP-22.01, Rapid Downpower as directed
	SRO		**DIRECTS** actions of 2-AOP-22.01, Rapid Downpower
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, Rapid Downpower**	
		4.1 Immediate Operator Actions:	
	SRO		***DIRECTS*** *Immediate Operator Actions for 2-AOP-22.01, RAPID DOWNPOWER*
	SRO	**1. BEGIN** boration per operator aid OR Attachment 1, RCS Boration Guidance.	***SRO DIRECTS ATC*** *to make boration 15 gallons per minute from a Boric Acid Makeup tank to the charging pump suction. Attachment 1, RCS Boration Guidance.*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		ATTACHMENT 1 RCS Boration Guidance NOTE • Step 1 in this attachment is applicable when the CVCS is normally aligned, with NO RCS boration or dilution in progress. If other than normal alignment, use guidance of 2-NOP-02.24, Boron Concentration Control. • An Operator Aid has been placed at RTGB-205. Any revision to this section of the procedure shall verify the validity of the Operator Aid and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Operator Aid Placard.	
	ATC	**1. BORATE** the RCS by the following: **A. START** either Boric Acid Pump 2A or 2B.	***ATC STARTS*** *Boric Acid Pump* ***ATC VERIFIES*** *Boric Acid Pump STARTS*
	ATC	**1. BORATE** the RCS by the following: **B. PLACE** FCV-2210Y, BORIC ACID (RTGB-205), control switch in AUTO.	***ATC PLACES*** *FCV-2210Y, BORIC ACID control switch in AUTO*
EXAMINER:			
	ATC	**1. BORATE** the RCS by the following: **C.** IF borating to the Charging Pump suction, THEN **OPEN** V2525, BORON LOAD CONTROL VALVE	***ATC PLACES*** *V2525, BORON LOAD control switch in OPEN* ***ATC IDENTIFIES*** *V2525, BORON LOAD* ***ATC REPORTS***
	SRO		***SRO DIRECTS ATC*** ***The SRO may alternately***
	ATC	**1. BORATE** the RCS by the following: **D.** IF borating to the VCT, THEN **OPEN** V2512, REACTOR MAKEUP WATER STOP VLV	***ATC PLACES*** *V2512, REACTOR MAKEUP WATER STOP VLV control switch in OPEN* ***ATC VERIFIES*** *V2512, REACTOR MAKEUP WATER STOP VLV is OPEN*
	ATC	**1. BORATE** the RCS by the following: **E. ADJUST** FIC-2210Y, BORIC ACID, to the desired flowrate.	***ATC ADJUST****S FIC-2210Y, BORIC ACID, to the desired flowrate of 15 gpm*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC	**1. BORATE** the RCS by the following: **F.** IF desired to maximize the boric acid flow rate, THEN **CLOSE** the running BAM pump recirc valve. • V2650, TANK 2A RECIRC VALVE • V2651, TANK 2B RECIRC VALVE	***ATC DETERMINES*** *not required*
	ATC	**1. BORATE** the RCS by the following: **G. CYCLE** V2513, VENT VALVE (RTGB-205) to maintain VCT pressure less than or equal to 30 psig.	***ATC CYCLES*** *V2513, VENT VALVE as necessary to maintain VCT pressure less than or equal to 30 psig*
	ATC	**1. BORATE** the RCS by the following: **H. CYCLE** V2500, DIVERT VALVE (RTGB-205) to WMS if necessary to maintain the desired VCT level.	***ATC CYCLES*** *V2500, DIVERT VALVE to WMS if necessary to maintain the desired VCT level*
	ATC		**ATC UPDATES** crew on Reactivity Addition
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWN POWER**	
	SRO	**2. PREPARE** turbine for load reduction per operations hard cards.	***SRO DIRECTS BOP*** *to set up the turbine for a target of 100 MW and load rate at 10 megawatts per minute per operations hard cards*
2-NOP-99.07		**The following actions are taken from 2-NOP-99.07 OPERATIONS HARD CARDS**	
2-NOP-99.07 OPERATIONS HARD CARDS **ATTACHMENT 3 TURBINE ADJUSTMENTS TO MAINTAIN POWER NOTE** **A Hard Card has been placed at RTGB-201. Any revision to this section of the procedure shall verify the validity of the Hard Card and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Hard Card placecard.**			
	BOP	**TURBINE ADJUSTMENTS TO MAINTAIN POWER**	***BOP ENSURES*** *Ovation display 5551, TURBINE CONTROL SYSTEM - OPERATION PANEL, is open*
	BOP	**TURBINE ADJUSTMENTS TO MAINTAIN POWER TOUCH MODIFY** from RAMP INTERFACE group.	***BOP TOUCHES MODIFY*** *from RAMP INTERFACE group*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**TURBINE ADJUSTMENTS TO MAINTAIN POWER** **ADJUST** values, as directed by SM/US, for the following on MODIFY RAMP SETPOINTS: (display 7055) • TARGET SELECT • RATE SELECT	***BOP ADJUSTS*** *values, as directed by SM/US, for the following on MODIFY RAMP SETPOINTS: (display 7055)* • *TARGET SELECT set at 100 MW* • *RATE SELECT set at 10 MW/min*
	BOP		***BOP NOTIFIES*** *SRO that the Turbine is set up with a Target of 100 MW at a rate of 10 MW/min*
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWNPOWER**	
	SRO	**3. INSERT** the Lead CEA Group approximately 6 inches to initially lower RCS temperature per operations hard cards.	***SRO DIRECTS ATC*** *to insert lead group CEAs ~3 inches in Manual Sequential*
2-NOP-99.07		**The following actions are taken from 2-NOP-99.07, OPERATIONS HARD CARDS**	
2-NOP-99.07 OPERATIONS HARD CARDS **ATTACHMENT 1 CEDMCS OPERATIONS NOTE** **A Hard Card has been placed at RTGB-204. Any revision to this section of the procedure shall verify the validity of the Hard Card and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Hard Card placecard.**			
	ATC	**Moving CEAs in group** On CEDMCS Control Panel Group Select Switch, **SELECT** target group.	***ATC SELECTS*** *Target Group 5*
CAUTION When performing a rapid downpower due to a dropped CEA, then MANUAL GROUP (MG) shall be selected. This will prevent multiple CEA groups from moving.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC	**Moving CEAs in group** On CEDMCS Control Panel Mode Select Switch, **SELECT** mode of movement: MANUAL GROUP (MG) OR MANUAL SEQUENTIAL (MS)	***ATC SELECTS*** *MANUAL GROUP (MG) OR MANUAL SEQUENTIAL (MS) On CEDMCS Control Panel*
	ATC	**Moving CEAs in group** IF CEA Motion Inhibit is present, THEN PERFORM the following: PRESS and HOLD CMI BYPASS pushbutton. PRESS and RELEASE BYPASS ENABLE pushbutton.	***STEP*** *will be N/A* ***NO*** *CEA Motion Inhibit is present*
	ATC	**Moving CEAs in group** **POSITION** group as desired using INSERT/WITHDRAW Manual Control lever.	***ATC POSITIONS*** *group as directed to 3" inserted from previous position using INSERT/WITHDRAW Manual Control lever*
	ATC	**Moving CEAs in group** IF CMI BYPASS pushbutton is being held, THEN **RELEASE** CMI BYPASS pushbutton.	***STEP*** *will be N/A* ***NO*** *CEA Motion Inhibit is present*
	ATC	**Moving CEAs in group** **OBSERVE** RSPT AND Pulse Counter CEA position indications to verify CEA motion and alignment.	***ATC OBSERVES*** *RSPT AND Pulse Counter CEA position indications and verifies CEA motion and position*
	ATC	**Moving CEAs in group** On CEDMCS Control Panel, **SELECT** OFF on Mode Select Switch when the desired height is reached.	***ATC SELECTS*** *OFF on Mode Select Switch when the desired height is reached*
	ATC	**Moving CEAs in group** **ENSURE** RSPT and Pulse Counter indications match.	***ATC ENSURES*** *RSPT and Pulse Counter indications match*
	ATC		***ATC Updates crew on Reactivity Addition***
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWNPOWER**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
4.2 Subsequent Operator Actions			
	SRO	**1. WHEN** Tavg begins to lower and is less than Tref, THEN **TOUCH** GO from RAMP INTERFACE group. (OVATION display 5551)	***DIRECTS ATC*** *to monitor Tavg and to notify him when it is lowering and less than Tref*
	ATC		***ATC NOTIFIES*** *the SRO that Tavg is lowering and less than Tref*
	SRO		***DIRECTS BOP*** *to* ***TOUCH GO*** *from RAMP INTERFACE group. (OVATION display 5551)*
	BOP		***BOP*** *to* ***TOUCHES GO*** *on the RAMP INTERFACE group to begin turbine load reduction per operations hard cards as follows:* *5.* ***TOUCH GO*** *from RAMP INTERFACE group. (display 5551)* *6.* ***MONITOR*** *turbine governor valves response on Ovation main operation window, TURBINE CONTROL SYSTEM – OPERATION PANEL. (display 5551)* ***BOP Updates crew on load reduction initiation.***
	SRO/ATC	SRO directs ATC to MAINTAIN T-avg and T-ref	***8. MAINTAIN*** *T-avg and T-ref as close as possible during load changes by adjusting either or both of the following:* • *Reactivity rate* • *Turbine load rate*
	SRO	**2. NOTIFY** plant personnel using Gai-tronics and boost function as follows: "Attention all personnel, Unit 2 has commenced a Rapid Downpower due to _____."	***DIRECTS BOP to NOTIFY*** *plant personnel using Gai-tronics and boost function as follows:* *"Attention all personnel, Unit 2 has commenced a Rapid Downpower due to excessive RCS leakage."*
	BOP		***NOTIFIES*** *plant personnel using Gai-tronics and boost function as follows:* *"Attention all personnel, Unit 2 has commenced a Rapid Downpower due to excessive RCS leakage."*
	SRO	**3. NOTIFY** System of the rapid downpower load reduction.	***DIRECTS BOP*** *to* ***NOTIFY*** *System of the rapid downpower*
	BOP		***NOTIFIES*** *System of the rapid downpower, via dedicated RED phone.*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE OPS-530, Pre-Planned Power Change Guidance, delineates operations department policy for the use of pre-planned downpower profiles provided by the Plant Physics Curve Book.	
	SRO	**4. PERFORM** a Crew update to include the following: • Expected final power level • Initial boration rate • Initial load rate • Expected amount of boric acid addition • Expected amount of CEA motion using pre-planned downpower profiles in the Plant Physics Curve Book	***SRO UPDATES*** *crew with the following information:* • *Expected final power level Offline* • *Initial boration rate 15 GPM* • *Initial load rate of 10 MW/MIN* • *Expected amount of boric acid addition Per preplanned power guidance* • *Expected amount of CEA motion Per preplanned power guidance*
	SRO	**5. PLACE** Pressurizer on recirculation per operations hard cards.	***SRO should recognize*** *heaters are all on to maintain pressure from PZR safety valve leak. Recirculation should not be directed as this will lower pressure*
	SRO	**6. START** additional charging pump as required per operations hard cards.	***SRO DIRECTS ATC*** *to* ***START*** *a second charging pump per operations hard cards, if not previously started*
2-NOP-99.07		**The following actions are taken from 2-NOP-99.07, OPERATIONS HARD CARDS**	
		2-NOP-99.07 OPERATIONS HARD CARDS **ATTACHMENT 8 CHARGING PUMP OPERATIONS WHILE IN AN AOP NOTE** **A Hard Card has been placed at RTGB-201. Any revision to this section of the procedure shall verify the validity of the Hard Card and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Hard Card placecard.**	
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW** IF in MODE 1 or 2, THEN PLACE V2520, ION EXCHANGER BYPASS VALVE, in BYPASS to minimize reactivity effects of changing letdown temperature.	***BOP PLACES*** *V2520, ION EXCHANGER BYPASS VALVE, in BYPASS*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW	
		NOTE • When starting OR stopping a charging pump with LIC-2110, LETDOWN LEVEL, in Single Element Mode, it may be necessary to place the controller in Manual Mode to prevent pressurizer level from deviating too far from setpoint. • In Manual Mode, the letdown flow should be adjusted as necessary to maintain pressurizer level at setpoint. The controller should be returned to Auto when it reaches setpoint with the desired number of charging pumps running.	
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: START** charging pump by placing its control switch in START.	***BOP STARTS*** *Second charging pump by placing its control switch in START*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: PLACE** CHRG PUMP SEL RUNNING - B/U PP switch in proper position per operator aid.	***BOP PLACES*** *CHRG PUMP SEL RUNNING - B/U PP switch in proper position per operator aid*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: WHEN** 3 minutes has elapsed since pump start, THEN ENSURE associated recirc valve is CLOSED.	***BOP ENSURES*** *Second Charging Pp recirc valve is CLOSED*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW:** WHEN letdown temperature stabilizes, THEN **ENSURE** V2520, ION EXCHANGER BYPASS VALVE, control switch is returned to AUTO.	***BOP ENSURES*** *V2520, ION EXCHANGER BYPASS VALVE, control switch is returned to AUTO after temp stabilizes*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: NOTIFY** RP and SNPO of current charging pump alignment.	***BOP NOTIFIES*** *RP and SNPO of starting of the Second charging pump*
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWNPOWER**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE • The procedural limit for ASI control is +/- 0.5 of ESI. It is desired to maintain ASI within a control band of +/- 0.2 of ESI. • US may direct temporary operation outside of ASI limit. (Note: Band stops <50% power)	
	SRO	**7. MAINTAIN** Axial Shape Index ±0.5 of ESI using CEAs.	***DIRECTS ATC*** *to maintain ASI to within +/- 0.2 of ESI using the sliding scale with lead group CEAs IAW 0-NOP-100.02 Axial Shape Index Control unless recommended otherwise by Reactor Engineering*
	ATC		***POSITIONS*** *lead group CEAs to control ASI to within +/- 0.2 from the ESI on the sliding scale IAW 0-NOP-100.02 Axial Shape Index Control*
		NOTE The procedural limit for Tave-Tref mismatch is +/- 6.6 degrees °F. It is desired to maintain a control band of +/- 2 degrees °F	
	SRO	**8. MAINTAIN** Tref and Tavg within 6.6 °F.	***DIRECTS ATC*** *to maintain Tave-Tref mismatch within +/- 2 degrees °F*
	SRO	**9.** IF reducing power by more than 20%, THEN **NOTIFY** SNPO to secure Zinc Injection per 2-NOP-02.26, Zinc Addition.	***DIRECTS BOP*** *to dispatch a SNPO to secure Zinc injection*
		NOTE Condenser back pressure is provided on OVATION displays 5559, TURBINE EXHAUST HOOD SPRAY AND CONDENSER VACUUM and 5605, CONDENSER VACUUM MONITORING. The condenser back pressure trip and alarm setpoints are variables that are dependent on power level.	
	SRO	**10. VERIFY** Condenser Back Pressure less than 8.859 inHgA.	***DIRECTS BOP*** *to report Condenser Backpressure*
		NOTE OVATION displays 5559, TURBINE EXHAUST HOOD SPRAY AND CONDENSER VACUUM and 5605, CONDENSER VACUUM MONITORING, indicate time remaining before an automatic Turbine Trip is initiated by DEH, when operating in the Restricted Operating Region.	
	SRO	**11. VERIFY** Condenser Back Pressure below alarm limits Acceptable Operating Region Attachment 4, Condenser Pressure Limitations. **OR** OVATION display 5605, CONDENSER VACUUM MONITORING.	***DIRECTS BOP*** *to monitor Condenser Backpressure*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	5	
Event Description:	**Unidentified RCS leak of approximately 20 gpm / Rapid Downpower**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**12. VERIFY** CONDENSER DIFFERENTIAL pressure less than 2.0 inHgA. (OVATION display 5559 OR 5605)	***DIRECTS BOP*** *to monitor Condenser differential pressure*
	SRO	**13. VERIFY** parameters listed on Attachment 3, Rapid Downpower Parameters, are within limits.	***DIRECTS BOP*** *to monitor parameters listed on Attachment 3*
		NOTE Rapid Downpower may result in Pressurizer Pressure dropping below DNBR Limit.	
	SRO	**14. MAINTAIN** PZR pressure between 2225 and 2275 psia.	***DIRECTS ATC*** *to* ***MAINTAIN*** *PZR pressure between 2225 and 2275 psia by controlling HIC-1100*
		NOTE A large rate of change in Tavg may cause transient level variance.	
	SRO	**15. MAINTAIN** PZR level between 27% and 68%.	***DIRECTS ATC*** *to* ***MAINTAIN PZR*** *level between 27% and 68%*
	SRO	**16.** WHEN Final power level is achieved, THEN **GO TO** Section 4.2, Step 35 to STABILIZE the unit.	***SRO*** *will continue with procedure to remove the unit offline*
Proceed to Event 6.			

Appendix D		Operator Action				Form ES-D-2			
Op Test No.:	L-19-1	Scenario #	1	Event #	6				
Event Description:	**LOCA / 2-HVS-1A trip**								

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
Note to Evaluator: RCS LOCA is a malfunction initiated from the Booth upon direction by the evaluator the leak is located on the 2A1 cold leg using Leak Valve LV06 with a 360 sec ramp. 2-HVS-1A trip is also triggered on this step.			
Booth Operator Instructions: • **After Crew Trips the Reactor or at lead evaluators direction insert LOCA and 2-HVS-1A trip** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**			
Indications: **Annunciators:** **Multiple**			
	SRO		**DIRECTS** Reactor trip
	ATC		**CONFIRMS** reactor power is lowering and startup rate is negative **REPORTS "REACTOR TRIPPED"** **States evaluating CEAs or that all CEAs are inserted**
	ATC		Performs Scan of RTGBs to quickly assess the plant status by systematically reviewing key safety parameters/system conditions of the control boards. **RECOGNIZES: PVC-1100F is failed OPEN SEE Event 7**
	BOP		**VERIFIES** all governor and throttle valves closed **REPORTS "Turbine Tripped"**
	BOP		**ANNOUNCE** on the Gaitronics: Unit 1 (2) Reactor has tripped **NOTIFY** the NPO to perform Appendix X, Section 1 of 2-EOP-99 **CONTACT** the SM, STA and Shift Comm. to report to the Control Room
	SRO		Performs Scan of RTGBs to quickly assess the plant status by systematically reviewing key safety parameters/system conditions of the control boards.
	ATC		**REPORTS "All CEAs INSERTED" if not reported previously**
	SRO		**DIRECTS ATC** to start remaining Charging Pumps as necessary
	SRO		**DIRECTS** Implementation Of EOP-01, Standard Post Trip Actions
2-EOP-01		**The following actions are taken from 2-EOP-01, Standard Post Trip Actions**	

Appendix D			Operator Action					Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #	6		
Event Description:	**LOCA / 2-HVS-1A trip**							

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		4.1 Immediate Operator Actions: • **ATC: Verifies Reactor power lowering, Negative Startup rate, all CEAs and verifies no dilution is in progress inserted and communicates status to the Unit Supervisor. Starts backup charging pumps as necessary.** • **BOP: Verifies all governor and throttle valves closed and communicates status to the Unit Supervisor. Makes plant announcements and trip notifications.**	
		4.0 Operator Actions:	
	SRO	**Step 1 VERIFY reactor trip:**	***SRO DIRECTS*** *VERIFY reactor trip, ATC Verifies:* ☐ *Reactor power LOWERING* ☐ *Startup Rate NEGATIVE* ☐ *All CEAs are fully INSERTED* ☐ *NO dilution is in progress*
	SRO	**Step 2 VERIFY turbine trip:**	***SRO DIRECTS VERIFY*** *turbine trip, BOP Verifies:* ☐ *All governor and throttle valves CLOSED.* ☐ *Main Generator breakers are OPEN* ☐ *Turbine speed LOWERING*
	SRO	**Step 3 VERIFY Maintenance of Vital Auxiliaries:**	***SRO DIRECTS VERIFY*** *Maintenance of Vital Auxiliaries, BOP Verifies:* ☐ *VERIFY station loads transferred to offsite electrical power* ☐ *VERIFY all Vital and Non-Vital AC buses transfer from Auxiliary to Start-up Transformers AND are ENERGIZED* ☐ *VERIFY all Vital and Non Vital DC Buses are ENERGIZED* ☐ *VERIFY seal cooling to RCPs:* ***IF SIAS has occurred the SRO will DIRECT two RCPs to be tripped and perform 2-EOP-99 App.J to restore CCW to the RCPs***
	SRO	**Step 4 VERIFY RCS Inventory Control:**	***SRO DIRECTS VERIFY*** *RCS Inventory Control, ATC Verifies:* ☐ *Pressurizer level is between 10 and 68%* ☐ *Pressurizer level is trending to between 30 and 35%* **Pressurizer level will be abnormally low due to the RCS leak. This parameter will drive the crew to enter 2-EOP-03**

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	6	
Event Description:	**LOCA / 2-HVS-1A trip**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 5 VERIFY RCS Pressure Control:**	***SRO DIRECTS VERIFY*** *RCS Pressure Control, ATC Verifies:* ☐ *Pressurizer pressure is between 1800 and 2300 psia* ☐ *Pressurizer pressure is trending to between 2225 and 2275 psia* **RCS Pressure will be abnormally low due to PCV-1100F failing open on trip; see event 7.** **IF SIAS** has occurred the **SRO** will **DIRECT** two RCPs to be tripped and perform 2-EOP-99 App.J to restore CCW to the RCPs
	SRO	**Step 6 VERIFY Core Heat Removal:**	***SRO DIRECTS VERIFY*** *Core Heat Removal, ATC Verifies:* ☐ *At least one RCP is RUNNING and all RUNNING RCPs are supplied with CCW* ☐ *Loop ΔT is less than 10˚F* ☐ *RCS subcooling greater than or equal to 20°F* ☐ *NO indication of RCP cavitation*
	SRO	**Step 7 VERIFY RCS Heat Removal:**	***SRO DIRECTS*** *VERIFY RCS Heat Removal, ATC Verifies:* ☐ *VERIFY the following conditions exist on at least one S/G:* • *S/G NR level is between 20 and 81%* • *Feedwater is being supplied* ☐ *IF 2A or 2B AFW Pump is the ONLY source of Feedwater, THEN STOP one RCP in each loop* ☐ *VERIFY at least ONE of the following is supplying feedwater to the S/G(s):* • *Main or Auxiliary Feedwater* ☐ *VERIFY RCS TAVG is between 525 and 535°F RCS Temp will be lower due to lower power level* ☐ *VERIFY S/G pressure is between 850 and 930 psia (835 and 915 psig)* *IF MSIS has actuated the **SRO will direct** placing the ADVs in service*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	6	
Event Description:	**LOCA / 2-HVS-1A trip**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 8 VERIFY containment conditions:**	***SRO DIRECTS*** *VERIFY* containment conditions, *BOP Verifies:* ☐ *Containment pressure is less than 2 psig* ☐ *Containment temperature is less than 120°F* ***BOP RECOGNIZES*** *Containment temperature is high and evaluates the status of the Containment Cooling Fans* ***BOP RECOGNIZES 2-HVS1A is tripped*** ☐ *Containment radiation level less than alarm values AND stable or lowering:* • *CIS Radiation Monitors* • *Containment Atmospheric Monitors* **Containment Atmospheric Monitors will be abnormally high due to the RCS leak. This parameter will drive the crew to enter 2-EOP-03** ☐ *Secondary plant radiation levels less than alarm values AND stable or lowering:* • *Condenser Air Ejector Monitor* • *S/G Blowdown Monitors* • *Main Steamline Monitors*
	SRO	**Step 9 DIRECT a field operator to perform the following:**	***SRO DIRECTS BOP*** *to perform step 9, BOP performs step 9:* ☐ *Directs NPO to perform Section 1 of Appendix X, Secondary Plant Post Trip Actions* ☐ *Directs SNPO to VERIFY SFP inventory and temperature are normal on all available indications*
	SRO	**Step 10 DIAGNOSE the event using Attachment 1, Diagnostic Flow Chart.**	***SRO DIAGNOSE*** *the event using Attachment 1, Diagnostic Flow Chart and determines an LOCA is in progress*
	SRO	**Step 11 GO TO the appropriate Emergency Operating Procedure.**	***SRO Performs*** *a crew brief and transitions to 2-EOP-03 LOCA*

Appendix D		Operator Action					Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	6		
Event Description:	**LOCA / 2-HVS-1A trip**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
2-EOP-03		**The following actions are taken from 2-EOP-03, LOSS OF COOLANT ACCIDENT**	
		NOTE ☐ Instruments should be channel checked when one or more confirmatory indications are available. Reg Guide 1.97 designated instruments should be used for diagnosis of events and confirmation of safety functions. ☐ Steps designated with an * may be performed non-sequentially or are to be performed continuously.	
		CAUTION A harsh containment condition exists if containment temperature is greater than 200°F. Figure 1A should be used for determination of subcooling when indicated containment temperature is **less** than or **equal** to 200°F. Figure 1B should be used when indicated containment temperature is **greater** than 200°F. Figure 1A should also be used if containment temperature had exceeded 200°F during event progression but was lowered to 200°F or less by containment cooling systems.	
4.0 Operator Actions:			
	SRO	**1. MONITOR** the SFSCs and **VERIFY** the SFSC acceptance criteria are MET every 15 minutes.	*The **SRO DIRECTS** the STA to perform SFSCs now and every fifteen minutes*
	SRO	**2. IMPLEMENT** the Emergency Plan.	*The **SRO DIRECTS** the SM to **IMPLEMENT** the Emergency Plan*
	SRO	**3. IMPLEMENT** placekeeping**.**	*The **SRO Pulls** the **Place Keeper** from the back of 2-EOP-03 and begins tracking his progress on the placekeeper*
EXAMINER: The implementation of the following step "Sampling Steam Generators" is located in the appendices after Event 8			
	SRO	**4. SAMPLE** steam generators for activity per Appendix A, Sampling Steam Generators.	*The **SRO DIRECTS** the BOP to **PERFORM** Appendix A of 2-EOP-99, Sampling Steam Generators*
	SRO	**5. VERIFY** SIAS is ACTUATED.	***This is a continuous step and will be performed after SIAS actuation conditions are met*** ***SRO VERIFIES** SIAS actuated when either of the following conditions are met:* *• Pressurizer pressure is less than 1736 psia* *• Containment Pressure is greater than 3.5 psig*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	6	
Event Description:	**LOCA / 2-HVS-1A trip**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE Per Flowserve Engineering evaluation, during an emergency, the High Pressure Safety Injection pumps can be operated for up to 24 hours with no Component Cooling Water supplied to the seal heat exchangers without resulting in a significant increase in seal leakage.	
	SRO	**6. OPTIMIZE** SI as follows: **A. VERIFY** SIAS is ACTUATED. **B. VERIFY** all available SI pumps are RUNNING. **C. VERIFY** SI flow within Figure 2, Safety Injection Flow vs. RCS Pressure. **D. VERIFY** all available charging pumps are RUNNING.	***SRO VERIFIES:*** • *SIAS is ACTUATED.* • *SI pumps are OPERATING.* • *SI flow within Figure 2, Safety Injection Flow vs. RCS Pressure.* • *All available charging pumps are RUNNING.* • *Charging header is available*
	SRO	**7. IMPLEMENT** RCP trip strategy as follows: **A. VERIFY** pressurizer pressure is less than 1736 psia. **B. ENSURE** ONE RCP in each loop is STOPPED. **C. VERIFY** RCS subcooling is greater than minimum RCS subcooling	***SRO IMPLEMENTS*** *RCP Trip Strategy* *When subcooling is lost the* ***SRO will DIRECT*** *Secure all RCPs*
EXAMINER: The implementation of the following step "Restore CCW to the RCPs" is located in the appendices after Event 8			
	SRO	**8. CHECK** RCP seal cooling as follows: **A. VERIFY** CCW to the RCPs. **B.** IF both of the following conditions exist: • RCPs have CCW flow • CIAS has isolated the normal RCP bleed off flow path to the VCT THEN **ESTABLISH** the alternate RCP bleedoff flow path to the quench tank by OPENING V2507, RCP Bleed off Relief Stop Vlv.	***May Have been previously completed*** ***SRO DIRECTS*** *the BOP to Restore CCW to the RCPs per Appendix J of 2-EOP-99:* ***The BOP*** *restores CCW to the RCPs with Appendix J of 2-EOP-99*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	6	
Event Description:	**LOCA / 2-HVS-1A trip**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**9. CHECK** if RCPs are operating within limits: **A. VERIFY** at least one RCP is OPERATING. **B.** For all operating RCPs, **VERIFY** RCP operating limits are MET per Table 13, RCP Operating Limits.	***SRO DIRECTS ATC to VERIFY*** *operating limits are MET per Table 13, RCP Operating Limits for any running RCPs.* ***The ATC to VERIFIES*** *operating limits are MET per Table 13, RCP Operating Limits for any running RCPs.*
	SRO	**10. ISOLATE** potential LOCA locations as follows: **A. VERIFY** both PORVs are CLOSED. **B. VERIFY** Letdown is ISOLATED. **C. VERIFY** all SIX RCS sample valves are CLOSED. **D. VERIFY** RCS-to-CCW boundary is INTACT as follows: • CCW high radiation monitor alarms are CLEAR. (Annunciators PLP-101 and PLP 102) • CCW surge tank high level alarm is CLEAR. (Annunciator LB-10) **ENSURE** sample flow to the CCW radiation monitors. **E. VERIFY** LOCA is inside Containment by evaluating the following: • RAB radiation monitor trends and alarms - NORMAL. • RAB sump level alarms are CLEAR. (Annunciators LA-2, LA-8, LB-2 and LB-8)	***SRO EVALUATES*** *plant conditions and takes appropriate actions to isolate the RCS leak*

Appendix D	Operator Action					Form ES-D-2
Op Test No.: L-19-1	Scenario #	1	Event #	6		
Event Description:	**LOCA / 2-HVS-1A trip**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**11. ENSURE** Containment isolation and Containment cooling as follows: **A. VERIFY** one of the following conditions is MET: • Containment pressure is greater than 3.5 psig • Containment radiation greater than 10 R/hr • SIAS is ACTUATED **B. VERIFY** CIAS is ACTUATED. **C.** IF Containment pressure is greater than 3.5 psig, THEN **VERIFY** MSIS is ACTUATED. **D. ENSURE** all available Emergency Containment HVAC systems are RUNNING: • At least ONE train of SBVS • At least ONE train of Containment Fan Coolers	***SRO EVALUATES*** *plant conditions and Verifies required ESFAS actuations have occurred*
	SRO	**12. CHECK** if containment spray actuation is required: **A. VERIFY** Containment pressure is greater than 5.4 psig. **B. VERIFY** CSAS is ACTUATED. **C. VERIFY** Containment Spray flow is at least 2700 gpm from each header.	***SRO EVALUATES*** *step and* ***DIRECTS Verification of CSAS if required*** **"2A"CS pump will be tripped and "B" CSAS will fail to actuate CSAS; see event 8.**
	SRO	**13. VERIFY** circulating water flow to the Main Condenser.	***SRO VERIFIES*** *circulating water flow to the main condenser*
	SRO	**14. STABILIZE** the secondary plant per Appendix X, Secondary Plant Post Trip Actions, Section 2.	***SRO DIRECTS*** *the BOP to Perform Appendix X, Secondary Plant Post Trip Actions, Section 2 as time permits* ***The BOP PERFORMS*** *Appendix X, Secondary Plant Post Trip Actions, Section 2 as time permits*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	6	
Event Description:	**LOCA / 2-HVS-1A trip**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**15.** IF a LOOP has occurred, THEN **PERFORM** both of the following to restore Instrument Air: **A. ENSURE** 2AB 480V Load Center is aligned to an energized bus. **B**. **DISPATCH** an operator to restore Instrument Air per Appendix H, Operation of the 2A and 2B Instrument Air Compressors.	***SRO EVALUATES*** *step and Determines it is not required*
	SRO	**16.** Within one hour of CSAS actuation, **CHECK** if early containment spray flow reduction criteria are MET: **A. VERIFY** all containment spray pumps are operating. **B. VERIFY** all of the following criteria are MET: • Containment pressure less than 42 psig. • At least two containment cooling fans are in operation. • Safety injection is actuated. • SI flow is within Figure 2, SI Flow vs. RCS Pressure. **C. STOP** a Containment Spray Pump. **D. VERIFY** containment pressure remains less than 42 psig.	***SRO EVALUATES*** *step and Determines it is not required*
	SRO	**17.** Within 1 hour of CSAS actuation, **VERIFY** only ONE Hydrazine Pump is RUNNING.	***SRO EVALUATES*** *step and Determines it is not required*
	SRO	**18. VERIFY** LOCA is still in PROGRESS.	***SRO EVALUATES*** *step and Determines the RCS leak has not been terminated*
NOTE **Cooldown rates up to 100°F in any 1 hour period are permitted to regain or maintain minimum subcooling.**			

Appendix D			Operator Action						Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #	6			
Event Description:	**LOCA / 2-HVS-1A trip**								
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior						

	SRO/ATC	**19. COOLDOWN** the RCS (to SDC) as follows: **A. COOLDOWN** the RCS using SBCS. **B.** IF RCPs are operating, THEN **COOLDOWN** at a rate **NOT** to exceed 100°F in any 1 hour period per 2-GOP-305, Reactor Plant Cooldown – Hot Standby to Cold Shutdown. **C.** IF all RCPs are STOPPED, THEN **COOLDOWN** at a rate **NOT** to exceed 50°F in any 1 hour period per 2-AOP-01.13, Natural Circulation Cooldown.	***SRO DIRECTS*** *the ATC to initiate an RCS cooldown using SBCS* ***The ATC*** *will plot cooldown IAW OPS Policy 539 and place the SBCS permissive switch to manual and begin an RCS cooldown using V8801 in manual control to attain a cooldown as directed by the SRO. When MSIS actuates the SRO will direct the cooldown to be performed using 1 ADV in each Steam Generator.*
NOTE **Maintaining subcooling as low as possible while still within the limits of Figure 1A or 1B will lower the break flow rate and minimize the severity of the accident.**			
	SRO	**20. DEPRESSURIZE** the RCS to SDC entry conditions as follows: **A. OPERATE** main or auxiliary pressurizer sprays. **B. VERIFY** HPSI throttle criteria are MET. **C.** IF in service, THEN **CONTROL** letdown. **D. THROTTLE** SI flow as necessary per Appendix S, Safety Injection Throttling and Restoration.	***SRO DIRECTS*** *the ATC to initiate an RCS depressurization using Main or Auxiliary sprays* ***The ATC*** *will initiate an RCS depressurization using Main or Auxiliary sprays while maintaining subcooled margin*
The Scenario can be terminated once RCS cooldown and depressurization has commenced			
CAUTION **RCS inventory and containment conditions safety functions should be under positive control prior to blocking safeguards signals. Safety functions should be closely monitored for degradation. Manual actuation of ESFAS may be necessary should conditions warrant.**			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	6	
Event Description:	**LOCA / 2-HVS-1A trip**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**21.** WHEN permissive conditions are MET, THEN **BLOCK** automatic MSIS and SIAS actuation signals as follows: **A.** IF MSIS is ABSENT, THEN **BLOCK** automatic actuation of MSIS. **B.** IF SIAS is ABSENT, THEN **BLOCK** automatic actuation of SIAS.	When Containment pressure reaches 3.5 psi MSIS cannot be blocked
	SRO	**22. CHECK** if HPSI throttle criteria are MET: **A. VERIFY** at least ONE HPSI pump is OPERATING. **B. VERIFY** all of the following HPSI throttle criteria are MET: • RCS subcooling is greater than or equal to minimum subcooling • Pressurizer level is greater than 30% and stable or rising • At least one S/G is available for RCS heat removal with level being restored to OR maintained between 60 and 70% NR • Rx Vessel level indicates sensors 4 through 8 are covered, or **NO** abnormal differences (greater than 20°F) between Thot and Rep CET temperature **C. THROTTLE** SI flow per Appendix S, Safety Injection Throttling and Restoration.	***SRO EVALUATES*** *step and Determines takes actions as plant conditions warrant*
	SRO	**23. CHECK** HPSI pump restart criteria: **A. VERIFY** HPSI throttling criteria are being maintained.	***SRO EVALUATES*** *step and Determines takes actions as plant conditions warrant*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	6	
Event Description:	**LOCA / 2-HVS-1A trip**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**24. CHECK** LPSI pump stop criteria: **A. VERIFY** pressurizer pressure is greater than 250 psia AND CONTROLLED. **B. STOP** the LPSI pumps. **C. CLOSE** the LPSI injection valves. **D. PLACE** LPSI pump handswitches in AUTO.	***SRO EVALUATES*** *step and Determines takes actions as plant conditions warrant*
	SRO	**25. CHECK** LPSI pump restart criteria: **A. VERIFY** both LPSI pumps are STOPPED. **B. VERIFY** RAS is ABSENT. **C. VERIFY** pressurizer pressure is less than 250 psia. **D. START** LPSI pumps as necessary. **E. OPEN** the LPSI injection valves.	***SRO EVALUATES*** *step and Determines takes actions as plant conditions warrant*
	SRO	**26. VERIFY** Letdown IN SERVICE.	***SRO evaluates*** *step and Determines takes actions as plant conditions warrant*

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #	7	
Event Description:	**PCV-1100F will fail open**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
			Note to Evaluator: PCV-1100F fails open is a malfunction an auto trigger when RX power lowers to .05%.
			Booth Operator Instructions: • **Upon Reactor Trip Event 7 PCV-1100F fails open will be auto inserted.** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**
			Indications: **Annunciators:**
	ATC		**RECOGNIZES** PVC-1100F is failed OPEN
	ATC		**ATTEMPTS** to close all spray valves in manual
	ATC		**RECOGNIZES** the need to secure the 2B1 RCP to stop the de-pressurization
	ATC		**RECOMMENDS** securing the 2B1 RCP
	SRO		**DIRECTS** the ATC the secure the 2B1 RCP
	ATC		**SECURES** the 2B1 RCP
2-EOP-01		**The following actions are taken from 2-EOP-01, Standard Post Trip Actions**	
			4.2 Immediate Operator Actions: • **ATC: Verifies Reactor power lowering, Negative Startup rate, all CEAs and verifies no dilution is in progress inserted and communicates status to the Unit Supervisor. Starts backup charging pumps as necessary.** • **BOP: Verifies all governor and throttle valves closed and communicates status to the Unit Supervisor. Makes plant announcements and trip notifications.**
			4.0 Operator Actions:

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #	7	
Event Description:	**PCV-1100F will fail open**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 5 VERIFY RCS Pressure Control:**	***SRO DIRECTS VERIFY*** *RCS Pressure Control, ATC Verifies:* ☐ *Pressurizer pressure is between 1800 and* ***L-19-100 psia*** ☐ *Pressurizer pressure is trending to between 2225 and 2275 psia* **IF SIAS** has occurred the **SRO** will **DIRECT** two RCPs to be tripped and perform 2-EOP-99 App.J to restore CCW to the RCPs

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #	8	
Event Description:	**B train of CSAS does not actuate**						
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior				

CT-2	INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY- SAFEGUARDS EQUIPMENT THAT IS ESSENTIAL TO THE MAINTENANCE OF SAFETY FUNCTIONS HAS NOT AUTO-ACTUATED WHEN IT SHOULD HAVE. ACTUATION OF "B" TRAIN OF CONTAINMENT SPRAY WITHIN 15 MINUTES OF ENTERING 2-EOP-03 TO PREVENT UNNECESSARY ENTRY INTO FUNCTIONAL RECOVERY PROCEDURE AND ESCALATION OF EAL TO SAE (LOSS OF SECOND FISSION PRODUCT BARRIER) DUE TO INACTION BY THE OPERATORS, OR 15 MINUTE POST CSAS IF AFTER 2-EOP-03 ENTRY.

Note to Evaluator: "B" CSAS Actuation module FAILED AS-IS, is an auto trigger that is inserted upon loading the scenario and is cleared when the applicant cycles the THINK push button and the CSAS actuation switch simultaneously.

Booth Operator Instructions:

- **NONE: "A" Containment Spray Pump fails and "B" CSAS Actuation module FAILED AS-IS, is an auto trigger**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications: Safety Injection Actuation Alarms and supporting plant parameters

Annunciators: Multiple

	BOP		Recognizes plant parameters require CSAS and validates its actuation
	BOP		Identifies that "A" CS pump is tripped and B train CSAS did not actuate and takes action to actuate A train CSAS
	BOP		Pushes the "B" CSAS push button and turns the "B" CSAS actuation switch, then verifies the 2B CS pump started and adequate containment spray flow
	BOP		Updates the crew on the actuation status of CSAS

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #		
Event Description:	**APPENDICES**						
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior				

2-EOP-99 APP "A"		**The following actions are for Sampling Steam Generators Using 2-EOP-99, APPENDIX "A"**	
	BOP	**1. If a LOOP has occurred, Then PERFORM BOTH of the following:** **A. ENSURE 2AB 480V Load Center is aligned to an energized bus.** **B. DISPATCH an operator to restore Instrument Air. REFER TO Appendix H, Operation of the 2A and 2B Instrument Air Compressors.**	***2AB Bus energized when 2A EDG output breaker is closed. Determines no additional action required***
NOTE ☐ **HCV-14-9 (HCV-14-10) will open 5 seconds after HCV-14-8A (HCV-14-8B) starts to open** ☐ **When SIAS is present, placing the control switches in CLOSE and then OVERRIDE will open the CCW 'N' header valves, until SIAS is reset**			
	BOP	**2. If an INADVERTENT SIAS has closed the 'N' Header valves, Then PERFORM EITHER of the following:** ☐ RESTORE flow to the "A" CCW Header by **placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A** **HCV-14-9** **OR** ☐ RESTORE flow to the "B" CCW Header by **placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B** **HCV-14-10**	***Determines no action required, no inadvertent SIAS***
CAUTION **Under SIAS conditions, the CCW 'N' header shall only be aligned to ONE essential header. This will maintain train separation while safeguards signals are still present.**			

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #		
Event Description:		**APPENDICES**					
Time	Position / Competency	Procedure Step				Applicant's Actions or Behavior	

	BOP	**3. If a VALID SIAS has closed the 'N' Header valves, Then PERFORM the following:** **A. VERIFY both safety related CCW headers are operational.** **B. VERIFY 'N'-Header is intact (NO seismic event has occurred).** **C. ALIGN the 'N' Header to one Safety Related CCW Header by performing either of the following:** **RESTORE flow to the 'A' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A, HCV-14-9** **OR** **RESTORE flow to the 'B' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B, HCV-14-10**	**BOP restores "N" header flow**
	BOP	**4. If the 'N' Header has been restored, Then OPEN FCV-L-19-1-7 and FCV-L-19-1-9,** **SGBD Sample Valves by performing the following:** **A. If CIAS or high radiation has closed the SGBD Sample Valves, Then OPEN FCV-L-19-1-7 and FCV-L-19-1-9 by PLACING the control switch to CLOSE / OVERRIDE.** **B. OPEN FCV-L-19-1-7 and FCV-L-19-1-9, SGBD Sample Valves.**	**BOP** restores SGBD sample flow.
	BOP	**5. If the 'N' Header is in service, Then DIRECT Chemistry to perform S/G samples** **for isotopic activity and Tritium.**	**BOP** directs chemistry to perform required samples

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #		
Event Description:	**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**6. If S/Gs cannot be sampled, Then DIRECT Health Physics to conduct secondary plant local area radiation surveys.**	**BOP** determines step is N/A
		NOTE **The Safety Related CCW header NOT aligned to the 'N' Header will be operable to supply essential equipment.**	
	BOP	**7. DECLARE the Safety Related CCW header aligned to the 'N' Header, inoperable but available.**	**BOP** informs US to declare CCW header inoperable
	BOP	**8. If any of the following conditions occur prior to reaching cold shutdown or resetting SIAS,** • **Seismic event** • **'N' Header is found NOT intact** • **The operable Safety Related CCW header becomes inoperable** **Then ISOLATE the 'N' header.**	**BOP** monitors for these conditions, determines N/A at this time
2-EOP-99 APP "J"		**The following actions are for Restoring CCW to the RCPs Using 2-EOP-99, APPENDIX "J".**	
	BOP	**1. If a LOOP has occurred,** **Then PERFORM BOTH of the following:** ☐ A. ENSURE 2AB 480V Load Center is aligned to **an energized bus.** ☐ B. DISPATCH an operator to restore Instrument **Air. REFER TO Appendix H, Operation of the 2A and 2B Instrument Air Compressors.**	**BOP** determines LOOP has not occurred, the was 2AB bus energized with the 2A EDG breaker closure
	BOP	**2. ENSURE Instrument Air to Containment is available by PLACING HCV-18-1 to CLOSE / OVERRIDE and then to OPEN.**	**BOP** opens HCV-18-1

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	1	Event #		
Event Description:	**APPENDICES**					

Time	Position Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE ☐ HCV-**14-9 (HCV-14-10) will open 5 seconds after HCV-14-8A (HCV-14-8B) starts to open.** ☐ When SIAS is present, placing the control**switches in CLOSE and then OVERRIDE will open the CCW 'N' header valves, until SIAS is reset.**	
	BOP	**3. If an INADVERTENT SIAS has occurred, Then RESTORE flow from Either 'A' or 'B' CCW Header to the 'N' Header by placing the control switches for the desired train to CLOSE and then to OVERRIDE:** **HCV-14-8A** **HCV-14-9** **OR** **HCV-14-8B** **HCV-14-10**	**BOP** determines no inadvertent SIAS occurred
		CAUTION **Under SIAS conditions, the CCW 'N' header shall only be aligned to ONE essential header. This will maintain train separation while safeguards signals are still present.**	

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #		
Event Description:	**APPENDICES**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**4. If a VALID SIAS has closed the 'N' Header valves, Then PERFORM the following:** **A. VERIFY both safety related CCW headers are operational.** **B. VERIFY 'N'-Header is intact (NO seismic event has occurred).** **C. ALIGN the 'N' Header to one Safety Related CCW Header by performing either of the following:** **RESTORE flow to the 'A' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A, HCV-14-9** **OR** **RESTORE flow to the 'B' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B, HCV-14-10**	**BOP** realigns the "N" header restoring CCW flow
	BOP	**5. OPEN ALL of the following CCW to / from the RCP valves:** **☐HCV-14-1, CCW To RC PUMP** **☐HCV-14-2, CCW From RC PUMP** **☐HCV-14-7, CCW To RC PUMP** **☐HCV-14-6, CCW From RC PUMP**	**BOP** opens valves restoring CCW flow to RCPs
	BOP	**6. ENSURE V2507, RCP Bleedoff Relief Stop Vlv, is OPEN.**	**BOP** opens V2507

CAUTION

RCP Seal Cooler isolation valves automatically close on high Seal Cooler outlet temperature of 200°F. Maintaining the control switch in the OPEN position will override this function. CCW radiation monitors should be closely monitored for indication of RCS to CCW leakage should conditions warrant the valve(s) to be maintained in the open position. Consideration should be given to returning the control switch(es) to the AUTO position once the valves have been opened.

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	1	Event #		
Event Description:		**APPENDICES**					
Time	Position / Competency	Procedure Step				Applicant's Actions or Behavior	

	BOP	**7. ENSURE ALL RCP Seal Cooler Isolation valves are OPEN:** **HCV-14-11-A1,CCW From 2A1 RCP Seal Cooler** **HCV-14-11-A2,CCW From 2A2 RCP Seal Cooler** **HCV-14-11-B1,CCW From 2B1 RCP Seal Cooler** **HCV-14-11-B2,CCW From 2B2 RCP Seal Cooler**	**BOP** verifies valves are open
NOTE **Reactor Coolant Pumps must be secured if CCW flow is not restored within 10 minutes.**			
	BOP	**8. VERIFY CCW flow to running RCPs by any of the following:** ☐ DCS RCP Overview Screen ☐ FIS-14-15A/B/C/D, CCW From RCP Hx Flow ☐ L-6, RCP CCW Flow Low Trip, Annunciator clear.	**BOP** verifies CCW flow to RCPs
NOTE **The Safety Related CCW header NOT aligned to the 'N' Header will be operable to supply essential equipment.**			
	BOP	**9. DECLARE the Safety Related CCW header aligned to the 'N' Header, inoperable but available.**	**BOP** informs US to declare CCW header is inoperable
	BOP	**10. If any of the following conditions occur prior to reaching cold shutdown or resetting SIAS,** ☐ Seismic event ☐ 'N' Header is found NOT intact ☐ The operable Safety Related CCW header **becomes inoperable** **Then ISOLATE the 'N' header.**	**BOP** monitors for these conditions, not present at this time

SIMULATOR LESSON LAYOUT

QUANTITATIVE ATTRIBUTES

Malfunctions:

Before EOP Entry:

1. PCV-1100E fails open
2. RWT LEVEL LIS-07-2C fails Low
3. PIC-2201 LD Pressure Controller Auto fails
4. RCS leakage develops

After EOP Entry:

1. PCV-1100F fails open
2. A CSAS pump trips on high amps
3. B Train of CSAS fails to auto

Abnormal Events:

1. PCV-1100E fails open
2. RWT LEVEL LIS-07-2C fails Low
3. PIC-2201 LD Pressure Controller Auto fails
4. RCS leakage develops

Major Transients:

1. LOCA Ramped in over 6 minutes

Critical Tasks:

1. RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION –Take action to close PCV-1100E prior to reaching RPS setpoint for reactor trip.
2. INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY- Actuation of "B" Train of Containment Spray

OPERATIONS SHIFT TURNOVER REPORT

DAYS Today

UNIT 2 CONTROL ROOM

Desk RCO: _____ **Board RCO:** _____

Protected Train: A **Online Risk:** GREEN

Unit 2 Identified RCS Leakage: .02 gpm **Unit 2 Unidentified RCS Leakage:** .06 gpm

Unit 2 Scheduled Activities per the OSP:

No scheduled surveillances

Unit 2 Unscheduled Surveillances:

No unscheduled surveillances

Upcoming ECOs to Hang or Release:

None

Tech Spec Action Statement:

1. NONE

Operator Work Around:

None

Locked in Annunciators:

1. NONE

Current Status:

1. 2-3% power, MOC, no scheduled surveillances, all Mode 1 preps complete
2. 2A Screen Wash Pump OOS,
3. Small amounts of sea grass has been observed in the intake, 2B Screen wash pump is running 2-NOP-21.15, INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green.
4. A Reactor Start-up is in progress following a Forced Outage for Feed Water control Valve issues, on main feedwater and SBCS,
5. Raise reactor power to 10-12% IAW 2-GOP-201 step 4.3.10b and declared Mode 1

Longstanding Problems:

None

Reactivity Turnover:

Per Procedure guidance and Reactor Engineering guidance letter

Facility:	St. Lucie	Scenario No.:	2	Op-Test No.:	L-19-1
Examiners:		Operators:	SRO:		
			ATC:		
			BOP:		
Initial Conditions:	45% power, MOC, no scheduled surveillances, return the unit to 100%.				
Turnover:	2A Screen Wash Pump OOS, 2-NOP-21.15, INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green.				
Critical Tasks:	1. INITIATE EMERGENCY BORATION TO SHUTDOWN THE REACTOR WHEN REQUIRED- If any CEA is not fully inserted, and then the crew initiates emergency boration to achieve SDM during verification of reactor trip and before exiting 2- EOP-01. 2. INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY – Restore 2A CS pump and flow prior to exceeding 44 psig design pressure of containment.				

Event No.	Malf. No.	Event Type*	Event Description
1		R/ATC/SRO	**Action:** Raise Power to 100%
2	1	I/ATC/SRO TS/SRO	**Malf:** 2B S/G PT-8023D fails high **Action:** Bypass RPS/AFAS bistables **T.S.** 3.3.1, 3.3.2
3	2	C/ BOP/SRO TS/SRO	**Malf:** HVS-1C trips **Action:** start B/U fan **T.S.** 3.6.2.1 Action B
4	3	I /ATC/SRO TS/SRO	**Malf:** LIC 2110 L/D flow controller fails to Minimum flow in auto **Action:** Manually control letdown flow
5	4	M/ALL	**Malf:** 2A Main Feed Reg valve fails open requiring RX trip, ESD in Containment from the 2A S/G and 2B3 4.16kv bus Lock Out on trip, **Action:** Trip RX
6	5	C/ATC/SRO	**Malf:** On trip 2 CEAs remain out of core **Action:** Emergency Borate **CT-1.** Initiate EB To Shut down The Reactor When Required- If any CEA is not fully inserted, to achieve SDM during verification of reactor trip and before exiting 2-EOP-01
7	6	C/ BOP/SRO TS/SRO	**Malf:** On RX trip FB 2, Exciter Supply Breaker fails to open **Action:** Open FB 2, Exciter Supply Breaker
8	7	C/ATC/SRO TS/SRO	**Malf:** 2A CS Pp breaker fails to auto close **Action:** Manually start 2A CS Pp **CT-2.**INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION in AUTO– Restore 2A CS pump and flow prior to exceeding 44 psig containment pressure

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Scenario 2 Summary

Event	Description
1	THIS IS A REACTIVITY EVENT; Raise Power to 100%; The SRO will direct the ATC and BOP to commence a unit up-power using the guidance of 2-GOP-201, "Reactor Plant Startup – Mode 2 to Mode 1." The ATC will begin RCS dilution and withdraw CEAs, as directed, to raise reactor power; The BOP will operate the TCS, as directed, to raise turbine load.
2	2B S/G PT-8023D will fail high, requiring entry into 2-AOP-99.01, "Loss of Tech Spec Instrumentation." The failure will be recognized and reported by the BOP and/or ATC. The SRO will direct stopping of the up power and then direct the BOP to bypass the affected RPS/AFAS/ESFAS bistables, as well as the S/G High Level Override. Requires a Tech Spec evaluation and entry into LCO 3.3.1 and 3.3.2.
3	HVS-1C Containment Cooler Fan trips the BOP will address the ARP identify the loss of light indication and report. The SRO will enter 2-AOP-25.01 Loss of RCB Cooling Fans and direct the starting of the standby fan cooler and enter T.S. 3.6.2.1 Action B
4	THIS IS A MANUAL CONTROL OF AN AUTO SYSTEM FAILURE; Level controller LIC 2110 fails to minimum letdown flow in auto, the ATC will identify the failure and take manual control of LIC-2110 to restore letdown flow to normal pre-event values. The SRO will implement 2-AOP-02.03, Charging And Letdown.
5	2A Main Feed Reg Valve will fail open requiring the crew to trip the unit. Upon the Reactor trip a Lock –out of the 2B3 4160 bus will occur. An ESD develops in Containment on the 2A S/G, the crew will identify the event. The SRO will evaluate the condition and direct the ATC to trip the reactor. 2-EOP-01 Standard post trip actions will be directed and the SRO will direct entry into 2-EOP-5 ESD.
6	THIS IS A CRITICAL TASK; On reactor trip, 2 CEAs will not fully insert into the core. The ATC will identify the failure and IAW 2-EOP-01, "Standard Post Trip Actions," Verify Reactor Trip contingency steps, Emergency Borate to achieve SDM due to the 2 CEAs stuck out of the core.
7	On Reactor Trip the Exciter Supply Breaker FB 2 does not open automatically. The BOP will identify the failure, report the condition, take contingency actions of 2-EOP-01 and open the breaker.
8	THIS IS A CRITICAL TASK; On CSAS; The breaker for the CS Pp 2A fails to auto close and the B Train of CSAS unavailable due to 2B3 4160 bus L/O. The BOP will identify the failure and take action to manually start the 2A CS Pp prior to exceeding 44 psig containment pressure.
Termination Criteria	The scenario is to be terminated after the crew has isolated the S/G with the ESD or at the Lead evaluators direction

SITE: ST. LUCIE **Revision #:** 0

LMS ID: N/A **LMS Rev. Date:** N/A

SEG TITLE: L-19-1 SCENARIO 2

SEG TYPE: ☐ **Training** ☒ **Evaluation**

PROGRAM: ☐ **LOCT** ☒ **LOIT** ☐ **Other:**

DURATION: 90 minutes

Developed by: _____ _____
Instructor/Developer Date

Reviewed by: _____ _____
Instructor (Instructional Review) Date

Validated by: _____ _____
SME (Technical Review) Date

Approved by: _____ _____
Training Supervision Date

Approved by: _____ _____
Training Program Owner (Line) Date

Scenario Outline

Facility:	St. Lucie	Scenario No.:	2	Op-Test No.:	L-19-1
Examiners:		Operators:	SRO:		
			ATC:		
			BOP:		

Initial Conditions: 45% power, MOC, no scheduled surveillances, return the unit to 100%.

Turnover: 2A Screen Wash Pump OOS, 2-NOP-21.15, INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green.

Critical Tasks:

1. INITIATE EMERGENCY BORATION TO SHUTDOWN THE REACTOR WHEN REQUIRED- If any CEA is not fully inserted, and then the crew initiates emergency boration to achieve SDM during verification of reactor trip and before exiting 2- EOP-01.
2. INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY – Restore 2A CS pump and flow prior to exceeding 44 psig design pressure of containment.

Event No.	Malf. No.	Event Type*	Event Description
1		R/ATC/SRO	**Action:** Raise Power to 100%
2	1	I/ATC/SRO TS/SRO	**Malf:** 2B S/G PT-8023D fails high **Action:** Bypass RPS/AFAS bistables **T.S.** 3.3.1, 3.3.2
3	2	C/ BOP/SRO TS/SRO	**Malf:** HVS-1C trips **Action:** start B/U fan **T.S.** 3.6.2.1 Action C&B
4	3	I /ATC/SRO TS/SRO	**Malf:** LIC 2110 L/D flow controller fails to Minimum flow in auto **Action:** Manually control letdown flow
5	4	M/ALL	**Malf:** 2A Main Feed Reg valve fails open requiring RX trip, ESD in Containment from the 2A S/G and 2B3 4.16kv bus Lock Out on trip, **Action:** Trip RX
6	5	C/ATC/SRO	**Malf:** On trip 2 CEAs remain out of core **Action:** Emergency Borate **CT-1.** Initiate EB To Shut down The Reactor When Required- If any CEA is not fully inserted, to achieve SDM during verification of reactor trip and before exiting 2-EOP-01
7	6	C/ BOP/SRO TS/SRO	**Malf:** On RX trip FB 2, Exciter Supply Breaker fails to open **Action:** Open FB 2, Exciter Supply Breaker
8	7	C/ATC/SRO TS/SRO	**Malf:** 2A CS Pp breaker fails to auto close **Action:** Manually start 2A CS Pp **CT-2**.INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION in AUTO– Restore 2A CS pump and flow prior to exceeding 44 psig containment pressure

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

SIMULATOR EXERCISE GUIDE REQUIREMENTS

Terminal Objective Given specific plant conditions, the students will be able to mitigate events in accordance with plant procedures.

Enabling Objectives: None

Prerequisites:
1. Simulator
2. Applicants enrolled in Initial License Program

Training Resources:
1. Floor Instructor as Shift Technical Advisor
2. Simulator Booth Operator
3. NRC Evaluators

References:
1. 2-GOP-201, Reactor Plant Startup – Mode 2 to Mode 1
2. 2-AOP-99.01, Loss of Tech Spec Instrumentation
3. 2-AOP-25.01 Loss of RCB Cooling Fans
4. 2-AOP-02.03, Charging and Letdown
5. 2-EOP-01, Standard Post Trip Actions
6. 2-EOP-05, Excessive Steam Demand
7. 2-EOP-99, Appendices / Figures / Tables /Data Sheets
8. Unit-2 Technical Specifications

Protected Content: **NONE**

Evaluation Method: Simulator performance will be evaluated in accordance with NUREG 1021 rev. 11.

Risk Significant Operator Actions Contribution to CDF: Perform Emergency Boration to Shut down Reactor 0.5%

UPDATE LOG: Indicate in the following table any minor changes or major revisions made to the material after initial approval.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER REVIEWER	DATE DATE

L-19-1 NRC SCENARIO 1 OVERVIEW/SEQUENCE OF EVENTS

The crew assumes the shift at 45% power with no scheduled surveillances.

- 2-NOP-21.15, INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green 2B Screen wash Pump and traveling screens running
- 2A Screen wash Pump inoperable on Clearance

Raise Power to 100%; The SRO will direct the ATC and BOP to commence a unit up-power using the guidance of 2-GOP-201, Reactor Plant Startup – Mode 2 to Mode 1. The ATC will begin RCS dilution and withdraw CEAs, as directed (per 2-GOP-101 Reactor Operating Guidelines During Steady State and Scheduled Load Changes), to raise reactor power; The BOP will operate the Turbine Control System, as directed, to raise turbine load.

After the needed power change has been observed the 2B S/G LT9023D fails high, requiring entry into 2-AOP-99.01, Loss of Tech Spec Instrumentation. The failure should be recognized and reported by the BOP. The SRO will direct the BOP to bypass the affected RPS/AFAS/ESFAS bistables, as well as the S/G High Level Override. Requires a Tech Spec evaluation and entry into LCO 3.3.1 and 3.3.2.

HVS-1C Containment Cooler Fan trips the BOP will evaluate and Start the standby fan cooler

T.S.: 3.6.2.1

Level controller LIC 2110 fails to max letdown flow in auto, the ATC will identify the failure and take manual control of LIC-2110 to restore letdown flow to normal pre-event values. The SRO will implement 2-AOP-02.03, Charging And Letdown.

2A Main Feed Reg Valve fails open requiring a Reactor trip, upon the trip a Lock –out of the 2B3 4160 bus will occur and an ESD develops in Containment on the 2A S/G,

The crew will Enter 2-EOP-01 transition to 2-EOP-05 ESD

On reactor trip, 2 CEAs do not fully insert. The ATC will identify the failure and Emergency Borate IAW 2-EOP-01, Standard Post Trip Actions, Verify Reactor Trip, contingency steps.

CT-1: INITIATE EMERGENCY BORATION TO SHUTDOWN THE REACTOR WHEN REQUIRED- If any CEA is not fully inserted, and then the crew initiates emergency boration to achieve SDM during verification of reactor trip and before exiting 2- EOP-01.

On turbine trip the Exciter Supply Breaker FB 2 does not open, The BOP will identify the failure and OPEN Exciter Supply Breaker FB 2

On CSAS the breaker for the 2A CS Pp fails to auto close, B Train of CSAS unavailable due to 2B3 4160 bus L/O, the ATC/BOP will evaluate and Manually start the 2A CS Pp to get adequate spray flow

CT-2: INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY – Restore 2A CS pump and flow prior to exceeding 44 psig design pressure of containment.

Procedures Used	**Tech Specs Entered**
• 2-GOP-201, Reactor Plant Startup – Mode 2 to Mode 1 • 2-AOP-99.01, Loss of Tech Spec Instrumentation • 2-AOP-25.01 Loss of RCB Cooling Fans • 2-AOP-02.03, Charging and Letdown • 2-EOP-01, Standard Post Trip Actions • 2-EOP-05, Excessive Steam Demand • 2-EOP-99, Appendices / Figures / Tables /Data Sheets • Unit-2 Technical Specifications	• 3.3.2, 3.3.2 • 3.6.2.1

Scenario Setup and Booth Operator Instructions:

- **ENSURE** Examination Security has been established.
- **ENSURE** the Simulator is unloaded
- **ENSURE** IC #192 from Exam Flash drive is loaded as follows:
  - **Open**, folder L-19-1 NRC SCENARIO ICs
  - **Copy**, CY18B#192.ic and CY18B#192.rlp
  - **Open**, IC folder on simulator operator station desk top
  - **Paste**, CY18B#192.ic and CY18B#192.rlp into IC Master
  - **Open**, folder L-19-1 NRC SCENARIO ICs
  - **Copy**, xr192.dat
  - **Open**, IC folder on simulator operator station desk top
  - **Paste**, xr192.dat into IC Data
- **ENSURE** Lesson for SCENARIO 1 from Exam Flash drive is loaded as follows:
  - **Open**, folder L-19-1 S-2 lsn
  - **Copy**, L-19-1 S-2.lsn
  - **Open**, Lessons folder on simulator operator station desk top
  - **Paste**, L-19-1 S-2.lsn into the Instructor Lessons folder
- **LOAD** the Simulator
- **RESTORE** IC#192
  - **RUN** the Simulator
  - Place the 2A Screen wash pump off
  - Place a Clearance tag on the 2A Screen wash pump
  - Start the 2B Screen wash pump
  - ENSURE the A Train Protected sign and OLRM sign are placed RTGB-203.
  - ENSURE the GREEN OLRM sign is placed RTGB-203.
  - ENSURE the CHEMISTRY sheet for MOC is placed on the Unit Supervisor Desk.
  - **FREEZE** the simulator
- **OPEN** and **EXECUTE** L-19-1 S- 2.lsn
- **RUN** the Simulator and allow for stabilization
- **FREEZE** the simulator
- **UNFREEZE** the simulator prior to the candidates entering the simulator
-

Post scenario simulator restoration:

- **ENSURE** L-19-1 NRC SCENARIO 2.lsn are deleted from Simulator in accordance with Attachment 2 of Training Department Policy PSL-TRNG 142

BRIEF / TURNOVER INFORMATION

- Conduct simulator crew pre-scenario brief using TR-AA-L-19-10-1007-F06, Simulator Instructor Pre-Exercise Checklist.
- Brief the scenario evaluators
- Brief surrogates using TR-AA-L-19-10-1007-F11, Surrogate Brief Checklist, if necessary.
- Crew Shift Turnover Information: See Attached

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	1	
Event Description:	Raise Power to 50%					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
Booth Operator Instructions: NONE **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**			
Indications: **Annunciators:**			
2-GOP-101		**The following actions are taken from 2-GOP-101, Reactor Operating Guidelines During Steady State and Scheduled Load Changes**	
4.1 Power Level Escalations			
	SRO	**PERFORMS A Crew Brief**	***SRO** briefs the crew on the pending up power*
	SRO	**1. MAINTAIN** T-avg at T-ref during main generator loading as follows: ☐ CEA withdrawal in Manual Sequential. ☐ Boron concentration changes per 2-NOP-02.24, Boron Concentration Control.	***SRO** will direct the **ATC MAINTAIN** T-avg at T-ref during main generator loading using Boron concentration changes per 2-NOP-02.24, Boron Concentration Control.*
	SRO	**2. IF** greater than or equal to 50% power OR 30% power during shape annealing factor test, THEN RAISE power as follows: A. USE boration or dilution per 2-NOP-02.24, Boron Concentration Control for all planned reactivity additions.	***SRO EVALUATES** step and determines it to be N/A until greater than 50% power*
	SRO	**3. IF** available, **THEN ENSURE** two Charging Pumps are operating per 2-NOP-02.02, Charging and Letdown.	***SRO DIRECTS the ATC** to Start the 2B Charging pump per 2-NOP-02.02, Charging and Letdown*
	SRO	**4. PLACE** the Pressurizer on recirculation per Attachment 1, Pressurizer Recirculation Guidelines.	***SRO DIRECTS the ATC** to PLACE the Pressurizer on recirculation per Attachment 1, Pressurizer Recirculation Guidelines*
	SRO	**5. CONTINUE** to load Main Generator per 2-GOP-201, Reactor Plant Startup - MODE 2 to MODE 1.	***SRO DIRECTS** up power per 2-GOP -201, Reactor Plant Startup - MODE 2 to MODE 1*
2-GOP-201		**The following actions are taken from 2-GOP-201, Reactor Plant Startup – Mode 2 To Mode 1 AND RE guidance**	
4.8 Raising Reactor Power from 45% to 100%			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	1	
Event Description:	Raise Power to 50%					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**PERFORMS A Crew Brief**	***SRO*** *briefs the crew on the pending up power*
	SRO	**STEP 4.8.13 PLACE PSS in service as follows** A. PLACE POWER SYSTEM STABILIZER control switch in ON. B. VERIFY red PSS light is ON. C. RECORD time PSS placed in service in Narrative log. D. NOTIFY System Load Dispatch that the PSS has been placed in service. E. RECORD time System Load Dispatch is notified in narrative log. F. NOTIFY Unit 1 that the Unit 2 PSS is in service, reactive load should be adjusted as necessary	***SRO*** *will direct the* ***BOP*** *to the PSS in service*
	SRO	**SRO refers to the Reactor Engineering power change guidance for the up power**	***SRO EVALUATES*** *RE guidance and directs reactivity changes as directed in the letter*
	SRO	**SRO directs the ATC to setup a dilution per RE guidance and IAW 2-NOP-02.24**	***The ATC*** *begins a dilution IAW 2-NOP-02.24*
	SRO	**SRO directs BOP to setup the turbine for a up power at a rate as described in the RE guidance letter**	***The BOP*** *sets the Turbine up for an up power at the directed target and rate using the Hard Card*
	SRO	**SRO directs ATC to maintain ASI per prescribe guidance**	*The ATC maintain ASI per prescribe guidance*
At the Lead Evaluator's direction, PROCEED to Event 2.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	2	
Event Description:	**2B S/G PT-8023D fails high**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

T.S. 3.3.1	As a minimum, the reactor protective instrumentation channels and bypasses of Table 3.3-1 shall be OPERABLE. 6. Steam Generator Pressure – Low– Total Channels 4/SG Channels to TRIP 2/SG MIN OPERABLE 3/SG Action 2 –a. With the number of channels OPERABLE one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may continue provided the inoperable channel is placed in the bypassed or tripped condition within 1 hour. The channel shall be returned to OPERABLE status no later than during the next COLD SHUTDOWN.
T.S. 3.3.2	The Engineered Safety Features Actuation System (ESFAS) instrumentation channels and bypasses shown in Table 3.3-3 shall be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.3-4. ACTION b. With an ESFAS instrumentation channel inoperable, take the ACTION shown in Table 3.3-3. 4. MSIS b. Steam Generator Pressure – Low– Total Channels 4/SG Channels to TRIP 2/SG MIN OPERABLE 3/SG 8. AFAS a. SG 2A – SG 2B Diff Press– Total Channels 4/SG Channels to TRIP 2/SG MIN OPERABLE 3/SG

Note to Evaluator: 2B S/G PT-8023D Fails High is a malfunction initiated from the Booth upon direction by the evaluator.

Booth Operator Instructions:

- **Upon cue from Lead Examiner, trigger Event 2: 2B S/G PT-8023D Fails High**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications:

PI-8023D will indicate high scale on RTGB 203

MD RPS bistable for TM/LP will be in trip.

Annunciators:

H-4 TM/LP CHANNEL C SETPOINT HIGH/LOW

L-36 TM/LP CHANNEL TRIP

L-44 TM/LP CHANNEL PRE TRIP SG

EXAMINER: The SRO may announce Multiple Alarms to direct the crew to systematically evaluate the plant status.

	BOP/ATC		**Acknowledges** annunciators and **Communicates** IAW plant policies.
	BOP/ATC		**Diagnoses** PT-8023D has failed high; RPS bistable TMLP tripped and **Communicates** status IAW plant policies.

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	2	
Event Description:	**2B S/G PT-8023D fails high**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP		**Complies** with ARP's and **Communicates** and/or takes action as directed by ARP.
	SRO		**Directs** Power stabilization at current power level
	SRO		**Diagnoses, Interprets,** that PT-8023D has failed high, **Communicates** agreement with the ATCs diagnoses and **Directs** entry into 2-AOP-99.01 Loss of Tech Spec Instrumentation
	SRO		**Updates** crew and **Enters** 2-AOP-99.01, Loss of Tech Spec Instrumentation
	SRO		**Directs** actions of 2-AOP-99.01, Loss of Tech Spec Instrumentation
	SRO		**Notifies** SM of entry into 2-AOP-99.01, Loss of Tech Spec Instrumentation
2-AOP-99.01	**The following actions are taken from 2-AOP-99.01, Loss of Tech Spec Instrumentation**		
4.1 Immediate Operator Actions: NONE			
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
NOTE A TRANSMITTER failure can be discriminated from a METER failure by the presence of annunciators and protection and control actuations.			
	SRO	**1. CONFIRM** failed channel by any of the following methods: • Channel check comparison with redundant channels • Annunciators • Bistable or status lights • Any instrument-related testing or surveillance procedure in progress	***Interprets*** *the indications and determines the failure to be PT-8023D 2B Steam Generator Pressure Transmitter for MD channel*
NOTE BISTABLE TRIP UNIT is abbreviated as BTU in this AOP			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	2	
Event Description:	**2B S/G PT-8023D fails high**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**2**. IF entering this procedure to restore an affected channel, THEN GO TO Section 4.2.1, Step 7.	***N/A***
	SRO	**3**. Using Attachment 5, Channel Failure Impact Table, PERFORM the following: **A.** LOCATE table row for affected instrument or channel.	**Locates** correct table row for PT-8023D
	SRO	**3**. Using Attachment 5, Channel Failure Impact Table, PERFORM the following: **B**. REFER TO applicable Tech Specs.	***Refers to applicable Tech Specs 3.3.1 & 3.3.2***
	SRO	**3**. Using Attachment 5, Channel Failure Impact Table, PERFORM the following: **C**. PERFORM applicable procedure section for affected instrument.	***PERFORMs** section 4.2.10*
	SRO	**4**. Using Attachment 6, Instrumentation, for Tech Spec applicability.	***PERFORMs** Attachment 6, Instrumentation, for Tech Spec applicability.* ***DETERMINES** TS 3.3.1 & 3.3.2 are applicable*
4.2.10 S/G Pressure Channel Failure			

Channel Indicator (source device)	RPS Trip	ESFAS Trip	Other Functions	Tech Specs	AOP Section
Linear Power Range Safety NI MA/MB/MC/MD	HI POWER >107%/+9.61% (VHP) LOC PWR DEN (variable) (LPD) TM/LO PRESS	N/A	VHP, LPD, TM/LP CWPs LIN 1.15% Input to TM/LP setpt (ASI) Input to HI RATE/LOSS LOAD trip blocks	3.3.1 3.2.4	Section 4.2.5
Pressurizer Pressure PI-1102A/B/C/D	Pzr Press > 2370 psia TM/LO PRESS (TM/LP)	SIAS < 1736 psia	DSS > 2450 psia (ATWS)	3.3.1 3.3.2	Section 4.2.6
T-cold TI-1102A/B/C/D (TY-1112CA/CB/CC/CD TY-1122CA/CB/CC/CD)	N/A	N/A	Input to ΔT Power Input to TM/LP setpt (Q Pwr) Input to LPD CWP	3.3.1	Section 4.2.7
T-hot TI-1102A/B/C/D (TY-1112HA/HB/HC/HD TY-1122HA/HB/HC/HD)	N/A	N/A	Input to ΔT Power Input to TM/LP setpt (Q Pwr) Input to LPD CWP	3.3.1	Section 4.2.8
TM/LP Setpoint Generator PIA-1102A/B/C/D	N/A	N/A	Variable between 1900 and 2370 psia. Set to 2500 psia for ASGT	3.3.1	Section 4.2.9
S/G Pressure PI-8013A/B/C/D PI-8023A/B/C/D	S/G Press ≤ 626 psia (auct low) TM/LO PRES (ASGT >120 psid)	MSIS < 600 psia	Input to AFAS	3.3.1 3.3.2	Section 4.2.10

S/G Pressure PI-8013A/B/C/D PI-8023A/B/C/D	S/G Press ≤ 626 psia (auct low) TM/LO PRES (ASGT >120 psid)	MSIS < 600 psia	Input to AFAS	3.3.1 3.3.2	Section 4.2.10

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	2	
Event Description:	**2B S/G PT-8023D fails high**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**1. CIRCLE** affected instrument and channel: • PI-8013 A / B / C / D • PI-8023 A / B / C / D	***PERFORMs*** *section 4.2.10* *1. CIRCLE affected instrument and channel:* • *PI-8013 A / B / C / D* • *PI-8023 A / B / C / D*
		NOTE • Bypassing ESFAS BTUs will require door Key 114 and either Key 136. • Bypassing AFAS will require Key 202 and one of the following keys; 203, 206. • If it is necessary to TRIP the RPS and ESFAS bistable trip units (BTUs), then it is preferable to leave the AFAS BTUs in BYPASS. • (Section 6.1.3, Management Directive 1) • An AFAS channel in the TRIPPED condition is limited to 48 hours per Tech Spec 3.3.2 Table 3.3-3. (Section 6.1.3, Management Directive 1)	
	SRO	**2. PERFORM** one of the following for the affected BTUs listed: • LOW PRES SG (RPS) (Key 105) • TM/LO PRESS (RPS) (Key 107) • For PI-8013 OR PI-8023 AFAS-1 • For PI-8013 OR PI-8023 AFAS-2 • For PI-8013 only S/G 2A PRESS (MSIS) (Key 134) • For PI-8023 only S/G 2B PRESS (MSIS) (Key 136) **A. BYPASS** affected BTUs using keyswitches and pushbuttons. OR **B. TRIP** affected BTUs per Attachment 3, Tripping and Restoring Protection Bistables.	***SRO DIRECTS*** *the* ***BOP*** *to* ***BYPASS*** *the affected BTUs using keyswitches and pushbuttons for Channel C as follows;* • *LOW PRES SG (RPS) (Key 105)* • *TM/LO PRESS (RPS) (Key 107)* • *For PI-8023 AFAS-1* • *For PI-8023 AFAS-2* • *For PI-8023 only S/G 2B PRESS (MSIS) (Key 136)*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	2	
Event Description:	**2B S/G PT-8023D fails high**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	Using 2-AOP-99.01 Loss of Tech Spec Instrumentation section **4.2.10 S/G Pressure Channel Failure** Step 2. and direction from the Unit Supervisor BYPASS affected BTUs using keyswitches and pushbuttons	***PERFORMs*** *section 4.2.10 as directed by the SRO;* *Obtains keys, unlocks cabinets and inserts keys: 114&136 for ESFAS, 202&206 for AFAS and keys 105&107 for RPS.* ***BOP*** *relieves the ATC*
	ATC	Using 2-AOP-99.01 Loss of Tech Spec Instrumentation section **4.2.10 S/G Pressure Channel Failure** Step 2. and direction from the Unit Supervisor BYPASS affected BTUs using keyswitches and pushbuttons	***ATC PERFORMs*** *section 4.2.10 as directed by the Unit Supervisor;* *IVs inserted keys: 136 for ESFAS and rotates key to bypass MD MSIS, 202&206 for MD AFAS Door and bypass compartment and keys 105&107 for MD RPS.* ***ATC Reports*** *to SRO that the affected BTUs have been BYPASSED using keyswitches and pushbuttons* ***ATC relieves*** *the BOP*
4.2.1 General Actions:			
	SRO	**5. INITIATE** work request for affected instrument or channel and **NOTIFY** I&C or EM as applicable.	***PERFORMS*** *section 4.2.1 Step 4 NOTIFIES I&C or EM as applicable and Notifies the SM of the failure and the Tech Spec entry*
	SRO	**6. DOCUMENT** problem as required: • EOOS Log • Condition report • Ops narrative log	***PERFORMS*** *section 4.2.1 Step 5 and Documents issue as appropriate in:* • *EOOS Log* • *Condition report* • *Ops narrative log*
	SRO	**7.** WHEN ready to restore affected channel, THEN **PERFORM** Attachment 2, Restoration of Tripped or Bypassed • Instrumentation Channels	***IDENTIFIES*** *step as N/A*
	SRO	**8. VERIFY** Exit Conditions are met. **9. EXIT** this procedure.	***VERIFIES*** *Exit conditions are met by:* • *Applicable Tech Spec LCO action requirements have been implemented.* • *Affected channel has been bypassed as required by Tech Specs and exits 2-AOP-99.01*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	2	
Event Description:	**2B S/G PT-8023D fails high**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Performs Crew Brief**	***SRO PERFORMs*** *crew brief on status of failed instrument, the Tech Spec entry and Notifies the SM.*
At the Lead Evaluator's direction, PROCEED to Event 3.			

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	2	Event #	3	
Event Description:	**HVS-1C trips**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

T.S. 3.6.2.1	TWO CONTAINMENT SPRAY TRAINS AND TWO CONTAINMENT COOLING TRAINS SHALL BE OPERABLE. B. WITH ONE CONTAINMENT COOLING TRAIN INOPERABLE, RESTORE THE INOPERABLE COOLING TRAIN TO OPERABLE STATUS WITHIN 7 DAYS; OTHERWISE BE IN MODE 3 WITHIN THE NEXT 6 HOURS AND IN MODE 4 WITHIN THE FOLLOWING 6 HOURS.

Note to Evaluator: HVS-1C Containment Cooler Fan TRIPS is a malfunction initiated from the Booth upon direction by the evaluator.

Booth Operator Instructions:

- **Upon cue from Lead Examiner, trigger Event 3: HVS-1C Containment Cooler Fan TRIPS**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action**
- **If called as the SNPO to check breaker 2-42701, then after 5 minutes report the breaker is tripped**
- **If called as the SNPO to check breaker 2-40506, then after 5 minutes report the breaker is tripped**
- **If called as EM to check above breakers, after 30 minutes report that the breaker 2-42701 needs to pulled and inspected and request an ECO**

Indications:
Lights for HVS-2A breaker/ fan extinguish
Annunciators: T-12

	BOP/ATC		**Acknowledges** annunciators and **Communicates** IAW plant policies
	BOP/ATC		**Diagnoses** that HVS-1C Containment Cooler Fan tripped **Communicates** status IAW plant policies
	BOP		**Complies** with ARPs for …and Communicates and/or takes action as directed by ARP
	SRO		**Diagnoses, Interprets,** that HVS-1C Containment Cooler Fan tripped **Communicates** agreement with the ATCs diagnoses and **Directs** entry into 2-AOP-25.01 Loss of RCB Cooling Fans **Directs** the starting of the standby fan cooler
	SRO		**Updates** crew and **Enters** AOP-25.01 Loss of RCB Cooling Fans
	SRO		**Directs** actions of AOP-25.01 Loss of RCB Cooling Fans

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	3	
Event Description:	**HVS-1C trips**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO		**Notifies** SM of entry into AOP-25.01 Loss of RCB Cooling Fans
2-ARP-01-T12		**The following actions are taken from 2-AOP-01-T12, Control Room Panel T HVCB**	
	BOP	**ALARM CONFIRMATION** 1. HVS-1C indicating lights OFF indicates either the control power fuse is blown or either of the following breakers are open 2-42701 2-40506	***BOP EVALUATES*** *HVS-1C indications and determines the indicating lights to be off*
	BOP/SRO	**OPERATOR ACTIONS** 2. **GO TO** 2-AOP-25.01, Loss of RCB Cooling Fans.	***BOP EVALUATES*** *HVS-1C indications and determines the fan to be tripped* ***BOP INFORMS*** *the SRO that the ARP directs entry into 2-AOP-25.01, Loss of RCB Cooling*
	SRO		Announces and enters 2-AOP-25.01, Loss of RCB Cooling Fans
	SRO		Directs actions of 2-AOP-25.01, Loss of RCB Cooling Fans
2-AOP-25.01		**The following actions are taken from 2-AOP-25.01, Loss of RCB Cooling Fans**	
4.1 Immediate Operator Actions: NONE			
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
	SRO	**1. PERFORM** applicable section per Table 1	***SRO EVALUATES*** *Table 1 and DETERMINES that section 4.2.5 Loss of Containment Fan Cooler is applicable*
4.2.5 Loss of Containment Fan Cooler:			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	3	
Event Description:	**HVS-1C trips**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		CAUTION **• HVS-1B should only be operated to perform the monthly surveillance to minimize run time until SL2-23 per AR 2078105,U2 HVS-1B Motor Bearing Lubrication Issue.** **• Sufficient Containment Fan Coolers are required to be operating to maintain Containment air temperature less than or equal to 120°F to maintain the reactor vessel support structure within its design basis. On loss of Containment Fan Coolers, operator action is required within 45 minutes from the time Containment air temperature exceeds 120°F to restore air temperature to less than or equal to 120°F OR initiate reactor trip and cooldown to at least Hot Shutdown. The total time allowed from the time Containment air temperature exceeds 120°F to reaching Hot Shutdown is 5 hours. (Section 6.2, Commitment 1, Section 6.2, Commitment 2)**	
	SRO	**1. START** standby Containment Fan Cooler: • HVS-1A • HVS-1B • HVS-1C • HVS-1D	***SRO DIRECTS*** *the SNPO to start the standby Containment Fan Cooler* ***BOP STARTS*** *the standby Containment Fan Cooler*
	SRO	**2. MONITOR** Containment air temperature less than or equal to120°F as average of following (RTGB-206): • TI-07-3A, TEMPERATURE • UR-07-1B, CNTMT & SUMP PRESS/TEMP Channel 1, TE-07-3B,CNTMT AIR TEMP	***SRO DIRECTS*** *the SNPO to* ***MONITOR*** *Containment air temperature less than or equal to120°F as average of following (RTGB-206):* • *TI-07-3A, TEMPERATURE* • *UR-07-1B, CNTMT & SUMP PRESS/TEMP Channel 1, TE-07-3B,CNTMT AIR TEMP*
	SRO	**3. VERIFY** Attachment 4, Containment Cooling Fan Local Breaker Operations, performed.	***SRO DIRECTS*** *the SNPO to perform Attachment 4*
ATTACHMENT 4			
	SRO	**1. VERIFY** electrical alignment of stopped Containment Fan Cooler as follows: • Bkr 2-40506, FDR BKR FOR MCC-2B9 2HVS-1C, CLOSED. • Bkr 2-42701, CONTAINMENT FAN COOLER 2HVS-1C, CLOSED. (Cubicle 1A, MCC-2B9)	***SRO DIRECTS*** *the SNPO to inspect the following breaker for status and indication* • *Bkr 2-40506, FDR BKR FOR MCC-2B9 2HVS-1C, CLOSED.* • *Bkr 2-42701, CONTAINMENT FAN COOLER 2HVS-1C, CLOSED. (Cubicle 1A, MCC-2B9)* *then after 5 minutes report that both breakers are tripped*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	3	
Event Description:	**HVS-1C trips**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**2. TROUBLESHOOT** stopped Containment Fan Cooler's 480 V load center breaker and fuses per 0-NOP-47.02, 480V Load Center Breaker Operation.	***SRO DIRECTS*** *480 V load center breaker and fuses per 0-NOP-47.02, 480V Load Center Breaker Operation be implemented*
	SRO	**3. ENSURE** fuses of stopped Containment Fan Cooler are checked and • Replaced as necessary	***SRO DIRECTS electrical*** *to inspect the fuses for HVS-1C and replace as necessary*
	SRO	**4. NOTIFY** Control Room of breaker status.	***SRO DIRECTS*** *the SNPO to Control Room of breaker status*
	SRO	**4.** IF breaker is tripped, THEN **IMPLEMENT** 0-NOP-99.05, Valve, Breaker, Motor and Instrument Instructions	***SRO IMPLEMENTS 0****-NOP-99.05, Valve, Breaker, Motor and Instrument Instructions*
4.2.5 Loss of Containment Fan Cooler:			
	SRO	**4. VERIFY** tripped Containment Fan Cooler OPERABLE	***SRO IDENTIFIES*** *HVS-1C is inoperable,* ***Notifies*** *the SM and* ***REVIEWS*** *Tech Specs 3.6.2.1, Containment Spray and Cooling Systems.*
	SRO	**5.** WHEN Section 3.0, EXIT CONDITIONS, are met, THEN **EXIT** this procedure	***SRO RECOGNIZES the*** *Containment Fan Cooler is not restored to normal operation and remains in the AOP*
	SRO	**Performs** Crew Brief	***SRO PERFORMs*** *crew brief on status of failed Component, the Tech Spec entry and Notifies the SM*
At the Lead Evaluator's direction, PROCEED to Event 4.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	4	
Event Description:	**LIC 2110 L/D flow controller fails to Minimum flow in auto**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
Note to Evaluator: LIC 2110 Letdown flow control Auto output fails Minimum is a malfunction initiated from the Booth upon direction by the evaluator.			
Booth Operator Instructions: • **Upon cue from Lead Examiner, trigger Event 4: LIC 2110 Letdown flow control Auto output fails Minimum** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**			
Indications: Letdown flow goes high and Pressurizer Level slowly lowers **Annunciators:**			
	ATC		Identifies controller issue with LIC-2110 and recommends taking manual control
	SRO		Directs the ATC to take manual control of LIC-2110
	BOP		Acknowledge annunciators and communicates status IAW plant policies
	ATC		Evaluates plant for being stable
	BOP		Pulls ARPs and communicates/takes action as directed
	SRO		Announces and enters 2-AOP-02.03, Charging And Letdown
	SRO		Directs actions of 2-AOP-02.03, Charging And Letdown
2-AOP-02.03		**The following actions are taken from 2-AOP-02.03, Charging And Letdown**	
4.1 Immediate Operator Actions: None applicable			
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
	SRO	**1.** IF charging and letdown flow has been lost, THEN, **PERFORM** the following:	*Step is not applicable*
	SRO	**2. VERIFY** all applicable automatic actions have occurred. Attachment 1, Charging and Letdown Automatic Responses, contains a listing of expected automatic action	*Step is not applicable*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	4	
Event Description:	**LIC 2110 L/D flow controller fails to Minimum flow in auto**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**3 .** IF charging and letdown flow has been lost, **THEN DETERMINE** the cause	*Step is not applicable*
	SRO	**4.** IF a charging system leak has occurred, THEN **ISOLATE** the leak and refer to applicable Technical Specifications for guidance	*Step is not applicable*
	SRO	**5. PERFORM** applicable section per Table	***SRO EVALUATES** the indications determines the failure to be LIC-2110 failed and proceeds to section 4.2.6*
4.2.6 General Actions: Letdown Level Control Malfunction			
	SRO	**1.** IF letdown level control is malfunctioning, THEN **PERFORM** the following: **VERIFY** the output of LIC-2110, LETDOWN LEVEL, is responding as expected to current plant conditions	***SRO VERIFIES** that the ATC has PLACED LIC-2110 in manual and is controlling Pressurizer Level* ***SRO DIRECTS** system walk downs observing for leaks or lifting relief valves*
	SRO	**SRO VERIFIES** Normal Charging and Letdown parameters are established with pressurizer level stable	***SRO Exits this procedure***
	SRO	**PERFORMS CREW BRIEF**	
At the Lead Evaluator's direction, PROCEED to Event 5.			

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
Note to Evaluator: FCV-9011 2A Main Feed Reg valve fails open is a malfunction initiated from the Booth upon direction by the evaluator. The ESD in Containment and the 2B3 4.16kv L/O are triggered upon either RX trip push buttons being pressed; the steam leak is located on 2A Main Steam Line using Leak Valve LV1 with a 2400 sec ramp.			
Booth Operator Instructions: • **Upon cue from Lead Examiner, trigger Event 5: 2A Main Feed Reg valve fails open requiring RX trip** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**			
Indications: 2A S/G level rising **Annunciators:** **Multiple**			
	ATC		Identifies 2A S/G level rising and attempts manual control, of S/G 2A level.
	SRO		Directs the ATC to take manual control of 2A S/G Main Feed Reg valve
	BOP		Acknowledge annunciators and communicates status IAW plant policies
	SRO		**DIRECTS** Reactor trip when S/G levels approach 80%
	ATC		Trips the Reactor
	ATC		**CONFIRMS** reactor power is lowering and startup rate is negative **REPORTS "REACTOR TRIPPED"** **States evaluating CEAs or that 2 CEAs not fully inserted CEAs**
	ATC		Performs Scan of RTGBs to quickly assess the plant status by systematically reviewing key safety parameters/system conditions of the control boards.
	BOP		**VERIFIES** all governor and throttle valves closed **REPORTS "Turbine Tripped"**
	BOP		**ANNOUNCE** on the Gaitronics: Unit 2 Reactor has tripped **NOTIFY** the NPO to perform Appendix X, Section 1 of 2-EOP-99 **CONTACT** the SM, STA and Shift Comm. to report to the Control Room
	SRO		Performs Scan of RTGBs to quickly assess the plant status by systematically reviewing key safety parameters/system conditions of the control boards.

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC		**REPORTS "2 CEAs not fully INSERTED" if not reported previously**
	SRO		**DIRECTS ATC** to start remaining Charging Pumps as necessary
	SRO		**DIRECTS** Implementation Of EOP-01, Standard Post Trip Actions
2-EOP-01		**The following actions are taken from 2-EOP-01, Standard Post Trip Actions**	
4.1 Immediate Operator Actions: • **ATC: Verifies Reactor power lowering, Negative Startup rate, all CEAs and verifies no dilution is in progress inserted and communicates status to the Unit Supervisor. Starts backup charging pumps as necessary.** • **BOP: Verifies all governor and throttle valves closed and communicates status to the Unit Supervisor. Makes plant announcements and trip notifications.**			
4.0 Operator Actions:			
	SRO	**Step 1 VERIFY reactor trip:**	***SRO DIRECTS*** *VERIFY reactor trip, ATC Verifies:* ☐ *Reactor power LOWERING* ☐ *Startup Rate NEGATIVE* ☐ *All CEAs are fully INSERTED* ***Two CEAs will not be inserted in the core requiring Emergency Boration see Event 6*** ☐ *NO dilution is in progress*
	SRO	**Step 2 VERIFY turbine trip:**	***SRO DIRECTS VERIFY*** *turbine trip, BOP Verifies:* ☐ *All governor and throttle valves CLOSED.* ☐ *Main Generator breakers are OPEN* ***FB-2 Exciter Field Breaker will be closed see Event 7*** ☐ *Turbine speed LOWERING*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 3 VERIFY Maintenance of Vital Auxiliaries:**	***SRO DIRECTS VERIFY*** *Maintenance of Vital Auxiliaries, BOP Verifies:* ☐ *VERIFY station loads transferred to offsite electrical power* ☐ *VERIFY all Vital and Non-Vital AC buses transfer from Auxiliary to Start-up Transformers AND are ENERGIZED* ***The 2B3 4160 bus will be Locked Out and non-recoverable.*** ☐ *VERIFY all Vital and Non Vital DC Buses are ENERGIZED* ☐ *VERIFY seal cooling to RCPs:*
	SRO	**Step 4 VERIFY RCS Inventory Control:**	***SRO DIRECTS VERIFY*** *RCS Inventory Control, ATC Verifies:* ☐ *Pressurizer level is between 10 and 68%* ☐ *Pressurizer level is trending to between 30 and 35%* **Pressurizer level will be abnormally low due to the Steam leak. This parameter will drive the crew to enter 2-EOP-05**
	SRO	**Step 5 VERIFY RCS Pressure Control:**	***SRO DIRECTS VERIFY*** *RCS Pressure Control, ATC Verifies:* ☐ *Pressurizer pressure is between 1800 and 2300 psia* ☐ *Pressurizer pressure is trending to between 2225 and 2275 psia* **RCS Pressure will be abnormally low due to the Steam leak. This parameter will drive the crew to enter 2-EOP-05** **IF SIAS** has occurred the **SRO** will **DIRECT** two RCPs to be tripped and will not perform 2-EOP-99 App.J to restore CCW to the RCPs due to the loss of 2B CCW pump
	SRO	**Step 6 VERIFY Core Heat Removal:**	***SRO DIRECTS VERIFY*** *Core Heat Removal, ATC Verifies:* ☐ *At least one RCP is RUNNING and all RUNNING RCPs are supplied with CCW* ☐ *Loop ΔT is less than 10°F* ☐ *RCS subcooling greater than or equal to 20°F* ☐ *NO indication of RCP cavitation*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 7 VERIFY RCS Heat Removal:**	***SRO DIRECTS*** *VERIFY RCS Heat Removal, ATC Verifies:* ☐ *VERIFY the following conditions exist on at least one S/G:* • *S/G NR level is between 20 and 81%* • *Feedwater is being supplied* ☐ *IF 2A or 2B AFW Pump is the ONLY source of Feedwater, THEN STOP one RCP in each loop* ☐ *VERIFY at least ONE of the following is supplying feedwater to the S/G(s):* • *Main or Auxiliary Feedwater* ☐ *VERIFY RCS TAVG is between 525 and 535°F* ***RCS Temperature will be abnormally low due to the Steam leak. This parameter will drive the crew to enter 2-EOP-05*** ☐ *VERIFY S/G pressure is between 850 and 930 psia (835 and 915 psig)*
	SRO	**Step 8 VERIFY containment conditions:**	***SRO DIRECTS*** *VERIFY* containment conditions, *BOP Verifies:* ☐ *Containment pressure is less than 2 psig* ***Containment Pressure will be abnormally high due to the Steam leak. This parameter will drive the crew to enter 2-EOP-05*** ☐ *Containment temperature is less than 120°F* ***Containment Temperature will be abnormally high due to the Steam leak. This parameter will drive the crew to enter 2-EOP-05*** ***BOP RECOGNIZES*** *Containment temperature is high and evaluates the status of the Containment Cooling Fans* ☐ *Containment radiation level less than alarm values AND stable or lowering:* • *CIS Radiation Monitors* • *Containment Atmospheric Monitors* ☐ *Secondary plant radiation levels less than alarm values AND stable or lowering:* • *Condenser Air Ejector Monitor* • *S/G Blowdown Monitors* • *Main Steamline Monitors*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 9 DIRECT a field operator to perform the following:**	***SRO DIRECTS BOP*** *to perform step 9, BOP performs step 9:* ☐ *Directs NPO to perform Section 1 of Appendix X, Secondary Plant Post Trip Actions* ☐ *Directs SNPO to VERIFY SFP inventory and temperature are normal on all available indications*
	SRO	**Step 10 DIAGNOSE the event using Attachment 1, Diagnostic Flow Chart.**	***SRO DIAGNOSE*** *the event using Attachment 1, Diagnostic Flow Chart and determines an ESD is in progress*
	SRO	**Step 11 GO TO the appropriate Emergency Operating Procedure.**	***SRO Performs*** *a crew brief and transitions to 2-EOP-5 ESD*

Booth Operator Instructions:

- **None**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications:

Tcold lowering rapidly, S/G pressure lowering rapidly, Containment pressure rising, Pressurizer pressure and level lowering Annunciators: Multiple

2-EOP-05 **The following actions are taken from 2-EOP-05, EXCESS STEAM DEMAND ESD**

CAUTION

A harsh containment condition exists if containment temperature is greater than 200°F. Figure 1A should be used for determination of subcooling when indicated containment temperature is **less** than or **equal** to 200°F. Figure 1B should be used when indicated containment temperature is **greater** than 200°F. Figure 1A should also be used if containment temperature had exceeded 200°F during event progression but was lowered to 200°F or less by containment cooling systems.

NOTE

☐ Instruments should be channel checked when one or more confirmatory indications are available. Reg Guide 1.97 designated instruments should be used for diagnosis of events and confirmation of safety functions.

☐ Steps designated with an * may be performed non-sequentially or are to be performed continuously.

4.0 Operator Actions:

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**1. MONITOR** the SFSCs and **VERIFY** the SFSC acceptance criteria are MET every 15 minutes	*The **SRO DIRECTS** the STA to perform SFSCs now and every fifteen minutes*
	SRO	**2. IMPLEMENT** the Emergency Plan	*The **SRO DIRECTS** the SM to **IMPLEMENT** the Emergency Plan*
	SRO	**3. IMPLEMENT** placekeeper	*The **SRO Pulls** the **Place Keeper** from the back of 2-EOP-05 and begins tracking progress on the place keeper*
EXAMINER: The implementation of the following step "Sampling Steam Generators" is located after Event 8 in the APPENDIX section			
	SRO	**4. SAMPLE** steam generators for activity per Appendix A, Sampling Steam Generators	*The **SRO DIRECTS** the BOP to **PERFORM** Appendix A of 2-EOP-99, Sampling Steam Generators*
	SRO	**5. VERIFY** SIAS is ACTUATED	***This is a continuous step and will be performed after SIAS actuation conditions are met*** ***SRO VERIFIES** SIAS actuated when either of the following conditions are met:* *• Pressurizer pressure is less than 1736 psia* *• Containment Pressure is greater than 3.5 psig*
NOTE **Per Flowserve Engineering evaluation, during an emergency, the High Pressure Safety Injection pumps can be operated for up to 24 hours with no Component Cooling Water supplied to the seal heat exchangers without resulting in a significant increase in seal leakage.**			
	SRO	**6. OPTIMIZE** SI as follows: **A. VERIFY** SIAS is ACTUATED **B. VERIFY** all available SI pumps are RUNNING **C. VERIFY** SI flow within Figure 2, Safety Injection Flow vs. RCS Pressure **D. VERIFY** all available charging pumps are RUNNING	***SRO VERIFIES:*** *• SIAS is ACTUATED* *• SI pumps are OPERATING* *• SI flow within Figure 2, Safety Injection Flow vs. RCS Pressure* *• All available charging pumps are RUNNING* *• Charging header is available*
	SRO	**7. CLOSE** the following valves: ☐MSIVs ☐MFIVs	***SRO DIRECTS** the BOP to CLOSE* *☐MSIVs* *☐MFIVs*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**8.** IF S/G pressure is less than 600 psia (585 psig), or Containment pressure is greater than 3.5 psig, THEN **VERIFY** MSIS is ACTUATED	*The **SRO DIRECTS** the BOP to **VERIFY** MSIS is ACTUATED*
	SRO	**9. IMPLEMENT** RCP trip strategy as follows: **A. VERIFY** pressurizer pressure is less than 1736 psia **B. ENSURE** ONE RCP in each loop is STOPPED **C. VERIFY** RCS subcooling is greater than minimum RCS subcooling	***SRO IMPLEMENTS** RCP Trip Strategy – Securing 1 RCP due to RCS temperature being less than 500F*
EXAMINER: The crew should not restore CCW to the RCPs due to the loss of a safety related AC bus however, the implementation of the following step "Restore CCW to the RCPs" is located after Event 8 in the APPENDIX section			
	SRO	**10. VERIFY** RCP seal cooling as follows: **A. VERIFY** CCW to the RCPs **B.** IF both of the following conditions exist: • RCPs have CCW flow • CIAS has isolated the normal RCP bleed off flow path to the VCT THEN **ESTABLISH** the alternate RCP bleedoff flow path to the quench tank by OPENING V2507, RCP Bleed off Relief Stop Vlv	***SRO RECOGNIZES due to the loss of a safety related AC bus they will not restore CCW to the RCPs*** ***DIRECTS** the BOP to Restore CCW to the RCPs per Appendix J of 2-EOP-99:* ***The BOP** restores CCW to the RCPs with Appendix J of 2-EOP-99* *If not previously completed*
	SRO	**11. CHECK** if RCPs are operating within limits: **A. VERIFY** at least one RCP is OPERATING **B.** For all operating RCPs, **VERIFY** RCP operating limits are MET per Table 13, RCP Operating Limits	***SRO DIRECTS ATC to VERIFY** operating limits are MET per Table 13, RCP Operating Limits for any running RCPs* ***The ATC VERIFIES** operating limits are MET per Table 13, RCP Operating Limits for any running RCPs*
	SRO	**12. VERIFY** circulating water flow to the Main Condenser	***SRO VERIFIES** circulating water flow to the main condenser*
	SRO	**13. STABILIZE** the secondary plant per Appendix X, Secondary Plant Post Trip Actions, Section 2	***SRO DIRECTS** the BOP to Perform Appendix X, Secondary Plant Post Trip Actions, Section 2 as time permits* ***The BOP PERFORMS** Appendix X, Secondary Plant Post Trip Actions, Section 2 as time permits*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**14. DETERMINE** the most affected S/G by evaluating the following indications: ☐High steam flow from one S/G ☐Dropping S/G pressure ☐Dropping S/G level ☐Dropping RCS TCOLD	***SRO EVALUATES*** *plant conditions and* ***DETERMINES*** *the 2A S/G is the most affected*
	SRO	**15. ISOLATE** the most affected S/G as follows: **A. VERIFY** break flow is still in PROGRESS **B. ISOLATE** the most affected S/G per Appendix R, Steam Generator Isolation	***SRO EVALUATES*** *plant conditions and DETERMINES the 2A S/G is the most affected and* ***DIRECTS*** *the* ***BOP*** *to ISOLATE the 2A S/G IAW Appendix R, Steam Generator Isolation section 1*
Indications: When directed to Isolate the 2A S/G **Annunciators: NONE**			
2-EOP-99 APP "R"		**The following actions are for Isolating Steam Generator 2A Using 2-EOP-99, APPENDIX "R" Section 1**	
	BOP	**1. ENSURE** HCV-08-1A, Main Steam Header 'A' Isolation Valve (MSIV), is CLOSED.	BOP **ENSURES HCV-08-1A, Main Steam Header 'A' Isolation Valve (MSIV), is CLOSED**
	BOP	**3. ENSURE** MV-08-1A, MSIV Header 'A' Bypass Valve, is CLOSED**.**	***BOP ENSURES MV-08-1A, MSIV Header 'A' Bypass Valve, is CLOSED***
	BOP	**4. ENSURE** HCV-09-1A, Main Feedwater Header 'A' Isolation Valve, is CLOSED.	***BOP ENSURES HCV-09-1A, Main Feedwater Header 'A' Isolation Valve, is CLOSED.***
	BOP	**5. ENSURE** HCV-09-1B, Main Feedwater Header 'A' Isolation Valve, is CLOSED.	***BOP ENSURES ENSURE HCV-09-1B, Main Feedwater Header 'A' Isolation Valve, is CLOSED.*** *Step 6.If BOTH HCV-09-1A and HCV-09-1B, Main Feedwater Isolation Valves to S/G 2A, are NOT CLOSED or suspected of leaking,* *Then PERFORM ANY of the following AS NECESSARY:* *☐ A. ENSURE ALL of the following valves are CLOSED:* *☐ MV09-5, Stm Gen 2A Reg Block Valve* *☐ LCV9005, 2A 15% Bypass* *☐ MV09-3, 2A 100% Bypass* *☐ B. STOP BOTH Main Feedwater Pumps*
	BOP	**7. ENSURE** FCV-23-3, 2A SG Blowdown, is CLOSED.	***BOP ENSURES*** *FCV-23-3, 2A SG Blowdown, is CLOSED*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**8. ENSURE** FCV-23-4, 2A SG Blowdown, is CLOSED.	***BOP ENSURES*** *FCV-23-4, 2A SG Blowdown, is CLOSED*
	BOP	**9. ENSURE** MV-08-18A, 2A S/G Atmos Dump Vlv, is CLOSED.	***BOP ENSURES*** *MV-08-18A, 2A S/G Atmos Dump Vlv, is CLOSED* ***BOP RECOGNIZES*** *MV-08-18A, 2A is failed open and reports the condition to the SRO*
	BOP	**10. CLOSE** MV-08-14, 2A S/G ADV Isol. (Key 79)	***BOP ENSURES*** *MV-08-14, 2A S/G ADV Isol. (Key 79) CLOSED* *IF not closed by ATC the BOP closes MV-08-14*
	BOP	**11. PLACE** the control switch for auxiliary feed, Pump 2A, in STOP.	***BOP ENSURES*** *the control switch for auxiliary feed, Pump 2A, is PLACED in STOP*
	BOP	**12. ENSURE** MV-09-9, Pump 2A Disch to SG 2A Valve, is CLOSED.	***BOP ENSURES*** *MV-09-9, Pump 2A Disch to SG 2A Valve, is CLOSED*
	BOP	**13. ENSURE** MV-09-11, Pump 2C Disch to SG 2A Valve, is CLOSED.	***BOP ENSURES*** *MV-09-11, Pump 2C Disch to SG 2A Valve, is CLOSED*
	BOP	**14. PLACE** MV-08-13, SG 2A Stm to AFW PP 2C, in CLOSE.	***BOP PLACES*** *MV-08-13, SG 2A Stm to AFW PP 2C, in CLOSE.* STEP 15 If MV-08-13, S/G 2A Steam to AFW Pump 2C, is NOT CLOSED or suspected of leaking, AND feed flow from 2C AFW pump is NOT required, Then CLOSE MV 08-3, 2C Pump to ISOLATE steam to 2C AFW Pump. (Key 78)
	BOP	**16. ENSURE** MV-08-19A, 2A S/G Atmos Dump Vlv, is CLOSED.	***BOP ENSURES*** *MV-08-19A, 2A S/G Atmos Dump Vlv, is CLOSED*
	BOP	**17. CLOSE** MV-08-15, 2A S/G ADV Isol. (Key 80)	***BOP*** *ENSURES MV-08-15, 2A S/G ADV Isol. (Key 80) CLOSED*
	BOP	**18.** If a SGTR is in progress, **Then NOTIFY** the SM that Control Room steps to isolate the affected S/G are complete for E-Plan purposes.	***BOP NOTIFIES*** *the SRO that the control room steps for isolating the 2A S/G are complete*
	BOP	**19. PERFORM** the following LOCAL operations:	***BOP DIRECTS*** *the field operator action to isolate the 2A S/G*
The Scenario can be terminated after the control room actions for 2A SG isolation are complete.			
2-EOP-05		**The following actions are taken from 2-EOP-05, EXCESS STEAM DEMAND ESD**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**16. VERIFY** the most affected S/G is isolated by evaluating the following: ☐S/G pressures ☐S/G levels ☐RCS TCOLD	***SRO EVALUATES*** *plant conditions and* ***DETERMINES*** *the 2A S/G was the most affected S/G and it is now isolated*
	SRO	**17. STABILIZE** RCS temperature within the limits of Figure 1A or 1B, RCS Pressure Temperature, as follows: **A. STEAM** the least affected S/G using the ADV. **A.1 STEAM** using 2C AFW Pump and alternate steaming flowpaths **1. REFER TO** Table 12, Alternate S/G Heat Removal paths **B. CONTROL** feedwater flow to the least affected S/G **C. STABILIZE** RCS temperature within the limits of Figure 1A or 1B, RCS Pressure Temperature **D.** IF both of the following conditions are met, ☐**NO** RCPs are RUNNING ☐The limits of Figure 1A or 1B, RCS Pressure Temperature, were exceeded THEN **PERFORM** both of the following: **(1) RECORD** the time, temperature and pressure when control of RCS temperature was regained **(2) MAINTAIN** RCS Pressure and Temperature stable for a minimum of two hours	***SRO DIRECTS the ATC to STABILIZE*** *RCS temperature within the limits of Figure 1A or 1B, RCS Pressure Temperature, by* ***STEAMING*** *the least affected S/G using the ADVs* *When plant indications present that the 2A S/G has reached dryout conditions (RCS temperature rises), the ATC will stabilize temperature by fully opening both ADVs on the 2A S/G, then adjusting the setpoint for the lowest Tc observed, and placing the controllers in automatic*
	SRO	**18.** IF a LOOP has occurred, THEN **PERFORM** both of the following to restore Instrument Air: **A. ENSURE** 2AB 480V Load Center is aligned to an energized bus **B**. **DISPATCH** an operator to restore Instrument Air per Appendix H, Operation of the 2A and 2B Instrument Air Compressors	***SRO EVALUATES*** *step and Determines it is not applicable*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**19. CHECK** if HPSI throttle criteria are MET: **A. VERIFY** at least ONE HPSI pump is OPERATING. **B. VERIFY** all of the following HPSI throttle criteria are MET: • RCS subcooling is greater than or equal to minimum subcooling • Pressurizer level is greater than 30% and stable or rising • At least one S/G is available for RCS heat removal with level being restored to OR maintained between 60 and 70% NR • Rx Vessel level indicates sensors 4 through 8 are covered, or **NO** abnormal differences (greater than 20°F) between Thot and Rep CET temperature **C. THROTTLE** SI flow per Appendix S, Safety Injection Throttling and Restoration	***SRO EVALUATES*** *step and Determines takes actions as plant conditions warrant*
	SRO	**20. CHECK** HPSI pump restart criteria: **A. VERIFY** HPSI throttle criteria are being maintained	***SRO EVALUATES*** *step and Determines it is not required*
	SRO	**21. CHECK** LPSI pump stop criteria: **A. VERIFY** pressurizer pressure is greater than 250 psia and CONTROLLED **A.1 GO TO** Section 4.0, Step 22 **B. STOP** the LPSI pumps **C. CLOSE** the LPSI injection valves **D. PLACE** the LPSI Pump handswitches in AUTO	***SRO EVALUATES*** *step and Determines takes actions as plant conditions warrant*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	5	
Event Description:	**2A Main Feed Reg valve fails open, RX trip, ESD in Contmnt on the 2A S/G and 2B3 4.16kv bus Lock Out**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**22. CHECK** LPSI pump restart criteria: **A. VERIFY** both LPSI pumps are STOPPED **B. VERIFY** pressurizer pressure is less than 250 psia **C. VERIFY** RAS has **NOT** ACTUATED **D. START** LPSI pumps as necessary **E. OPEN** the LPSI injection valves	***SRO EVALUATES*** *step and Determines takes actions as plant conditions warrant*
	SRO/ATC	**23. ENSURE** at least one S/G has level being restored to or maintained between 60 and 70% NR with main or auxiliary feedwater	***SRO DIRECTS*** *the* ***ATC*** *to ENSURE at least one S/G has level being restored to or maintained between 60 and 70% NR with main or auxiliary feedwater* ***The ATC*** *will ENSURE at least one S/G has level being restored to or maintained between 60 and 70% NR with main or auxiliary feedwater*
	SRO	**24. MAINTAIN** RCS within Figure 1A or 1B, RCS Pressure Temperature, as follows: **A. OPERATE** main or auxiliary pressurizer sprays **B. VERIFY** HPSI throttle criteria are MET **C.** IF in service, THEN **CONTROL** letdown **D. THROTTLE** SI flow as necessary per Appendix S, Safety Injection Throttling and Restoration **E. VERIFY** RCS is within Figure 1A or 1B, RCS Pressure Temperature	***SRO DIRECTS*** *the ATC to MAINTAIN RCS within Figure 1A or 1B, RCS* ***The ATC*** *will MAINTAIN RCS within Figure 1A or 1B, RCS*
The Scenario can be terminated after the control room actions for 2A SG isolation are complete.			
Proceed to Event 6.			

Appendix D			Operator Action					Form ES-D-2
Op Test No.:	L-19-1		Scenario #	2	Event #	6		
Event Description:	**On trip 2 CEAs remain out of core**							
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior					

CT-1	INITIATE EMERGENCY BORATION TO SHUTDOWN THE REACTOR WHEN REQUIRED- IF ANY CEA IS NOT FULLY INSERTED, AND THEN THE CREW INITIATES EMERGENCY BORATION TO ACHIEVE SDM DURING VERIFICATION OF REACTOR TRIP AND BEFORE EXITING 2- EOP-01.

Note to Evaluator: On trip 2 CEAs remain out of core is an auto trigger upon either RX trip push buttons being pressed.

Booth Operator Instructions:

- **On trip 2 CEAs remain out of core is an auto trigger, no booth operator action required.**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications: CEAs not inserted in the core post trip

Annunciators: Multiple

2-AOP-02.02 **The following actions are taken from 2-AOP-02.02, Emergency Boration**

4.1 Immediate Operator Actions: NONE

NOTE

This Procedure may contain steps that could adversely affect reactivity. Proper consideration and appropriate briefings shall occur prior to performance of steps that could challenge reactivity.

The following information is posted as an Operator Aid at RTGB-205 Panel "M". Any revision to this section of the procedure shall verify the validity of the Operator Aid and, if changes are necessary, an assignment to Ops Support Labeling Specialist to update and install revised Operator Aids must be initiated to incorporate these changes on a new Operator Aid placard.

4.2 Subsequent Operator Actions

	ATC	**1. VERIFY** at least one charging pump is running with control switch in START	***ATC VERIFIES*** *at least one charging pump is running with control switch in START*

NOTE

The MAKEUP MODE SELECTOR switch is required to be in MANUAL prior to switching the Boric Acid Pump control switches to preclude pump breaker trips

	ATC	**1. VERIFY** at least one charging pump is running with control switch in START	***ATC VERIFIES*** *at least one charging pump is running with control switch in START*
	ATC	**2. VERIFY** the MAKEUP MODE SELECTOR switch is in MANUAL	***ATC VERIFIES*** *the MAKEUP MODE SELECTOR switch is in MANUAL*

Appendix D			Operator Action						Form ES-D-2
Op Test No.:	L-19-1		Scenario #	2	Event #	6			
Event Description:		**On trip 2 CEAs remain out of core**							
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior						

	ATC	**3. ENSURE** V2525, BORON LOAD CONTROL VALVE is CLOSED	***ATC ENSURES*** *V2525, BORON LOAD CONTROL VALVE is CLOSED*
NOTE Both Boric Acid Pumps are required to be placed in service when the combined Boric Acid Makeup Tank volumes are being credited as a borated water source. Otherwise, the pump associated with the Boric Acid Makeup Tank being credited as the borated water source should be started.			
	ATC	**4. PERFORM** the following to Emergency Borate using V2514, EMERGENCY BORATE: **A. START** at least one of the following: • 2A (BORIC ACID PUMP) • 2B (BORIC ACID PUMP) **B.** IF 2A BORIC ACID PUMP was started, THEN **CLOSE** V2650, TANK 2A RECIRC VALVE. **C.** IF 2B BORIC ACID PUMP was started, THEN **CLOSE** V2651, TANK 2B RECIRC VALVE **D. OPEN** V2514, EMERGENCY BORATE	***ATC PERFORMS*** *the following* ***STARTS*** *at least one BORIC ACID PUMP* ***CLOSES*** *the BORIC ACID TANK RECIRC VALVE for the pump started and* ***OPENS*** *V2514, EMERGENCY BORATE VALVE*

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	2	Event #	7	
Event Description:		**On RX trip FB 2, Exciter Supply Breaker fails to open**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
			Note to Evaluator: Field Breaker FB-2 fails to open is an auto trigger that is inserted upon loading the scenario and is cleared when the applicant manually opens the breaker.
			Booth Operator Instructions: • **Upon Reactor Trip Event 7 Field Breaker FB-2 fails to open will be auto inserted.** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**
			Indications: **Annunciators:**
	BOP		**RECOGNIZES** Field Breaker FB-2 failed to open
	BOP		**OPENS** Field Breaker FB-2
	ATC		**RECOGNIZES** the need to secure the 2B1 RCP to stop the de-pressurization
	ATC		**RECOMMENDS** securing the 2B1 RCP
	SRO		**DIRECTS** the ATC the secure the 2B1 RCP
	ATC		**SECURES** the 2B1 RCP
2-EOP-01		**The following actions are taken from 2-EOP-01, Standard Post Trip Actions**	
			4.2 Immediate Operator Actions: • **ATC: Verifies Reactor power lowering, Negative Startup rate, all CEAs and verifies no dilution is in progress inserted and communicates status to the Unit Supervisor. Starts backup charging pumps as necessary.** • **BOP: Verifies all governor and throttle valves closed and communicates status to the Unit Supervisor. Makes plant announcements and trip notifications.**
			4.0 Operator Actions:

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #	7	
Event Description:	**On RX trip FB 2, Exciter Supply Breaker fails to open**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 5 VERIFY RCS Pressure Control:**	***SRO DIRECTS VERIFY*** *RCS Pressure Control, ATC Verifies:* ☐ *Pressurizer pressure is between 1800 and* ***L-19-100 psia*** ☐ *Pressurizer pressure is trending to between 2225 and 2275 psia* **IF SIAS** has occurred the **SRO** will **DIRECT** two RCPs to be tripped and perform 2-EOP-99 App.J to restore CCW to the RCPs

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	2	Event #	8	
Event Description:	**2A CS Pp breaker fails to auto close**						
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior				

CT-2	. INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY – RESTORE 2A CS PUMP AND FLOW PRIOR TO EXCEEDING 44 PSIG DESIGN PRESSURE OF CONTAINMENT.

Note to Evaluator: "2A" CS Pump fails to Auto start is an auto trigger that is inserted upon loading the scenario and is cleared when the applicant manually starts the component.

Booth Operator Instructions:

- **NONE: "2A" CS Pump fails to Auto start and "B" train CS is unavailable due to the 2B3 4160 bus Lock out, is an auto trigger**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications: Safety Injection Actuation Alarms and supporting plant parameters
Annunciators: Multiple

	BOP		Recognizes plant parameters require CSAS and validates its actuation
	BOP		Identifies that "2A" CS pump did not start and B train CSAS is unavailable due to the loss of the 2B3 4160 bus and takes action to start the "2A" CS pump
	BOP		Manually starts the 2A CS pump and verifies adequate containment spray flow
	BOP		Updates the crew on the actuation status of CSAS

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	2	Event #		
Event Description:		**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

2-EOP-99 APP "A"		**The following actions are for Sampling Steam Generators Using 2-EOP-99, APPENDIX "A"**	
	BOP	**1. If a LOOP has occurred, Then PERFORM BOTH of the following:** **A. ENSURE 2AB 480V Load Center is aligned to an energized bus.** **B. DISPATCH an operator to restore Instrument Air. REFER TO Appendix H, Operation of the 2A and 2B Instrument Air Compressors.**	***2AB Bus energized when 2A EDG output breaker is closed. Determines no additional action required***
NOTE ☐ **HCV-14-9 (HCV-14-10) will open 5 seconds after HCV-14-8A (HCV-14-8B) starts to open** ☐ **When SIAS is present, placing the control switches in CLOSE and then OVERRIDE will open the CCW 'N' header valves, until SIAS is reset**			
	BOP	**2. If an INADVERTENT SIAS has closed the 'N' Header valves, Then PERFORM EITHER of the following:** ☐ RESTORE flow to the "A" CCW Header by **placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A** **HCV-14-9** **OR** ☐ RESTORE flow to the "B" CCW Header by **placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B** **HCV-14-10**	***Determines no action required, no inadvertent SIAS***
CAUTION **Under SIAS conditions, the CCW 'N' header shall only be aligned to ONE essential header. This will maintain train separation while safeguards signals are still present.**			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #		
Event Description:	**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**3. If a VALID SIAS has closed the 'N' Header valves, Then PERFORM the following:** **A. VERIFY both safety related CCW headers are operational.** **B. VERIFY 'N'-Header is intact (NO seismic event has occurred).** **C. ALIGN the 'N' Header to one Safety Related CCW Header by performing either of the following:** **RESTORE flow to the 'A' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A, HCV-14-9** **OR** **RESTORE flow to the 'B' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B, HCV-14-10**	**BOP restores "N" header flow**
	BOP	**4. If the 'N' Header has been restored, Then OPEN FCV-L-19-1-7 and FCV-L-19-1-9,** **SGBD Sample Valves by performing the following:** **A. If CIAS or high radiation has closed the SGBD Sample Valves, Then OPEN FCV-L-19-1-7 and FCV-L-19-1-9 by PLACING the control switch to CLOSE / OVERRIDE.** **B. OPEN FCV-L-19-1-7 and FCV-L-19-1-9, SGBD Sample Valves.**	**BOP** restores SGBD sample flow.
	BOP	**5. If the 'N' Header is in service, Then DIRECT Chemistry to perform S/G samples** **for isotopic activity and Tritium.**	**BOP** directs chemistry to perform required samples

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #		
Event Description:	**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**6. If S/Gs cannot be sampled, Then DIRECT Health Physics to conduct secondary plant local area radiation surveys.**	**BOP** determines step is N/A
		NOTE **The Safety Related CCW header NOT aligned to the 'N' Header will be operable to supply essential equipment.**	
	BOP	**7. DECLARE the Safety Related CCW header aligned to the 'N' Header, inoperable but available.**	**BOP** informs US to declare CCW header inoperable
	BOP	**8. If any of the following conditions occur prior to reaching cold shutdown or resetting SIAS,** • **Seismic event** • **'N' Header is found NOT intact** • **The operable Safety Related CCW header becomes inoperable** **Then ISOLATE the 'N' header.**	**BOP** monitors for these conditions, determines N/A at this time
2-EOP-99 APP "J"		**The following actions are for Restoring CCW to the RCPs Using 2-EOP-99, APPENDIX "J".**	
	BOP	**1. If a LOOP has occurred,** **Then PERFORM BOTH of the following:** ☐ A. ENSURE 2AB 480V Load Center is aligned to **an energized bus.** ☐ B. DISPATCH an operator to restore Instrument **Air. REFER TO Appendix H, Operation of the 2A and 2B Instrument Air Compressors.**	**BOP** determines LOOP has not occurred, the was 2AB bus energized with the 2A EDG breaker closure
	BOP	**2. ENSURE Instrument Air to Containment is available by PLACING HCV-18-1 to CLOSE / OVERRIDE and then to OPEN.**	**BOP** opens HCV-18-1

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	2	Event #		
Event Description:	**APPENDICES**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE ☐ **HCV-14-9 (HCV-14-10) will open 5 seconds after HCV-14-8A (HCV-14-8B) starts to open.** ☐ When SIAS is present, placing the control switches in CLOSE and then OVERRIDE will open the CCW 'N' header valves, until SIAS is reset.	
	BOP	**3. If an INADVERTENT SIAS has occurred, Then RESTORE flow from Either 'A' or 'B' CCW Header to the 'N' Header by placing the control switches for the desired train to CLOSE and then to OVERRIDE:** **HCV-14-8A** **HCV-14-9** **OR** **HCV-14-8B** **HCV-14-10**	**BOP** determines no inadvertent SIAS occurred
		CAUTION **Under SIAS conditions, the CCW 'N' header shall only be aligned to ONE essential header. This will maintain train separation while safeguards signals are still present.**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	2	Event #		
Event Description:	**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**4. If a VALID SIAS has closed the 'N' Header valves, Then PERFORM the following:** **A. VERIFY both safety related CCW headers are operational.** **B. VERIFY 'N'-Header is intact (NO seismic event has occurred).** **C. ALIGN the 'N' Header to one Safety Related CCW Header by performing either of the following:** **RESTORE flow to the 'A' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A, HCV-14-9** **OR** **RESTORE flow to the 'B' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B, HCV-14-10**	**BOP** realigns the "N" header restoring CCW flow
	BOP	**5. OPEN ALL of the following CCW to / from the RCP valves:** **☐HCV-14-1, CCW To RC PUMP** **☐HCV-14-2, CCW From RC PUMP** **☐HCV-14-7, CCW To RC PUMP** **☐HCV-14-6, CCW From RC PUMP**	**BOP** opens valves restoring CCW flow to RCPs
	BOP	**6. ENSURE V2507, RCP Bleedoff Relief Stop Vlv, is OPEN.**	**BOP** opens V2507

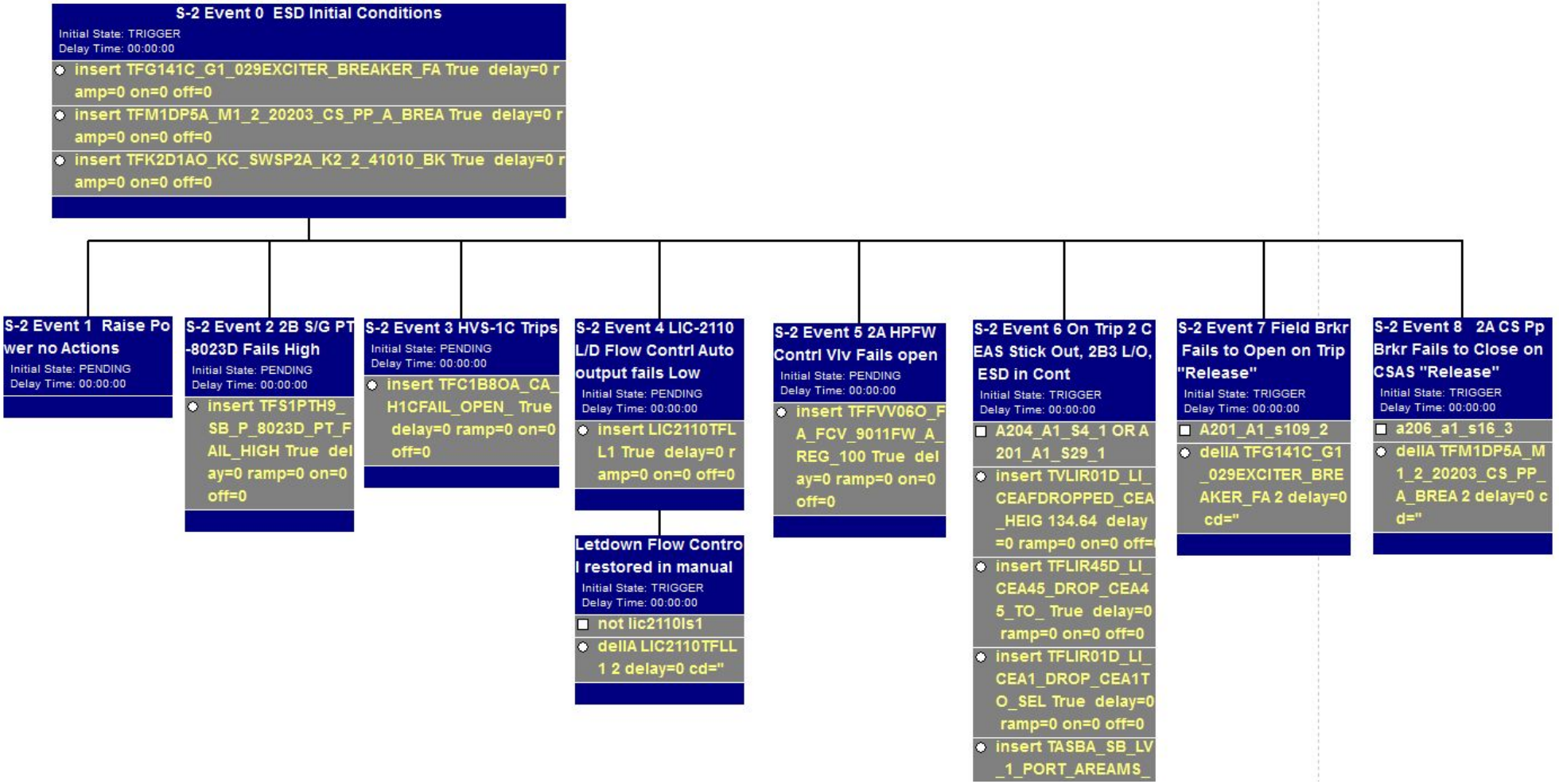
CAUTION

RCP Seal Cooler isolation valves automatically close on high Seal Cooler outlet temperature of 200°F. Maintaining the control switch in the OPEN position will override this function. CCW radiation monitors should be closely monitored for indication of RCS to CCW leakage should conditions warrant the valve(s) to be maintained in the open position. Consideration should be given to returning the control switch(es) to the AUTO position once the valves have been opened.

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	2	Event #		
Event Description:		**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**7. ENSURE ALL RCP Seal Cooler Isolation valves are OPEN:** **HCV-14-11-A1,CCW From 2A1 RCP Seal Cooler** **HCV-14-11-A2,CCW From 2A2 RCP Seal Cooler** **HCV-14-11-B1,CCW From 2B1 RCP Seal Cooler** **HCV-14-11-B2,CCW From 2B2 RCP Seal Cooler**	**BOP** verifies valves are open
		NOTE **Reactor Coolant Pumps must be secured if CCW flow is not restored within 10 minutes.**	
	BOP	**8. VERIFY CCW flow to running RCPs by any of the following:** ☐ DCS RCP Overview Screen ☐ FIS-14-15A/B/C/D, CCW From RCP Hx Flow ☐ L-6, RCP CCW Flow Low Trip, Annunciator clear.	**BOP** verifies CCW flow to RCPs
		NOTE **The Safety Related CCW header NOT aligned to the 'N' Header will be operable to supply essential equipment.**	
	BOP	**9. DECLARE the Safety Related CCW header aligned to the 'N' Header, inoperable but available.**	**BOP** informs US to declare CCW header is inoperable
	BOP	**10. If any of the following conditions occur prior to reaching cold shutdown or resetting SIAS,** ☐ Seismic event ☐ 'N' Header is found NOT intact ☐ The operable **Safety Related CCW header becomes inoperable** **Then ISOLATE the 'N' header.**	**BOP** monitors for these conditions, not present at this time

SIMULATOR LESSON LAYOUT



QUANTITATIVE ATTRIBUTES

Malfunctions:

Before EOP Entry:

1. 2B S/G PT-8023D fails high
2. HVS-1C trips
3. LIC 2110 L/D flow controller fails to Minimum flow
4. 2A Main Feed Reg valve fails open

After EOP Entry:

1. ESD in Containment from the 2A S/G
2. 2B3 4.16kv bus Lock Out
3. 2 CEAs remain out of core
4. FB 2, Exciter Supply Breaker fails to open
5. 2A CS Pp breaker fails to auto close

Abnormal Events:

1. 2B S/G PT-8023D fails high
2. HVS-1C trips
3. LIC 2110 L/D flow controller fails to Minimum flow

Major Transients:

2A Main Feed Reg valve fails open requiring RX trip, ESD in Containment

Critical Tasks:

1. INITIATE EMERGENCY BORATION TO SHUTDOWN THE REACTOR WHEN REQUIRED- If any CEA is not fully inserted, and then the crew initiates emergency boration to achieve SDM during verification of reactor trip and before exiting 2- EOP-01.
2. INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY – Restore 2A CS pump and flow prior to exceeding 44 psig design pressure of containment.

OPERATIONS SHIFT TURNOVER REPORT

DAYS Today

UNIT 2 CONTROL ROOM

Desk RCO: _____ **Board RCO:** _____

Protected Train: A **Online Risk:** GREEN

Unit 2 Identified RCS Leakage: .02 gpm **Unit 2 Unidentified RCS Leakage:** .06 gpm

Unit 2 Scheduled Activities per the OSP:

No scheduled surveillances

Unit 2 Unscheduled Surveillances:

No unscheduled surveillances

Upcoming ECOs to Hang or Release:

None

Tech Spec Action Statement:

1. NONE

Operator Work Around:

None

Locked in Annunciators:

1. NONE

Current Status:

1. The Unit is at 45% power, 2B MFW pump repaired and the clearance is currently being released after 5-day maintenance window, in 2-GOP-201 Step 4.8.13, up power is on hold for turnover.
2. Raise power to 50% and hold until the 2B Feedwater pump has been signed off.
3. 2A Screen Wash Pump OOS,
4. Small amounts of sea grass has been observed in the intake, 2B Screen wash pump is running 2-NOP-21.15, INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green.
5. RP has been notified that the second Charging Pump will be started for up power.

Longstanding Problems:

None

Reactivity Turnover:

15 gpm dilution is in progress to maintain current power level for turnover

Appendix D	Scenario Outline	Form ES-D-1

Facility:	St. Lucie	Scenario No.:	4	Op-Test No.:	L-19-1
Examiners:		Operators:	SRO:		
			ATC:		
			BOP:		

Initial Conditions: 100% power, MOC, no scheduled surveillances, maintain 100% power

Turnover: 2A Screen Wash Pump OOS, 2-NOP-21.15 INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green. 2B Charging Pp is OOS, 2A AFW Pp OOS, LIC-1110Y

Critical Tasks:
1. RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain RCS pressure within the bounds of the RPS TM/LP (Variable) trip set points. - Manually isolate lifting PORV prior to reaching an automatic reactor trip.
2. RESTORE AC POWER – Restore power to a vital AC 480 V AB bus. Align 2AB 480V LC to 'B' train to power to 2C Charging Pp and meet fig 2 within 15 minutes of 2A3 4.16KV bus lockout to prevent unnecessary escalation of the EALs.

Event No.	Malf. No.	Event Type*	Event Description
1	1	I/BOP/SRO TS/SRO	**Malf:** LT-9023A ("A" Channel Feedwater Level transmitter for 2B S/G) fails low **Action:** Bypass bistables **T.S.** 3.3.1 and 3.3.2
2	2	C/ATC/SRO TS/SRO	**Malf:** PORV V1474 ramps open **Action:** Close PORV block valve. **CT-1** RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain RCS pressure within the bounds of the RPS TM/LP (Variable) trip set points.
3	3	I/ATC/SRO	**Malf:** LIC-1110X oscillations LIC-1110Y Inop on Turnover **Action:** Manually Control LIC-1100Y or LIC-2110
4	4	C/ATC/ R/ATC/SRO TS/SRO	**Malf:** 2B SGTL (approx. 200 gpd) **Action:** ATC calculates leak rate; SRO enters SGTL, Commences a rapid downpower **T.S.** 3.4.6.2, 3.4.5
5	5	M/ALL	**Malf:** 2A2 RCP shaft slowly seizes, SGTR of 300 gpm on trip **Action:** Trip RX and trip RCP perform 2-EOP-01 go to 2-EOP-04
6	6	C/BOP/SRO	**Malf:** 2A3 4160 bus locks out on trip **Action:** Align 2AB 480V LC to 'B' train **CT-2** Action: Align 2AB 480V LC to 'B' train to power to 2C Charging Pp and meet fig 2 to prevent going to a SAE
7	7	M/ALL	**Malf:** 2A Steam Generator MS line break upstream of MSIV **Action:** Transition to 2-EOP-15,direct isolation of 2A S/G due to ESD
8	8	C/BOP/SRO	**Malf:** During isolation of 2A S/G, MV-08-13,S/G 2A Steam to AFW Pump 2C breaker trips when the valve is taken closed **Action:** Close MV-08-3 using key 78

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Scenario 4 Summary

Event	Description
1	LT-9023 ("A" Channel Feedwater NR Level transmitter for the 2B S/G) fails low; the BOP will respond to the annunciators, evaluate the failure and report. The SRO will evaluate the failure and enter 2 AOP-99.01 and direct the BOP to bypass the appropriate RPS and AFAS channel IAW section 4.2.12. Tech Spec evaluation and entry into LCO 3.3.1 and 3.3.2 required.
2	THIS IS A CRITICAL TASK; PORV V1474 leaks by on ramp to 50% open; The ATC will identify the failure by RCS parameters changing and indications PORV tail pipe temperature rising and Acoustic monitors system trends. The SRO will direct the ATC to place the PORV to off and then close PORV block valve V1476 and implement 2-AOP-01.10. CT-1 RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain RCS pressure within the bounds of the RPS TM/LP (Variable) trip set points.
3	THIS IS A MANUAL CONTROL OF AN AUTO SYSTEM FAILURE; LIC-1110X, X channel pressurizer level controller has oscillations in auto LIC-1110Y, Y channel pressurizer level controller is Inoperable on Turnover The ATC will Manually Control LIC-1100X, X channel pressurizer level controller or LIC-2110 Letdown flow controller.
4	THIS IS A REACTIVITY EVENT; A 2B SGTL (approx. 200 gpd) will begin, the ATC will recognize pressurizer level lowering, letdown lower, main steam radiation levels rising (3 min to see) and RCS pressure lowering. Report the conditions and begin a leak rate calculation. The SRO will enter 2-AOP-08.02 SGTL, quantify leakage and commence a down power using 2-AOP-22.01 Rapid Downpower. Tech Spec evaluation and entry into LCO 3.4.6.2 and 3.4.5 required.
5	After adequate power maneuvers are observed the 2A2 RCP vibrations alarm will be received followed by a slow rise in RCP amps to indicate the RCP shaft slowly seizing. The ATC will identify the failure and report, the SRO will direct the ATC to trip the RX and then to secure the 2A2 RCP. 2-EOP-01 will be implemented. On the trip the SGTL is ramped up to 300gpm, the SRO will transition to 2-EOP-04 SGTR.
6	THIS IS A CRITICAL TASK; On the trip the 2A3 4160 bus locks out the BOP will Align the 2AB 480V LC to 'B' train to provide power to the 2C Charging pp IAW 2-EOP-01 CT-2 Action: Align 2AB 480V LC to 'B' train to power to 2C Charging Pp and meet fig 2 to prevent escalation of the EALs.
7	After the crew enters 2-EOP-04 SGTR A MS line safety lifts (occurs when the RO takes the SBCS permissive switch to manual to begin RCS cooldown) on the 2A Steam Generator The SRO will re-evaluate the plant conditions and transition to 2-EOP-15 and direct the BOP to isolate the 2A S/G due to the ESD.
8	MV-08-13, S/G 2A Steam to AFW Pump 2C breaker will trip when the valve is taken to the closed direction during App R to isolate the 2A S/G, the BOP will recognize the failure and report. The SRO will direct the BOP to perform the action of 2-EOP-99, APP R and close MV-08-3 using key 78.
Termination Criteria	The scenario will be terminated after the crew Isolates the 2A S/G IAW 2-EOP-99 App. R or at the lead evaluators discretion.

SITE: ST. LUCIE **Revision #:** 0

LMS ID: N/A **LMS Rev. Date:** N/A

SEG TITLE: L-19-1 SCENARIO 4

SEG TYPE: ☐ Training ☒ Evaluation

PROGRAM: ☐ LOCT ☒ LOIT ☐ Other:

DURATION: 90 minutes

Developed by: _____ _____
Instructor/Developer Date

Reviewed by: _____ _____
Instructor (Instructional Review) Date

Validated by: _____ _____
SME (Technical Review) Date

Approved by: _____ _____
Training Supervision Date

Approved by: _____ _____
Training Program Owner (Line) Date

Scenario Outline

Facility:	St. Lucie	Scenario No.:	4	Op-Test No.:	L-19-1
Examiners:		Operators:	SRO:		
			ATC:		
			BOP:		

Initial Conditions: 100% power, MOC, no scheduled surveillances, maintain 100% power

Turnover: 2A Screen Wash Pump OOS, 2-NOP-21.15 INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green. 2B Charging Pp is OOS, 2A AFW Pp OOS, LIC-1110Y OOS

Critical Tasks:
1. RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain RCS pressure within the bounds of the RPS TM/LP (Variable) trip set points. - Manually isolate lifting PORV prior to reaching an automatic reactor trip.
2. RESTORE AC POWER – Restore power to a vital AC 480 V AB bus. Align 2AB 480V LC to 'B' train to power to 2C Charging Pp and meet fig 2 within 15 minutes of 2A3 4.16KV bus lockout to prevent unnecessary escalation of the EALs.

Event No.	Malf. No.	Event Type*	Event Description
1	1	I/BOP/SRO TS/SRO	**Malf:** LT-9023A ("A" Channel Feedwater Level transmitter for 2B S/G) fails low **Action:** Bypass bistables **T.S.** 3.3.1 and 3.3.2
2	2	C/ATC/SRO TS/SRO	**Malf:** PORV V1474 ramps open **Action:** Close PORV block valve. **CT-1** RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain RCS pressure within the bounds of the RPS TM/LP (Variable) trip set points.
3	3	I/ATC/SRO	**Malf:** LIC-1110X oscillations LIC-1110Y Inop on Turnover **Action:** Manually Control LIC-1100X or LIC-2110
4	4	C/ATC/ R/ATC/SRO TS/SRO	**Malf:** 2B SGTL (approx. 200 gpd) **Action:** ATC calculates leak rate; SRO enters SGTL, Commences a rapid downpower **T.S.** 3.4.6.2, 3.4.5
5	5	M/ALL	**Malf:** 2A2 RCP shaft slowly seizes, SGTR of 300 gpm on trip **Action:** Trip RX and trip RCP perform 2-EOP-01 go to 2-EOP-04
6	6	C/BOP/SRO	**Malf:** 2A3 4160 bus locks out on trip **Action:** Align 2AB 480V LC to 'B' train **CT-2** Action: Align 2AB 480V LC to 'B' train to power to 2C Charging Pp and meet fig 2 to prevent going to a SAE
7	7	M/ALL	**Malf:** 2A Steam Generator MS line break upstream of MSIV **Action:** Transition to 2-EOP-15,direct isolation of 2A S/G due to ESD
8	8	C/BOP/SRO	**Malf:** During isolation of 2A S/G, MV-08-13,S/G 2A Steam to AFW Pump 2C breaker trips when the valve is taken closed **Action:** Close MV-08-3 using key 78

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

SIMULATOR EXERCISE GUIDE REQUIREMENTS

Terminal Objective Given specific plant conditions, the students will be able to mitigate events in accordance with plant procedures.

Enabling Objectives: None

Prerequisites:
1. Simulator
2. Applicants enrolled in Initial License Program

Training Resources:
1. Floor Instructor as Shift Technical Advisor
2. Simulator Booth Operator
3. NRC Evaluators

References:
1. 2-AOP-99.01, Loss of Tech Spec Instrumentation
2. 2-AOP-01.10, Pressurizer Pressure and Level
3. 2-AOP-02.01, Charging and Letdown
4. 2-AOP-08.02, Steam Generator Tube Leak
5. 2-AOP-22.01, Rapid Downpower
6. 2-EOP-01, Standard Post Trip Actions
7. 2-EOP-04, Steam Generator Tube Rupture
8. 2-EOP-15, Functional Recovery
9. 2-EOP-99, Appendices / Figures / Tables /Data Sheets
10. Unit-2 Technical Specifications

Protected Content: **NONE**

Evaluation Method: Simulator performance will be evaluated in accordance with NUREG 1021 rev. 11.

Operating Experience: N/A

Risk Significant Operator Actions: Isolate PORV Relief Path After PORV Fails Open

UPDATE LOG: Indicate in the following table any minor changes or major revisions made to the material after initial approval.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER REVIEWER	DATE DATE

L-19-1 NRC SCENARIO 4 OVERVIEW/SEQUENCE OF EVENTS

Event	Description
1	LT-9023 ("A" Channel Feedwater NR Level transmitter for the 2B S/G) fails low; the BOP will respond to the annunciators, evaluate the failure and report. The SRO will evaluate the failure and enter 2 AOP-99.01 and direct the BOP to bypass the appropriate RPS and AFAS channel IAW section 4.2.12. Tech Spec evaluation and entry into LCO 3.3.1 and 3.3.2 required.
2	THIS IS A CRITICAL TASK; PORV V1474 leaks by on ramp to 50% open; The ATC will identify the failure by RCS parameters changing and indications PORV tail pipe temperature rising and Acoustic monitors system trends. The SRO will direct the ATC to place the PORV to off and then close PORV block valve V1476 and implement 2-AOP-01.10. CT-1 RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain RCS pressure within the bounds of the RPS TM/LP (Variable) trip set points.
3	THIS IS A MANUAL CONTROL OF AN AUTO SYSTEM FAILURE; LIC-1110X, X channel pressurizer level controller has oscillations in auto LIC-1110Y, Y channel pressurizer level controller is Inoperable on Turnover The ATC will Manually Control LIC-1100X, X channel pressurizer level controller or LIC-2110 Letdown flow controller.
4	THIS IS A REACTIVITY EVENT; A 2B SGTL (approx. 200 gpd) will begin, the ATC will recognize pressurizer level lowering, letdown lower, main steam radiation levels rising (3 min to see) and RCS pressure lowering. Report the conditions and begin a leak rate calculation. The SRO will enter 2-AOP-08.02 SGTL, quantify leakage and commence a down power using 2-AOP-22.01 Rapid Downpower. Tech Spec evaluation and entry into LCO 3.4.6.2 and 3.4.5 required.
5	After adequate power maneuvers are observed the 2A2 RCP vibrations alarm will be received followed by a slow rise in RCP amps to indicate the RCP shaft slowly seizing. The ATC will identify the failure and report, the SRO will direct the ATC to trip the RX and then to secure the 2A2 RCP. 2-EOP-01 will be implemented. On the trip the SGTL is ramped up to 300gpm, the SRO will transition to 2-EOP-04 SGTR.
6	THIS IS A CRITICAL TASK; On the trip the 2A3 4160 bus locks out the BOP will Align the 2AB 480V LC to 'B' train to provide power to the 2C Charging pp IAW 2-EOP-01 CT-2 Action: Align 2AB 480V LC to 'B' train to power to 2C Charging Pp and meet fig 2 to prevent escalation of the EALs.
7	After the crew enters 2-EOP-04 SGTR A MS line safety lifts (occurs when the RO takes the SBCS permissive switch to manual to begin RCS cooldown) on the 2A Steam Generator The SRO will re-evaluate the plant conditions and transition to 2-EOP-15 and direct the BOP to isolate the 2A S/G due to the ESD.
8	MV-08-13, S/G 2A Steam to AFW Pump 2C breaker will trip when the valve is taken to the closed direction during App R to isolate the 2A S/G, the BOP will recognize the failure and report. The SRO will direct the BOP to perform the action of 2-EOP-99, APP R and close MV-08-3 using key 78.
Termination Criteria	The scenario will be terminated after the crew Isolates the 2A S/G IAW 2-EOP-99 App. R or at the lead evaluators discretion.

Procedures Used	**Tech Specs Entered**
• 2-AOP-99.01, Loss of Tech Spec Instrumentation • 2-AOP-01.10, Pressurizer Pressure and Level • 2-AOP-02.01, Charging and Letdown • 2-AOP-08.02, Steam Generator Tube Leak • 2-AOP-22.01, Rapid Downpower • 2-EOP-01, Standard Post Trip Actions • 2-EOP-04, Steam Generator Tube Rupture • 2-EOP-15, Functional Recovery • 2-EOP-99, Appendices / Figures / Tables /Data Sheets • Unit-2 Technical Specifications	• 3.2.5 • 3.3.1 • 3.3.2 • 3.4.6.2 • 3.4.5

Scenario Setup and Booth Operator Instructions:

- **ENSURE** Examination Security has been established.
- **ENSURE** the Simulator is unloaded
- **ENSURE** Lesson for SCENARIO 4 from Exam Flash drive is loaded as follows:
  - **Open**, folder L-19-1 NRC SCENARIO 4 lsn
  - **Copy**, L-19-1 NRC SCENARIO 4.lsn
  - **Open**, Lessons folder on simulator operator station desk top
  - **Paste**, L-19-1 NRC SCENARIO 4.lsn into the Instructor Lessons folder; NRC; L-19-1
- **LOAD** the Simulator
- **RESTORE** IC#1
  - **RUN** the Simulator
  - Place the 2A AFW pump control switch in the STOP position and Hang an ECO tag on switch
  - Place the 2B Charging pump control switch in the STOP position and Hang an ECO tag on switch
  - Hang an ECO tag on LIC-1110Y Y Pressurizer Level Controller
  - Place the 2A Screen wash pump off
  - Place a Clearance tag on the 2A Screen wash pump
  - Start the 2B Screen wash pump
  - Place GUARDED EQUIPMENT as outlined Guarded Equipment procedure
  - Place a marked up copy of 2-NOP-21.15 INTAKE INTRUSION MONITORING AND MITIGATION on the US desk
  - ENSURE the A Train Protected sign and a GREEN OLRM sign are placed RTGB-203.
  - ENSURE the CHEMISTRY sheet for MOC is placed on the Unit Supervisor Desk.
  - **FREEZE** the simulator
- **OPEN** and **EXECUTE** L-19-1 NRC SCENARIO 4.lsn
- **RUN** the Simulator and allow for stabilization
- **FREEZE** the simulator
- **UNFREEZE** the simulator prior to the candidates entering the simulator

Post scenario simulator restoration:

- **ENSURE** L-19-1 NRC SCENARIO 4.lsn are deleted from Simulator in accordance with Attachment 2 of Training Department Policy PSL-TRNG 142

BRIEF / TURNOVER INFORMATION

- Conduct simulator crew pre-scenario brief using TR-AA-L-19-10-1007-F06, Simulator Instructor Pre-Exercise Checklist.
- Brief the scenario evaluators
- Brief surrogates using TR-AA-L-19-10-1007-F11, Surrogate Brief Checklist, if necessary.
- Crew Shift Turnover Information: See Attached

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	1	
Event Description:	**2B S/G LT-9023A FAILS LOW ("A" Channel Level transmitter for the 2B S/G) fails low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

T.S. 3.3.1	AS A MINIMUM, THE REACTOR PROTECTIVE INSTRUMENTATION CHANNELS AND BYPASSES OF TABLE 3.3-1 SHALL BE OPERABLE. 8. STEAM GENERATOR LEVEL – LOW TOTAL CHANNELS 4/SG CHANNELS TO TRIP 2/SG MIN OPERABLE 3/SG ACTION: 2. A. WITH THE NUMBER OF CHANNELS OPERABLE ONE LESS THAN THE TOTAL NUMBER OF CHANNELS, STARTUP AND/OR POWER OPERATION MAY CONTINUE PROVIDED THE INOPERABLE CHANNEL IS PLACED IN THE BYPASSED OR TRIPPED CONDITION WITHIN 1 HOUR
T.S. 3.3.2	THE ENGINEERED SAFETY FEATURES ACTUATION SYSTEM (ESFAS) INSTRUMENTATION CHANNELS AND BYPASSES SHOWN IN TABLE 3.3-3 SHALL BE OPERABLE WITH THEIR TRIP SETPOINTS SET CONSISTENT WITH THE VALUES SHOWN IN THE TRIP SETPOINT COLUMN OF TABLE 3.3-4. 7. AUXILIARY FEEDWATER c. SG LEVEL (2A/2B) – LOW CHANNELS 4/SG CHANNELS TO TRIP 2/SG MIN OPERABLE 3/SG ACTION: 20. A. THE INOPERABLE CHANNEL IS PLACED IN EITHER THE BYPASSED OR TRIPPED CONDITION WITHIN 1 HOUR. IF AN INOPERABLE SG LEVEL CHANNEL CANNOT BE RESTORED TO OPERABLE STATUS WITHIN 48 HOURS, THEN AFAS-1 OR AFAS-2 AS APPLICABLE IN THE INOPERABLE CHANNEL SHALL BE PLACED IN THE BYPASSED CONDITION

Note to Evaluator: The 2B S/G LT-9023A fails low is a malfunction initiated from the Booth upon direction by the evaluator.

Booth Operator Instructions:

- **Upon cue from Lead Examiner, trigger Event 1: 2B S/G LT-9023A FAILS LOW**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications:
PI-8023D will indicate low scale on RTGB 203
MC RPS bistables for 2B S/G Low Level will be in trip.
Annunciators:
L-3 S/G LEVEL LOW CHANNEL TRIP
L-11 S/G LEVEL LOW CHANNEL PRE- TRIP
EXAMINER: The SRO may announce Multiple Alarms to direct the crew to systematically evaluate the plant status.

	BOP/ATC		**Acknowledges** annunciators and **Communicates** IAW plant policies
	BOP/ATC		**Diagnoses** 2B S/G LT-9023A has failed low; RPS bistables Lo SG level have tripped and **Communicates** status IAW plant policies
	BOP		**Complies** with ARP's for L-3,L-11 and **Communicates** and/or takes action as directed by ARP

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	1	
Event Description:	**2B S/G LT-9023A FAILS LOW ("A" Channel Level transmitter for the 2B S/G) fails low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO		**Diagnoses, Interprets,** that 2B S/G LT-9023A has failed low, **Communicates** agreement with the ATCs diagnoses and **Directs** entry into 2-AOP-99.01, Loss of Tech Spec Instrumentation
	SRO		**Updates** crew and **Enters** 2-AOP-99.01, Loss of Tech Spec Instrumentation
	SRO		**Directs** actions of 2-AOP-99.01, Loss of Tech Spec Instrumentation
	SRO		**Notifies** SM of entry into 2-AOP-99.01, Loss of Tech Spec Instrumentation
2-AOP-99.01		**The following actions are taken from 2-AOP-99.01, Loss of Tech Spec Instrumentation**	
4.1 Immediate Operator Actions: NONE			
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
NOTE A TRANSMITTER failure can be discriminated from a METER failure by the presence of annunciators and protection and control actuations.			
	SRO	**1. CONFIRM** failed channel by any of the following methods: • Channel check comparison with redundant channels • Annunciators • Bistable or status lights • Any instrument-related testing or surveillance procedure in progress	***Interprets*** *the indications and determines the failure to be 2B S/G LT-9023A 2B Steam Generator Level Transmitter for MD channel*
NOTE **BISTABLE TRIP UNIT is abbreviated as BTU in this AOP**			
	SRO	**2**. IF entering this procedure to restore an affected channel, THEN GO TO Section 4.2.1, Step 7	***N/A***

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	1	
Event Description:	**2B S/G LT-9023A FAILS LOW ("A" Channel Level transmitter for the 2B S/G) fails low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**3**. Using Attachment 5, Channel Failure Impact Table, PERFORM the following: **A.** LOCATE table row for affected instrument or channel	**Locates** correct table row for LT-9023A
	SRO	**3**. Using Attachment 5, Channel Failure Impact Table, PERFORM the following: **B**. REFER TO applicable Tech Specs	***Refers to applicable Tech Specs 3.3.2***
	SRO	**3**. Using Attachment 5, Channel Failure Impact Table, PERFORM the following: **C**. PERFORM applicable procedure section for affected instrument	***PERFORMs*** *section 4.2.11*
	SRO	**4**. Using Attachment 6, Instrumentation, for Tech Spec applicability.	***PERFORMs*** *Attachment 6, Instrumentation, for Tech Spec applicability.* ***DETERMINES*** *TS 3.3.1 and 3.3.2 are applicable*
4.2.11 S/G Level Channel Failure			
	SRO	**1. CIRCLE** affected instrument and channel: • LIC-9013 A / B / C / D • LIC-9023 A / B / C / D	***PERFORMs*** *section 4.2.11.1. CIRCLE affected instrument and channel:* • *LIC-9013 A / B / C / D* • *LIC-9023 A / B / C / D*

NOTE

- Bypassing AFAS will require Key 202 and one of the following keys; 203, 204, 205, or 206.
- If it is necessary to TRIP the RPS and ESFAS bistable trip units (BTUs), then it is preferable to leave the AFAS BTUs in BYPASS. (Section 6.1.3, Management Directive 1)
- An AFAS channel in the TRIPPED condition is limited to 48 hours per Tech Spec 3.3.2 Table 3.3-3. (Section 6.1.3, Management Directive 1)

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	1	
Event Description:	**2B S/G LT-9023A FAILS LOW ("A" Channel Level transmitter for the 2B S/G) fails low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**2. PERFORM** one of the following for the affected BTUs listed: • LO LVL SG (RPS) (Key 104) • For LIC-9013 only AFAS-1 • For LIC-9023 only AFAS-2 **A. BYPASS** affected BTUs using keyswitch and pushbuttons **B. TRIP** affected BTUs per Attachment 3, Tripping and Restoring Protection Bistables	***SRO DIRECTS*** *the* ***BOP*** *to* ***BYPASS*** *the affected BTUs using keyswitches and pushbuttons as follows;* • *LO LVL SG (RPS) (Key 104)* • *For LIC-9023 only AFAS-2*
	SRO	**3. PLACE** S/G HI LEVEL OVERRIDE keyswitch for affected channel in BYPASS: (rear of RTGB-202) • Channel A (Key 15) • Channel B (Key 16) • Channel C (Key 17) • Channel D (Key 18)	***SRO DIRECTS*** *the* ***BOP*** *to* ***BYPASS*** *the affected BTUs using keyswitches and pushbuttons as follows;* • *Channel A (Key 15)*
	BOP	Using 2-AOP-99.01 Loss of Tech Spec Instrumentation section **4.2.11 S/G Level Channel Failure** Step 2. and direction from the Unit Supervisor BYPASS affected BTUs using keyswitches and pushbuttons	***PERFORMs*** *section 4.2.11 as directed by the SRO;* *Obtains keys, unlocks cabinets and inserts keys: LO LVL SG (RPS) (Key 104) 202&206 for AFAS and key 15 S/G HI LEVEL OVERRIDE* ***BOP*** *relieves the ATC*
	ATC	Using 2-AOP-99.01 Loss of Tech Spec Instrumentation section **4.2.11 S/G Level Channel Failure** Step 2. and direction from the Unit Supervisor BYPASS affected BTUs using keyswitches and pushbuttons	***ATC PERFORMs*** *section 4.2.11 as directed by the Unit Supervisor;* *IVs inserted keys: 104 for RPS and rotates key to bypass MD LO LVL SG, key 15 rotates key to bypass f S/G HI LEVEL OVERRIDE and 202&203 for MA AFAS Door and bypass compartment and pushes the bypass button* ***ATC Reports*** *to SRO that the affected BTUs have been BYPASSED using keyswitches and pushbuttons* ***ATC relieves*** *the BOP*
4.2.1 General Actions:			
	SRO	**5. INITIATE** work request for affected instrument or channel and **NOTIFY** I&C or EM as applicable	***PERFORMS*** *section 4.2.1 Step 4 NOTIFIES I&C or EM as applicable and Notifies the SM of the failure and the Tech Spec entry*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	1	
Event Description:	**2B S/G LT-9023A FAILS LOW ("A" Channel Level transmitter for the 2B S/G) fails low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**6. DOCUMENT** problem as required: • EOOS Log • Condition report • Ops narrative log	***PERFORMS*** *section 4.2.1 Step 5 and Documents issue as appropriate in:* • *EOOS Log* • *Condition report* • *Ops narrative log*
	SRO	**7.** WHEN ready to restore affected channel, THEN **PERFORM** Attachment 2, Restoration of Tripped or Bypassed • Instrumentation Channels	***IDENTIFIES*** *step as N/A*
	SRO	**8. VERIFY** Exit Conditions are met **9. EXIT** this procedure	***VERIFIES*** *Exit conditions are met by:* • *Applicable Tech Spec LCO action requirements have been implemented* • *Affected channel has been bypassed or tripped as required by Tech Specs and exits 2-AOP-99.01*
	SRO	**Performs Crew Brief**	***SRO PERFORMs*** *crew brief on status of failed instrument, the Tech Spec entry and Notifies the SM*
At the Lead Evaluator's direction, PROCEED to Event 2.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	2	
Event Description:	**PORV V1474 leaks by on ramp to 50% open**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
T.S. 3.2.5 DNB		THE FOLLOWING DNB-RELATED PARAMETERS SHALL BE MAINTAINED WITHIN THE LIMITS: B. PRESSURIZER PRESSURE* AS SHOWN ON TABLE 3.2-2 OF THE COLR, (2225 PSIA) ACTION: RESTORE PARAMETER WITHIN LIMITS WITHIN 2 HOURS OR REDUCE THERMAL POWER TO < 5% OF RATED THERMAL POWER WITHIN THE NEXT 4 HOURS	
CT-1		RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – MAINTAIN RCS PRESSURE WITHIN THE BOUNDS OF THE RPS TM/LP (VARIABLE) TRIP SET POINTS. - MANUALLY ISOLATE LIFTING PORV PRIOR TO REACHING AN AUTOMATIC REACTOR TRIP.	
Note to Evaluator: The PORV V1474 leaks by on ramp to 50% open is a malfunction initiated from the Booth upon direction by the evaluator.			
Booth Operator Instructions: • **Upon cue from Lead Examiner, trigger Event 2: PORV V1474 leaks by on ramp to 50% open** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**			
Indications: **RCS pressure lowering rapidly** **Annunciators:** **H-35, PORV V1474 TEST/OVERRIDE** **H-42, PORV V1474 NORM RANGE CONDITION SELECT NORM**			
	ATC		**IDENTIFIES** RCS pressure lowering rapidly, announces the failure to the SRO and states intended actions to place the PORV to off position and then close PORV block valve
	SRO		**DIRECTS** the ATC to place the PORV to off and then close PORV block valve
	BOP		**EVALUATES** plant for being stable
	BOP		Acknowledge annunciators and communicates status IAW plant policies.
	SRO		**ANNOUNCES** and enters 2-AOP-01.10, Pressurizer Pressure and Level
	SRO		**DIRECTS** actions of 2-AOP-01.10, Pressurizer Pressure and Level
2-AOP-01.10		**The following actions are taken from 2-AOP-01.10, Pressurizer Pressure and Level**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	2	
Event Description:	**PORV V1474 leaks by on ramp to 50% open**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
4.1 Immediate Operator Actions:			
	ATC	**1. IF at Normal Operating Pressure, THEN VERIFY PIC-1100X(Y), PRESSURIZER PRESSURE, stable.**	***4.1.1 CONTINGENCY ACTIONS*** ***SRO VERFIES*** *PORVs leakage has been stopped*
	ATC	**2. VERIFY selected Pressurizer pressure control channel PIC-1100X(Y), PRESSURE, NORMAL.**	***4.1.2 CONTINGENCY ACTIONS PLACE PRESSURE CONTROL CHANNEL*** ***SRO DETERMINES*** *PIC-1100 is operating correctly*
	SRO	**3. IF** either of the following conditions are met: ☐Pressurizer pressure is less than 2275 psia ☐Pressurizer pressure is lowering uncontrollably	***The SRO DETERMINES*** *the STEP is N/A*
	ATC	**4. VERIFY selected RRS channel Pressurizer level setpoint NORMAL as indicated on LR-1110, PRESSURIZER LEVEL.**	***The SRO DETERMINES the STEP is N/A***
	ATC	**5. VERIFY selected Pressurizer level control channel LIC-1110X(Y), LEVEL, NORMAL.**	***The SRO DETERMINES the STEP is N/A***
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
	SRO	**1. PERFORM** applicable section per Table 1.	***SRO EVALUATES*** *the indications determines the failure to be PORV V1474 and proceeds to section 4.2.2*
4.2.2 Pressurizer PORV or Safety Valve OPEN or Leaking			
	SRO	**1. VERIFY any Pressurizer PORV or safety is OPEN or leaking using any of the following:**	***SRO EVALUATES*** *failure and determines PORV V1474 was open*
	SRO	**2. IF safety valve leakage is identified, THEN GO TO Section 4.2.2, Step 9.**	***SRO EVALUATES*** *and DETERMINES the STEP is N/A*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	2	
Event Description:	**PORV V1474 leaks by on ramp to 50% open**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**3. IF PORV flow is indicated, THEN VERIFY TI-1115, 2A1 COLD LEG TEMPERATURE, AND TI-1125, 2B1 COLD LEG TEMPERATURE, indicate RCS temperature is greater than the following:** ☐ 255F **during heatup** ☐ 240F **during cooldown**	***SRO EVALUATES*** *and moves to step 4.2.4*
	SRO	**4 IF V1474, PORV, indicates flow AND Pressurizer pressure is less than 2300 psia,** **THEN ENSURE the following:** ☐ V1474, PORV, in **OVERRIDE.** ☐ V1476, PORV BLOCK **VALVE, CLOSED**.	***SRO VERIFIES*** *V1474, PORV, in OVERRIDE. And V1476, PORV BLOCK VALVE, CLOSED.*
	SRO	**5. IF V1475, PORV, indicates flow AND Pressurizer pressure is less than 2300 psia,** **THEN ENSURE the following:** ☐ V1475, PORV, in **OVERRIDE.** ☐ V1477, PORV BLOCK **VALVE, CLOSED**	***SRO EVALUATES and DETERMINES the STEP is N/A***
	SRO	**6. IF affected PORV can NOT be Identified AND Pressurizer pressure is less than 2300 psia,**	***SRO EVALUATES and DETERMINES the STEP is N/A***
	SRO	**6. VERIFY both PORV Mode Select switches in NORMAL:** ☐ V1474, MODE SELECT ☐ **V1475, MODE SELECT**	***SRO EVALUATES and DETERMINES thto consult plant management prior to proceeding***
At the Lead Evaluator's direction, PROCEED to Event 3.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	3	
Event Description:	**Pressurizer level transmitter LT 1110X oscillates in Auto**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
Note to Evaluator: Oscillating LT 1110X is a malfunction initiated from the Booth upon direction by the evaluator.			
Booth Operator Instructions: • **Upon cue from Lead Examiner, trigger Event 3: OSCILLATING LT 1110X** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**			
Indications: Oscillations on LIC-1110X, Pressurizer level swings and letdown flow oscillations **Annunciators:** **H-17 PZR CHANNEL X LEVEL HIGH/LOW** **M-5**			
	ATC		**IDENTIFIES** Pressurizer level swings, letdown flow oscillations and oscillations on LIC-1110X, **RECOGNIZES** LIC-1110Y is INOP announces the failure to the SRO and states intended actions of taking manual control of LIC-1110X
	SRO		**DIRECTS** the ATC to take **manual control of LIC-1110X or LIC-2110** and stabilizes Pressurizer level and letdown Flow
	BOP		**EVALUATES** plant for being stable
	BOP		Acknowledge annunciators and communicates status IAW plant policies
	SRO		**ANNOUNCES** and enters 2-AOP-01.10, Pressurizer Pressure and Level
	SRO		**DIRECTS** actions of 2-AOP-01.10, Pressurizer Pressure and Level
2-AOP-01.10		**The following actions are taken from 2-AOP-01.10, Pressurizer Pressure and Level**	
4.1 Immediate Operator Actions:			
	ATC	**1. IF** at Normal Operating Pressure, THEN VERIFY PIC-1100X(Y), PRESSURIZER PRESSURE, stable	***1.1 CONTINGENCY ACTIONS*** *N/A*
	ATC	**2. VERIFY** selected Pressurizer pressure control channel PIC-1100X(Y), PRESSURE, NORMAL	***2.1 CONTINGENCY ACTIONS*** *N/A*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	3	
Event Description:	**Pressurizer level transmitter LT 1110X oscillates in Auto**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC	**3.** IF either of the following conditions are met: • Pressurizer pressure is less than 2275 psia • Pressurizer pressure is lowering uncontrollably THEN **VERIFY** spray valves CLOSED: • PCV-1100E, SPRAY VALVE 2B2, status lights • PCV-1100F, SPRAY VALVE 2B1, status lights • TIA-1103, 2B1 SPRAY LINE (Water Temperature), and TIA-1104, 2B2 SPRAY LINE (Water Temperature), indicate approximately equal temperatures	***3.1 CONTINGENCY ACTIONS*** *N/A*
	ATC	**4. VERIFY** selected RRS channel Pressurizer level setpoint NORMAL as indicated on LR-1110, PRESSURIZER LEVEL.	***4.1 CONTINGENCY ACTIONS*** *N/A*
	ATC	**5. VERIFY** selected Pressurizer level control channel LIC-1110X(Y), LEVEL, NORMAL.	***5.1 CONTINGENCY ACTIONS*** *N/A* ***ATC DETERMINES*** *the failure is the Auto control section of LIC-1110X and with LIC-1110Y INOP, Takes* ***manual*** *control of* ***LIC-1110X or LIC-2110***
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
	SRO	**4.2.1 General Actions:** **1. PERFORM** applicable section per Table 1.	***SRO EVALUATES*** *the indications determines the failure to be LIC-1110X and with LIC-1110Y INOP, proceeds to section 4.2.6*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	3	
Event Description:	**Pressurizer level transmitter LT 1110X oscillates in Auto**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
4.2.6 Selected Pressurizer Level Control Channel Failure:			
	SRO	**1. VERIFY** LEVEL CONTROL CHANNEL selector switch selected to non-affected level control channel.	***1.1 CONTINGENCY ACTIONS*** *N/A*
	SRO	**2. VERIFY** Pressurizer level stable OR trending to Pressurizer level setpoint: • LR-1110, PRESSURIZER LEVEL • PR1108/LR1110X, LEVEL PRESSURE • LIC-1110X(Y), LEVEL	***2.1 CONTINGENCY ACTIONS*** ***PLACE*** *selected Pressurizer level indicating controller in MANUAL.* ***SRO DETERMINES*** *the failure is the Auto control section of LIC-1110X and with LIC-1110Y INOP,* ***DIRECTS manual*** *control be taken of* ***LIC-1110X or LIC-2110*** ***2.2 OPERATE*** *selected Pressurizer level indicating controller to maintain Pressurizer level within 2% of setpoint* ***SRO DIRECTS the ATC*** *to maintain Pressurizer level within 2% of setpoint*
	SRO	**4. GO TO** Section 4.2.1, Step 2.	***SRO GOES*** *TO Section 4.2.1, Step 2*
4.2.1 General Actions:			
	SRO	**2.** WHEN plant conditions have stabilized, THEN **REVIEW** Tech Specs for any required actions.	***SRO REVIEWS*** *Tech Specs for any required actions*
	SRO	**3.** WHEN Section 3.0, EXIT CONDITIONS, are met, THEN **EXIT** this procedure.	***SRO EXITS*** *the AOP*
	SRO	**Performs Crew Brief**	***SRO PERFORMs*** *crew brief on status of failed instrument, the Tech Spec entry and Notifies the SM*
At the Lead Evaluator's direction, PROCEED to Event 4.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

T.S. 3.4.5	SG TUBE INTEGRITY SHALL BE MAINTAINED AND ALL SG TUBES SATISFYING THE TUBE REPAIR CRITERIA SHALL BE PLUGGED OR REPAIRED IN ACCORDANCE WITH THE SG PROGRAM. REPAIR APPLIES ONLY TO THE ORIGINAL SGS.
T.S. 3.4.6.2	REACTOR COOLANT SYSTEM OPERATIONAL LEAKAGE SHALL BE LIMITED TO: c. 150 GALLONS PER DAY PRIMARY-TO-SECONDARY LEAKAGE THROUGH ANY ONE STEAM GENERATOR (SG), ACTON: WITH ANY REACTOR COOLANT SYSTEM OPERATIONAL LEAKAGE GREATER THAN ANY ONE OF THE LIMITS, EXCLUDING PRIMARY-TO-SECONDARY LEAKAGE, PRESSURE BOUNDARY LEAKAGE, AND LEAKAGE FROM REACTOR COOLANT SYSTEM PRESSURE ISOLATION VALVES, REDUCE THE LEAKAGE RATE TO WITHIN LIMITS WITHIN 4 HOURS OR BE IN AT LEAST HOT STANDBY WITHIN THE NEXT 6 HOURS

Note to Evaluator: 2B SGTL is a malfunction initiated from the Booth upon direction by the evaluator.

Booth Operator Instructions:

- **Upon cue from Lead Examiner, trigger Event 4: 2B SGTL Approx 200 gpd**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**
- **When called for Chemistry samples and Radiation surveys report back in 10 minutes that activity is present on/in the 2B S/G**

Indications: Main steam line radiations levels rising and SJAE radiations levels rising

Annunciators:

RMCS

	BOP		Acknowledge annunciators and communicates status IAW plant policies.
	BOP		Pulls ARPs and communicates/takes action as directed
	SRO		Directs the ATC to perform a Leak rate calculation
	ATC		Evaluates plant for being stable and calculates leak rate
	SRO		Announces and enters 2-AOP-08.02, Steam Generator Tube Leak
	SRO		Directs actions of 2-AOP-08.02, Steam Generator Tube Leak
2-AOP-08.02		**The following actions are taken from 2-AOP-08.02, Steam Generator Tube Leak**	

4.1 Immediate Operator Actions: NONE

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

4.2 Subsequent Operator Actions

4.2.1 General Actions:

	SRO/ATC	**1. VERIFY** pressurizer level stable or rising and pressure normal	***SRO DIRECTS ATC*** *to* ***VERIFY*** *pressurizer level stable or rising and pressure normal. And to start charging pumps and operate heaters as necessary to stabilize pressurizer level and pressure*
	SRO	**Makes Notifications**	***SRO NOTIFIES*** *the Shift Manager*
	SRO	**2. NOTIFY** Chemistry of probable S/G tube leakage and to begin sampling for activity	***SRO DIRECTS Chemistry*** *to sample S/Gs for activity*
	SRO	**3. REQUEST** Radiation Protection conduct secondary area radiation surveys	***SRO DIRECTS Radiation Protection*** *conduct secondary area radiation surveys*
	SRO	**4.** IF Air Ejector or Steam Generator Blowdown monitor is NOT spiking, THEN ESTIMATE leakage by comparing Air Ejector Monitor or Steam Generator Blowdown Monitor reading with Daily Chemistry Report	***SRO DIRECTS BOP*** *to collect reading from the SJAE rad monitor, the SRO evaluates the data to determine the leak rate.* ***The SRO determines*** *the leak rate to be greater than 150 gpd and evaluates T.S. 3.4.6.2 and 3.4.5*
	SRO	**5.** IF unable to estimate primary to secondary leakage or the radiation monitors are out of service, THEN ESTIMATE leak rate from Chemistry sample	***SRO DETERMINES*** *the leak rate to be greater than 150 gpd on previous step*
	SRO	**6. DETERMINE** primary to secondary leak rate by one of the following methods:	***SRO DIRECTS ATC*** *to report leak rate calculation results*
	SRO	**7.** IF sample flow is available to the radiation monitors, THEN LOG Air Ejector monitor or Steam Generator Blowdown Radiation Monitor readings every 15 minutes on Attachment 6, Steam Jet Air Ejector/Steam Generator Blowdown Monitoring	***SRO DIRECTS BOP*** *to begin Logging Air Ejector monitor or Steam Generator Blowdown Radiation Monitor readings every 15 minutes on Attachment 6*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**8. CONFIRM** S/G tube leakage using any of the following: ☐ Plant response ☐ Secondary radiation monitors rising ☐ High activity or rising trends on any of the following radiation monitors: • S/G liquid sample • Main steam line • S/G blowdown • Chemistry analysis • Rising S/G water level	***SRO EVALUATES*** *data and determines the 2B S/G has the tube leak at a rate of 150 gpd*
	SRO	**9.** IF at any time S/G blowdown sample flow isolates on high radiation, THEN PERFORM the following as necessary to support S/G sampling by Chemistry: ☐ PLACE FCV-23-7, 9, SAMPLE, in CLOSE/OVRD ☐ OPEN FCV-23-7, 9, SAMPLE	***SRO DIRECTS*** *step as necessary*
	SRO	**10. DISPATCH** a field operator to the SGBTF to perform the following: **A. VERIFY** SGBTF Truck Bay door is CLOSED. **B. VERIFY** the following SGBTF ventilation systems are in operation: ☐ Supply Fans HVS 10A or HVS-10B ☐ Exhaust Fans HVE 41A or HVE-41B ☐ SGBTF Ventilation Process Monitor	***SRO DIRECTS BOP*** *to perform this step*
	SRO	**11. EVALUATE** isolating blowdown and vacuum drag on Unit 1	***SRO CONTACTS*** *Unit-1 and advises*
	SRO	**12. VERIFY** steam generator blowdown aligned to Monitor Storage Tanks	***SRO VERIFIES*** *steam generator blowdown aligned to Monitor Storage Tanks*
	SRO	**13. IF** in MODE 1 through 3 and SIAS is NOT blocked, THEN GO TO Section 4.2.2	***SRO PROCEEDS*** *to section 4.2.2*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
4.2.2 Mode 1 through 3 - SIAS Not Blocked			
	SRO	**1. VERIFY** leak rate is LESS THAN 100 gpd.	***SRO DETERMINES*** *the leak rate exceeds 200gpd and IMPLEMENTS a rapid downpower at 10 MW/min per 2-AOP-22.01, Rapid Downpower, to attain the following:* ☐ *Power equal to or LESS THAN 50% in 1 hour* ☐ *Mode 3 within next 2 hours* *While continuing to step 4.2.4.7*
	SRO	**7.**A. IF plant conditions require, THEN INITIATE the Emergency Plan B. ENSURE Chemistry is implementing the Contaminated Water Plan per CY-SL-108-0002, High Activity In A Steam Generator C. IF radiation monitors indicate conditions are changing, THEN EVALUATE stabilizing the plant to facilitate leak rate determination	***SRO DIRECTS*** *these steps* ***SRO BRIEFS*** *the crew on the down power and clarifies parameters*
	SRO		**ANNOUNCES** and enters 2-AOP-22.01, Rapid Downpower as directed
	SRO		**DIRECTS** actions of 2-AOP-22.01, Rapid Downpower
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, Rapid Downpower**	
4.1 Immediate Operator Actions:			
	SRO		***DIRECTS*** *Immediate Operator Actions for 2-AOP-22.01, RAPID DOWNPOWER*
	SRO	**1. BEGIN** boration per operator aid OR Attachment 1, RCS Boration Guidance.	***SRO DIRECTS ATC*** *to make boration 15 gallons per minute from a Boric Acid Makeup tank to the charging pump suction. Attachment 1, RCS Boration Guidance.*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		ATTACHMENT 1 RCS Boration Guidance NOTE • Step 1 in this attachment is applicable when the CVCS is normally aligned, with NO RCS boration or dilution in progress. If other than normal alignment, use guidance of 2-NOP-02.24, Boron Concentration Control. • An Operator Aid has been placed at RTGB-205. Any revision to this section of the procedure shall verify the validity of the Operator Aid and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Operator Aid Placard.	
	ATC	**1. BORATE** the RCS by the following: **A. START** either Boric Acid Pump 2A or 2B.	***ATC STARTS*** *Boric Acid Pump* ***ATC VERIFIES*** *Boric Acid Pump STARTS*
	ATC	**1. BORATE** the RCS by the following: **B. PLACE** FCV-2210Y, BORIC ACID (RTGB-205), control switch in AUTO.	***ATC PLACES*** *FCV-2210Y, BORIC ACID control switch in AUTO*
EXAMINER:			
	ATC	**1. BORATE** the RCS by the following: **C.** IF borating to the Charging Pump suction, THEN **OPEN** V2525, BORON LOAD CONTROL VALVE	***ATC PLACES*** *V2525, BORON LOAD control switch in OPEN* ***ATC IDENTIFIES*** *V2525, BORON LOAD* ***ATC REPORTS***
	SRO		***SRO DIRECTS ATC*** ***The SRO may alternately***
	ATC	**1. BORATE** the RCS by the following: **D.** IF borating to the VCT, THEN **OPEN** V2512, REACTOR MAKEUP WATER STOP VLV	***ATC PLACES*** *V2512, REACTOR MAKEUP WATER STOP VLV control switch in OPEN* ***ATC VERIFIES*** *V2512, REACTOR MAKEUP WATER STOP VLV is OPEN*
	ATC	**1. BORATE** the RCS by the following: **E. ADJUST** FIC-2210Y, BORIC ACID, to the desired flowrate.	***ATC ADJUST****S FIC-2210Y, BORIC ACID, to the desired flowrate of 15 gpm*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC	**1. BORATE** the RCS by the following: **F.** IF desired to maximize the boric acid flow rate, THEN **CLOSE** the running BAM pump recirc valve. • V2650, TANK 2A RECIRC VALVE • V2651, TANK 2B RECIRC VALVE	***ATC DETERMINES*** *not required*
	ATC	**1. BORATE** the RCS by the following: **G. CYCLE** V2513, VENT VALVE (RTGB-205) to maintain VCT pressure less than or equal to 30 psig.	***ATC CYCLES*** *V2513, VENT VALVE as necessary to maintain VCT pressure less than or equal to 30 psig*
	ATC	**1. BORATE** the RCS by the following: **H. CYCLE** V2500, DIVERT VALVE (RTGB-205) to WMS if necessary to maintain the desired VCT level.	***ATC CYCLES*** *V2500, DIVERT VALVE to WMS if necessary to maintain the desired VCT level*
	ATC		**ATC UPDATES** crew on Reactivity Addition
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWN POWER**	
	SRO	**2. PREPARE** turbine for load reduction per operations hard cards.	***SRO DIRECTS BOP*** *to set up the turbine for a target of 100 MW and load rate at 10 megawatts per minute per operations hard cards*
2-NOP-99.07		**The following actions are taken from 2-NOP-99.07 OPERATIONS HARD CARDS**	
2-NOP-99.07 OPERATIONS HARD CARDS **ATTACHMENT 3 TURBINE ADJUSTMENTS TO MAINTAIN POWER NOTE** **A Hard Card has been placed at RTGB-201. Any revision to this section of the procedure shall verify the validity of the Hard Card and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Hard Card placecard.**			
	BOP	**TURBINE ADJUSTMENTS TO MAINTAIN POWER**	***BOP ENSURES*** *Ovation display 5551, TURBINE CONTROL SYSTEM - OPERATION PANEL, is open*
	BOP	**TURBINE ADJUSTMENTS TO MAINTAIN POWER** **TOUCH MODIFY** from RAMP INTERFACE group.	***BOP TOUCHES MODIFY*** *from RAMP INTERFACE group*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**TURBINE ADJUSTMENTS TO MAINTAIN POWER** **ADJUST** values, as directed by SM/US, for the following on MODIFY RAMP SETPOINTS: (display 7055) • TARGET SELECT • RATE SELECT	***BOP ADJUSTS*** *values, as directed by SM/US, for the following on MODIFY RAMP SETPOINTS: (display 7055)* • *TARGET SELECT set at 100 MW* • *RATE SELECT set at 10 MW/min*
	BOP		***BOP NOTIFIES*** *SRO that the Turbine is set up with a Target of 100 MW at a rate of 10 MW/min*
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWNPOWER**	
	SRO	**3. INSERT** the Lead CEA Group approximately 6 inches to initially lower RCS temperature per operations hard cards.	***SRO DIRECTS ATC*** *to insert lead group CEAs 6 inches in Manual Sequential*
2-NOP-99.07		**The following actions are taken from 2-NOP-99.07, OPERATIONS HARD CARDS**	
2-NOP-99.07 OPERATIONS HARD CARDS **ATTACHMENT 1 CEDMCS OPERATIONS NOTE** **A Hard Card has been placed at RTGB-204. Any revision to this section of the procedure shall verify the validity of the Hard Card and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Hard Card placecard.**			
	ATC	**Moving CEAs in group** On CEDMCS Control Panel Group Select Switch, **SELECT** target group.	***ATC SELECTS*** *Target Group 5*
CAUTION When performing a rapid downpower due to a dropped CEA, then MANUAL GROUP (MG) shall be selected. This will prevent multiple CEA groups from moving.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC	**Moving CEAs in group** On CEDMCS Control Panel Mode Select Switch, **SELECT** mode of movement: MANUAL GROUP (MG) OR MANUAL SEQUENTIAL (MS)	***ATC SELECTS*** *MANUAL GROUP (MG) OR MANUAL SEQUENTIAL (MS) On CEDMCS Control Panel*
	ATC	**Moving CEAs in group** IF CEA Motion Inhibit is present, THEN PERFORM the following: PRESS and HOLD CMI BYPASS pushbutton. PRESS and RELEASE BYPASS ENABLE pushbutton.	***STEP*** *will be N/A* ***NO*** *CEA Motion Inhibit is present*
	ATC	**Moving CEAs in group** **POSITION** group as desired using INSERT/WITHDRAW Manual Control lever.	***ATC POSITIONS*** *group as directed to 6" inserted from previous position using INSERT/WITHDRAW Manual Control lever*
	ATC	**Moving CEAs in group** IF CMI BYPASS pushbutton is being held, THEN **RELEASE** CMI BYPASS pushbutton.	***STEP*** *will be N/A* ***NO*** *CEA Motion Inhibit is present*
	ATC	**Moving CEAs in group** **OBSERVE** RSPT AND Pulse Counter CEA position indications to verify CEA motion and alignment.	***ATC OBSERVES*** *RSPT AND Pulse Counter CEA position indications and verifies CEA motion and position*
	ATC	**Moving CEAs in group** On CEDMCS Control Panel, **SELECT** OFF on Mode Select Switch when the desired height is reached.	***ATC SELECTS*** *OFF on Mode Select Switch when the desired height is reached*
	ATC	**Moving CEAs in group** **ENSURE** RSPT and Pulse Counter indications match.	***ATC ENSURES*** *RSPT and Pulse Counter indications match*
	ATC		***ATC Updates crew on Reactivity Addition***
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWNPOWER**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		4.2 Subsequent Operator Actions	
	SRO	**1. WHEN** Tavg begins to lower and is less than Tref, THEN **TOUCH** GO from RAMP INTERFACE group. (OVATION display 5551)	***DIRECTS ATC*** *to monitor Tavg and to notify him when it is lowering and less than Tref*
	ATC		***ATC NOTIFIES*** *the SRO that Tavg is lowering and less than Tref*
	SRO		***DIRECTS BOP*** *to* ***TOUCH GO*** *from RAMP INTERFACE group. (OVATION display 5551)*
	BOP		***BOP*** *to* ***TOUCHES GO*** *on the RAMP INTERFACE group to begin turbine load reduction per operations hard cards as follows:* *5.* ***TOUCH GO*** *from RAMP INTERFACE group. (display 5551)* *6.* ***MONITOR*** *turbine governor valves response on Ovation main operation window, TURBINE CONTROL SYSTEM – OPERATION PANEL. (display 5551)* ***BOP Updates crew on load reduction initiation.***
	SRO/ATC	SRO directs ATC to MAINTAIN T-avg and T-ref	***8. MAINTAIN*** *T-avg and T-ref as close as possible during load changes by adjusting either or both of the following:* • *Reactivity rate* • *Turbine load rate*
	SRO	**2. NOTIFY** plant personnel using Gai-tronics and boost function as follows: "Attention all personnel, Unit 2 has commenced a Rapid Downpower due to _____."	***DIRECTS BOP to NOTIFY*** *plant personnel using Gai-tronics and boost function as follows:* *"Attention all personnel, Unit 2 has commenced a Rapid Downpower due to excessive RCS leakage."*
	BOP		***NOTIFIES*** *plant personnel using Gai-tronics and boost function as follows:* *"Attention all personnel, Unit 2 has commenced a Rapid Downpower due to excessive RCS leakage."*
	SRO	**3. NOTIFY** System of the rapid downpower load reduction.	***DIRECTS BOP*** *to* ***NOTIFY*** *System of the rapid downpower*
	BOP		***NOTIFIES*** *System of the rapid downpower, via dedicated RED phone.*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE OPS-530, Pre-Planned Power Change Guidance, delineates operations department policy for the use of pre-planned downpower profiles provided by the Plant Physics Curve Book.	
	SRO	**4. PERFORM** a Crew update to include the following: • Expected final power level • Initial boration rate • Initial load rate • Expected amount of boric acid addition • Expected amount of CEA motion using pre-planned downpower profiles in the Plant Physics Curve Book	***SRO UPDATES*** *crew with the following information:* • *Expected final power level Offline* • *Initial boration rate 15 GPM* • *Initial load rate of 10 MW/MIN* • *Expected amount of boric acid addition Per preplanned power guidance* • *Expected amount of CEA motion Per preplanned power guidance*
	SRO	**5. PLACE** Pressurizer on recirculation per operations hard cards.	***SRO should recognize*** *heaters are all on to maintain pressure from PZR safety valve leak. Recirculation should not be directed as this will lower pressure*
	SRO	**6. START** additional charging pump as required per operations hard cards.	***SRO DIRECTS ATC*** *to* ***START*** *a second charging pump per operations hard cards, if not previously started*
2-NOP-99.07		**The following actions are taken from 2-NOP-99.07, OPERATIONS HARD CARDS**	
		2-NOP-99.07 OPERATIONS HARD CARDS **ATTACHMENT 8 CHARGING PUMP OPERATIONS WHILE IN AN AOP NOTE** **A Hard Card has been placed at RTGB-201. Any revision to this section of the procedure shall verify the validity of the Hard Card and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Hard Card placecard.**	
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW** IF in MODE 1 or 2, THEN PLACE V2520, ION EXCHANGER BYPASS VALVE, in BYPASS to minimize reactivity effects of changing letdown temperature.	***BOP PLACES*** *V2520, ION EXCHANGER BYPASS VALVE, in BYPASS*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW	
		NOTE • When starting OR stopping a charging pump with LIC-2110, LETDOWN LEVEL, in Single Element Mode, it may be necessary to place the controller in Manual Mode to prevent pressurizer level from deviating too far from setpoint. • In Manual Mode, the letdown flow should be adjusted as necessary to maintain pressurizer level at setpoint. The controller should be returned to Auto when it reaches setpoint with the desired number of charging pumps running.	
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: START** charging pump by placing its control switch in START.	***BOP STARTS*** *Second charging pump by placing its control switch in START*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: PLACE** CHRG PUMP SEL RUNNING - B/U PP switch in proper position per operator aid.	***BOP PLACES*** *CHRG PUMP SEL RUNNING - B/U PP switch in proper position per operator aid*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: WHEN** 3 minutes has elapsed since pump start, THEN ENSURE associated recirc valve is CLOSED.	***BOP ENSURES*** *Second Charging Pp recirc valve is CLOSED*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW:** WHEN letdown temperature stabilizes, THEN **ENSURE** V2520, ION EXCHANGER BYPASS VALVE, control switch is returned to AUTO.	***BOP ENSURES*** *V2520, ION EXCHANGER BYPASS VALVE, control switch is returned to AUTO after temp stabilizes*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: NOTIFY** RP and SNPO of current charging pump alignment.	***BOP NOTIFIES*** *RP and SNPO of starting of the Second charging pump*
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWNPOWER**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE • The procedural limit for ASI control is +/- 0.5 of ESI. It is desired to maintain ASI within a control band of +/- 0.2 of ESI. • US may direct temporary operation outside of ASI limit.	
	SRO	**7. MAINTAIN** Axial Shape Index ±0.5 of ESI using CEAs.	***DIRECTS ATC*** *to maintain ASI to within +/- 0.2 of ESI using the sliding scale with lead group CEAs IAW 0-NOP-100.02 Axial Shape Index Control unless recommended otherwise by Reactor Engineering*
	ATC		***POSITIONS*** *lead group CEAs to control ASI to within +/- 0.2 from the ESI on the sliding scale IAW 0-NOP-100.02 Axial Shape Index Control*
		NOTE The procedural limit for Tave-Tref mismatch is +/- 6.6 degrees °F. It is desired to maintain a control band of +/- 2 degrees °F	
	SRO	**8. MAINTAIN** Tref and Tavg within 6.6 °F.	***DIRECTS ATC*** *to maintain Tave-Tref mismatch within +/- 2 degrees °F*
	SRO	**9.** IF reducing power by more than 20%, THEN **NOTIFY** SNPO to secure Zinc Injection per 2-NOP-02.26, Zinc Addition.	***DIRECTS BOP*** *to dispatch a SNPO to secure Zinc injection*
		NOTE Condenser back pressure is provided on OVATION displays 5559, TURBINE EXHAUST HOOD SPRAY AND CONDENSER VACUUM and 5605, CONDENSER VACUUM MONITORING. The condenser back pressure trip and alarm setpoints are variables that are dependent on power level.	
	SRO	**10. VERIFY** Condenser Back Pressure less than 8.859 inHgA.	***DIRECTS BOP*** *to report Condenser Backpressure*
		NOTE OVATION displays 5559, TURBINE EXHAUST HOOD SPRAY AND CONDENSER VACUUM and 5605, CONDENSER VACUUM MONITORING, indicate time remaining before an automatic Turbine Trip is initiated by DEH, when operating in the Restricted Operating Region.	
	SRO	**11. VERIFY** Condenser Back Pressure below alarm limits Acceptable Operating Region Attachment 4, Condenser Pressure Limitations. **OR** OVATION display 5605, CONDENSER VACUUM MONITORING.	***DIRECTS BOP*** *to monitor Condenser Backpressure*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	4	
Event Description:	**2B S/G Tube Leak/Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**12. VERIFY** CONDENSER DIFFERENTIAL pressure less than 2.0 inHgA. (OVATION display 5559 OR 5605)	***DIRECTS BOP*** *to monitor Condenser differential pressure*
	SRO	**13. VERIFY** parameters listed on Attachment 3, Rapid Downpower Parameters, are within limits.	***DIRECTS BOP*** *to monitor parameters listed on Attachment 3*
		NOTE Rapid Downpower may result in Pressurizer Pressure dropping below DNBR Limit.	
	SRO	**14. MAINTAIN** PZR pressure between 2225 and 2275 psia.	***DIRECTS ATC*** *to* ***MAINTAIN*** *PZR pressure between 2225 and 2275 psia by controlling HIC-1100*
		NOTE A large rate of change in Tavg may cause transient level variance.	
	SRO	**15. MAINTAIN** PZR level between 27% and 68%.	***DIRECTS ATC*** *to* ***MAINTAIN PZR*** *level between 27% and 68%*
	SRO	**16.** WHEN Final power level is achieved, THEN **GO TO** Section 4.2, Step 35 to STABILIZE the unit.	***SRO*** *will continue with procedure to remove the unit offline*
Proceed to Event 5.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	5	
Event Description:	**2A2 RCP Shaft Seizure / S/G Tube Rupture**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
			Note to Evaluator: 2A2 RCP shaft slowly seizes is a malfunction initiated from the Booth upon direction by the evaluator, the 2B SGTR is an auto triggered step initiated when reactor power is < .5%
			Booth Operator Instructions: • **Upon cue from Lead Examiner, trigger Event 5: 2A2 RCP shaft slowly seizes, 2B SGTR ramped up.** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**
			Indications: **Pressurizer pressure and level lowering, Radiation Monitor levels rising** **Annunciators:** **J-10, 2A2 RCP HI VIBRATION HIGH THRUST BRG TEMP**
	ATC		**RECOGNIZES** 2A2 RCP high amps and recommends Reactor trip
	SRO		**DIRECTS** Reactor trip
	ATC		**TRIPS Reactor**
	ATC		**CONFIRMS** reactor power is lowering and startup rate is negative. **REPORTS "REACTOR TRIPPED"** **States evaluating CEAs or that all CEAs are inserted**
	SRO		**DIRECTS** securing of 2A2 RCP
	ATC		**TRIPS** 2A2 RCP
	BOP		**VERIFIES** all governor and throttle valves closed **REPORTS "Turbine Tripped"**
	BOP		**ANNOUNCE** on the Gaitronics: Unit 2 Reactor has tripped **NOTIFY** the NPO to perform Appendix X, Section 1 of EOP-99 **CONTACT** the SM, STA and Shift Comm. to report to the Control Room
	SRO		**PERFORMS** Scan of RTGBs to quickly assess the plant status by systematically reviewing key safety parameters/system conditions of the control boards

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	5	
Event Description:	**2A2 RCP Shaft Seizure / S/G Tube Rupture**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC		**REPORTS** "All CEAs INSERTED" if not reported previously
	SRO		**DIRECTS** IMPLEMENTATION OF EOP-01 STANDARD POST TRIP ACTIONS
	ATC		**RECOGNIZES** RCS lowering pressures and communicates to SRO
2-EOP-01		**The following actions are taken from 2-EOP-01, Standard Post Trip Actions**	
4.1 Immediate Operator Actions: • **ATC: Verifies Reactor power lowering, Negative Startup rate, all CEAs and verifies no dilution is in progress inserted and communicates status to the Unit Supervisor. Starts backup charging pumps as necessary.** • **BOP: Verifies all governor and throttle valves closed and communicates status to the Unit Supervisor. Makes plant announcements and trip notifications.**			
4.0 Operator Actions:			
	SRO	**Step 1 VERIFY reactor trip:**	***SRO DIRECTS VERIFY*** *Reactor trip, ATC Verifies:* ☐ *Reactor power LOWERING* ☐ *Startup Rate NEGATIVE* ☐ *All CEAs are fully INSERTED* ☐ *NO dilution is in progress*
	SRO	**Step 2 VERIFY turbine trip:**	***SRO DIRECTS VERIFY*** *turbine trip, BOP Verifies:* ☐ *All governor and throttle valves CLOSED* ☐ *Main Generator breakers are OPEN* ☐ *Turbine speed LOWERING*
	SRO	**Step 3 VERIFY Maintenance of Vital Auxiliaries:**	***SRO DIRECTS VERIFY*** *Maintenance of Vital Auxiliaries, BOP Verifies:* ☐ *VERIFY station loads transferred to offsite electrical power* ☐ *VERIFY all Vital and Non-Vital AC buses transfer from Auxiliary to Start-up Transformers AND are ENERGIZED* ☐ *VERIFY all Vital and Non Vital DC Buses are ENERGIZED* ***EVENT 6 will present itself at this point 2A3 4160 bus locks out*** ☐ *VERIFY seal cooling to RCPs:*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	5	
Event Description:	**2A2 RCP Shaft Seizure / S/G Tube Rupture**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 4 VERIFY RCS Inventory Control:**	***SRO DIRECTS VERIFY*** *RCS Inventory Control, ATC Verifies:* ☐ *Pressurizer level is between 10 and 68%* ☐ *Pressurizer level is trending to between 30 and 35%* **Pressurizer level will be abnormally low due to the Steam Generator Tube Rupture. This parameter will drive the crew to enter 2-EOP-04**
	SRO	**Step 5 VERIFY RCS Pressure Control:**	***SRO DIRECTS VERIFY*** *RCS Pressure Control, ATC Verifies:* ☐ *Pressurizer pressure is between 1800 and 2300 psia* ☐ *Pressurizer pressure is trending to between 2225 and 2275 psia* **RCS Pressure will be abnormally low due to the Steam Generator Tube Rupture. This parameter will drive the crew to enter 2-EOP-04**
	SRO	**Step 6 VERIFY Core Heat Removal:**	***SRO DIRECTS VERIFY*** *Core Heat Removal, ATC Verifies:* ☐ *At least one RCP is RUNNING and all RUNNING RCPs are supplied with CCW.* ☐ *Loop ΔT is less than 10°F* ☐ *RCS subcooling greater than or equal to 20°F* ☐ *NO indication of RCP cavitation*
	SRO	**Step 7 VERIFY RCS Heat Removal:**	***SRO DIRECTS VERIFY*** *RCS Heat Removal, ATC Verifies:* ☐ *VERIFY the following conditions exist on at least one S/G:* • *S/G NR level is between 20 and 81%* • *Feedwater is being supplied* ☐ *IF 2A or 2B AFW Pump is the ONLY source of Feedwater, THEN STOP one RCP in each loop* ☐ *VERIFY at least ONE of the following is supplying feedwater to the S/G(s):* • *Main or Auxiliary Feedwater* ☐ *VERIFY RCS TAVG is between 525 and 535˚F.* ☐ *VERIFY S/G pressure is between 850 and 930 psia (835 and 915 psig)*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	5	
Event Description:	**2A2 RCP Shaft Seizure / S/G Tube Rupture**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 8 VERIFY containment conditions:**	***SRO DIRECTS*** *VERIFY* containment conditions*, BOP Verifies:* ☐ *Containment pressure is less than 2 psig.* ☐ *Containment temperature is less than 120°F* ☐ *Containment radiation level less than alarm values AND stable or lowering:* • *CIS Radiation Monitors* • *Containment Atmospheric Monitors* ☐ *Secondary plant radiation levels less than alarm values AND stable or lowering* • *Condenser Air Ejector Monitor* • *S/G Blowdown Monitors* • *Main Steamline Monitors* ***Secondary Radiation Monitors will be abnormally high due to the Steam Generator Tube Rupture. This parameter will drive the crew to enter 2-EOP-04***
	SRO	**Step 9 DIRECT a field operator to perform the following:**	***SRO DIRECTS BOP*** *to perform step 9, BOP performs step 9:* ☐ *Directs NPO to perform Section 1 of Appendix X, Secondary Plant Post Trip Actions* ☐ *Directs SNPO to VERIFY SFP inventory and temperature are normal on all available indications*
	SRO	**Step 10 DIAGNOSE the event using Attachment 1, Diagnostic Flow Chart.**	***SRO DIAGNOSE*** *the event using Attachment 1, Diagnostic Flow Chart and determines an SGTR is in progress*
	SRO	**Step 11 GO TO the appropriate Emergency Operating Procedure.**	***SRO PERFORMS*** *a crew brief and transitions to 2-EOP-04*
	ALL		**RECOGNIZE** 2A Steam Generator level and radiations are abnormal
	SRO		Enter 2-EOP-04
2-EOP-04		**The following actions are taken from 2-EOP-04, Steam Generator Tube Rupture**	
4.2 Immediate Operator Actions: • **NONE**			
4.0 Operator Actions:			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	5	
Event Description:	**2A2 RCP Shaft Seizure / S/G Tube Rupture**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 1 MONITOR** the **SFSCs** and **VERIFY** the **SFSC** acceptance criteria are MET every 15 minutes.	***SRO DIRECTS*** *MONITOR the SFSCs and VERIFY the SFSC acceptance criteria are MET every 15 minutes* ☐ *STA or Extra RCO performs SFSCs*
	SRO	**Step 2 IMPLEMENT** the Emergency Plan.	***SRO NOTIFIES*** *the Shift Manager to IMPLEMENT the Emergency Plan*
	SRO	**Step 3 IMPLEMENT** place keeping.	***SRO IMPLEMENTS*** *the place keeper*
	SRO	**Step 4 SAMPLE** steam generators for activity per Appendix A, Sampling Steam Generators**.**	***SRO DIRECTS*** *the BOP to perform Appendix A of 2-EOP-99 to SAMPLE steam generators for activity:* *The BOP performs Appendix A of 2-EOP-99*
	SRO	**Step 5 VERIFY SIAS is ACTUATED.**	**This is a continuous step and will be performed after SIAS actuation conditions are met.** ***SRO VERIFIES*** *SIAS actuated when either of the following conditions are met:* ☐ *Pressurizer pressure is less than 1736 psia* ☐ *Containment Pressure is greater than 3.5 psig*
	SRO	**Step 6 OPTIMIZE SI as follows:**	***SRO VERIFIES:*** ☐ *SIAS is ACTUATED* ☐ *SI pumps are OPERATING* ☐ *SI flow within Figure 2, Safety Injection Flow vs. RCS Pressure* ☐ *All available charging pumps are RUNNING* ☐ *Charging header is available*
	SRO	**Step 7 IMPLEMENT RCP Trip Strategy as follows:** • **VERIFY pressurizer pressure is less than 1736 psia.** • **VERIFY SIAS is ACTUATED.** • **ENSURE** one **RCP** in each loop is STOPPED. • **VERIFY RCS** subcooling greater than minimum subcooling.	***SRO IMPLEMENTS*** *RCP Trip Strategy* ***IF*** *prior to LOOP trip 2 leave 2 running* ***IF*** *post LOOP then N/A*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	5	
Event Description:	**2A2 RCP Shaft Seizure / S/G Tube Rupture**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 8 VERIFY RCP Seal Cooling as follows:** • **VERIFY CCW to the RCPs.**	***WHEN SIAS*** *occurs CCW will be lost* ***2A3 4160 bus is locked out leaving 1 CCW pump the crew should not restore CCW to the RCPs due to only having one train of CCW operable***
	SRO	**Step 9 CHECK if RCPs are operating within limits:** • **VERIFY at least one RCP OPERATING.** • **For all operating RCPs, VERIFY operating limits are MET per Table 13, RCP Operating Limits.**	***SRO DIRECTS ATC*** *to* ***VERIFY*** *operating limits are MET per Table 13, RCP Operating Limits for any running RCPs* *The* ***ATC*** *to* ***VERIFIES*** *operating limits are MET per Table 13, RCP Operating Limits for any running RCPs*
	SRO	**Step 10 INITIATE lowering RCS Thot to less than 510°F using SBCS.**	***SRO DIRECTS ATC*** *to INITIATE lowering RCS Thot to less than 510°F using SBCS* ***EVENT 7 WILL PRESENT ITSELF WHEN THE RCO PLACES THE SBCS TO MANUAL FOR THE RCS COOLDOWN***
	SRO	**The SRO Will evaluate the plant and determine that a dual event is in progress and re-evaluates**	*SRO exits to 2-EOP-15 Functional Recovery*
The Scenario can be terminated once the 2A S/G is isolated by the control room steps or at the lead evaluator's discretion.			

Appendix D			Operator Action						Form ES-D-2
Op Test No.:	L-19-1		Scenario #	4	Event #	6			
Event Description:	**2A3 4.16 Bus Lockout**								
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior						

CT-2	RESTORE AC POWER – RESTORE POWER TO A VITAL AC 480 V AB BUS. ALIGN 2AB 480V LC TO 'B' TRAIN TO POWER TO 2C CHARGING PP AND MEET FIG 2 WITHIN 15 MINUTES OF 2A3 4.16KV BUS LOCKOUT TO PREVENT UNNECESSARY ESCALATION OF THE EALS.

Note to Evaluator: 2A3 4160 bus locks out is an auto triggered step initiated when reactor power is < .5%

Booth Operator Instructions:

- **None; 2A3 4160 bus locks out on trip**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications:

Annunciators:

2-EOP-01	**The following actions are taken from 2-EOP-01**

3. VERIFY Maintenance of Vital Auxiliaries:

	BOP/SRO	**A. VERIFY station loads transferred to offsite electrical power:** (1) VERIFY all Vital and Non-Vital AC buses transfer from Auxiliary to Start-up Transformers AND are ENERGIZED.	***RECOGNIZES*** *The 2A3 4.16 kv Bus is de-energized and Locked –out* ***COMMUNICATES*** *to the SRO* ***SRO DIRECTS ENSURING 2AB 480V Load Center is aligned to an energized bus.***
	BOP		**ALIGNS** the 2AB 480V Load Center to the "B" train
	BOP		**COMMUNICATES** to the **SRO** the status of the 2AB Load Center

At the Lead Evaluator's direction, PROCEED to Event 7.

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**						
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior				

Note to Evaluator: 2A S/G Main Steam Line Break is triggered when the operator takes the control switch for steam bypass to the manual position. This a failed open main steam safety valve located on the 2A main steam header.

Booth Operator Instructions:

- **NONE: 2A S/G Main Steam Line Break**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**
- **If called as the NPO to report on any steaming from the secondary, wait 1 minute and report "Steam is coming from the 2A main steam header"**

2-EOP-15	**The following actions are taken from 2-EOP-15 "Functional Recovery"**

4.0 Operator Actions:

	SRO	**Step 1 Classify Event** EVALUATE EPIP Classification criteria for present plant conditions and Emergency Plan Actions **REFER TO** EPIP-01, Classification of Emergencies.	***SRO DIRECTS*** *Sm to EVALUATE EPIP Classification criteria for present plant conditions and Emergency Plan Actions*
	SRO	**Step 2 Implement Place keeping** OPEN the Place keeper and NOTE the time of EOP entry.	***SRO IMPLEMENTS*** *the placekeeper*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 3 RCP Trip Strategy** **A.** If **ANY** of the following conditions exist, ☐2A or 2B AFW Pump is the **ONLY** source of Feedwater ☐RCS pressure is less than 1736 psia ☐RCS Temperature is less than 500☐F Then STOP **ONE** RCP in **EACH** loop **B.** If **ANY** of the following conditions exist, ☐Main or Auxiliary Feedwater flow can NOT be re-established ☐RCS subcooling is less than minimum subcooling ☐CCW is LOST to the RCPs for greater than 10 minutes Then STOP **ALL** RCPs.	***SRO IMPLEMENTS*** *RCP Trip Strategy* ***IF SIAS has occurred the crew will trip 2 RCPs and Leave 2 RCPs running CCW will be lost 2A3 4160 bus is locked out leaving 1 CCW pump the crew should not restore CCW to the RCPs due to only having one train of CCW operable***
	SRO	**Step 4 Ensure RCP Seal Cooling** **A.** VERIFY CCW to the RCPs. **B.** If **BOTH** of the following conditions exist, ☐ RCPs have CCW flow ☐ CIAS has isolated the normal RCP bleed off flow path to the VCT Then ESTABLISH the alternate RCP bleed off flow path to the Quench Tank by OPENING V2507, RCP Bleed off Relief Stop Vlv.	***WHEN SIAS occurs CCW will be lost 2A3 4160 bus is locked out leaving 1 CCW pump the crew should not restore CCW to the RCPs due to only having one train of CCW operable***
	SRO	**Step 5 Verify RCP Operating Limits** If RCPs are RUNNING, Then VERIFY RCP operating limits are satisfied **REFER TO** Table 13, RCP Operating Limits	***SRO DIRECTS ATC to VERIFY*** *operating limits are MET per Table 13, RCP Operating Limits for any running RCPs* ***The ATC to VERIFIES*** *operating limits are MET per Table 13, RCP Operating Limits for any running RCPs*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 6 Sample S/Gs** Sample **BOTH** S/Gs for activity and boron **REFER TO** Appendix A, Sampling Steam Generators	*The **SRO DIRECTS** the BOP to **PERFORM** Appendix A of 2-EOP-99, Sampling Steam Generators*
	SRO	**Step 7 Protect Main Condenser** PERFORM **BOTH** of the following: **A.** If Circulating Water flow to the Main Condenser has been lost, Then PERFORM **BOTH** of the following to protect the Secondary Plant: **1.** ENSURE MSIVs are CLOSED. **2.** ENSURE SGBD is ISOLATED. **B.** STABILIZE the Secondary Plant **AS NECESSARY**. **REFER TO** Appendix X, Secondary Plant Post Trip Actions, Section 2	***SRO VERIFIES** circulating water flow to the main condenser* ***SRO DIRECTS** the BOP to Perform Appendix X, Secondary Plant Post Trip Actions, Section 2 as time permits* ***The BOP PERFORMS** Appendix X, Secondary Plant Post Trip Actions, Section 2 as time permits*
	SRO	**Step 8 Restore Instrument Air** If a LOOP has occurred, Then PERFORM **BOTH** of the following: **A.** ENSURE 2AB 480V Load Center is aligned to an energized bus **B.** DISPATCH an operator to restore Instrument Air. **REFER TO** Appendix H, Operation of the 2A and 2B Instrument Air Compressors	***SRO IDENTIFIES** step is N/A*
	SRO	**Step 9 Perform Safety Function Status Checks** PERFORM the Safety Function Status Checks every 15 minutes **REFER TO** Attachment 1, Safety Function Status Check Sheet	*The **SRO DIRECTS** the STA to perform SFSCs now and every fifteen minutes*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 10 Identify Success Paths** IDENTIFY the success paths to be used to satisfy each safety function **REFER TO** Attachment 3, Functional Recovery Success Paths	***SRO UTILIZES*** *to evaluate safety function Status*
2-EOP-15 ATT 3		**The following actions from 2-EOP-15 ATT 3**	
	SRO	**Reactivity Control** RC-1, CEA Insertion RC-2, Boration via CVCS RC-3, Boration via SIAS	***SRO EVALUATES*** *and DETERMINES* ***Reactivity Control*** *is met by RC-3*
	SRO	**Maint of Vital Aux – DC** MVA-DC-1, Batteries/Chargers	***SRO EVALUATES*** *and DETERMINES* **Maint of Vital Aux – DC** *is met by MVA-DC-1*
	SRO	**Maint of Vital Aux – AC** MVA-AC-1, Startup Transformers MVA-AC-2, EDGs MVA-AC-3, Unit Crosstie	***SRO EVALUATES*** *and DETERMINES* **Maint of Vital Aux – AC** *is met by MVA-AC-1*
	SRO	**RCS Inventory Control** IC-1, CVCS IC-2, Safety Injection	***SRO EVALUATES*** *and DETERMINES* **RCS Inventory Control** *is met by IC-2*
	SRO	**RCS Pressure Control** PC-1, Subcooled Control PC-2, PORVs/Pzr Vent PC-3, Saturated Control	***SRO EVALUATES*** *and DETERMINES* **RCS Pressure Control** *is met by PC-3*
	SRO	**RCS & Core Heat** HR-1, S/G Without SIAS HR-2, S/G With SIAS HR-3, Once Through Cooling	***SRO EVALUATES*** *and DETERMINES* **RCS & Core Heat** *is met by HR-2*
	SRO	**Containment Isol** CI-1, Automatic/Manual Isol	***SRO EVALUATES*** *and DETERMINES* **Containment Isol** *Is* ***NOT*** *met*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Cntmt Press & Temp** CTPC-1, Normal Cntmt Fans CTPC-2, Cntmt Fan Coolers CTPC-3, Cntmt Spray	***SRO EVALUATES*** *and DETERMINES* **Cntmt Press & Temp** *Is met by CTPC-1*
	SRO	**Step 11 Perform Success Path Instructions** PERFORM **ALL** of the following **IN THE ORDER LISTED.** **A.** Instructions for a success path **MOST LIKELY** to be met for safety functions that are NOT met by **ANY** success path. **B.** Instructions for success paths for safety functions that are NOT met by Success Path 1. **C.** Instructions for **ALL** other success paths for safety functions met by Success Path 1.	***SRO DETERMINES CI-1*** *is the success path to be addressed first and* ***PERFORMS CI-1***
2-EOP-15 CI-1		**The following actions from 2-EOP-15 CONTAINMENT ISOLATION –CI-1**	
	SRO	**1. Ensure Containment Isolation and Cooling** If **ANY** of the following conditions exist, ☐ Containment pressure greater than 3.5 psig ☐ Containment radiation greater than 10 R/hr ☐ SIAS is ACTUATED Then PERFORM **ALL** the following: **A.** VERIFY **BOTH** the following: **1.** VERIFY CIAS has ACTUATED **2.** If Containment pressure is greater than 3.5 psig, Then VERIFY MSIS has ACTUATED **B.** ENSURE **ALL** available Emergency Containment HVAC systems are RUNNING: ☐ At least **ONE** train of SBVS ☐ At least **ONE** train of Containment Fan Coolers	***SRO EVALUATES*** *and DETERMINES* **SIAS is ACTUATED**

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		CAUTION If there is a conflict between isolating a S/G with indications of S/G tube leakage or isolating a S/G with an unisolable steam leak, Then the S/G with the ESD should be isolated. At least **ONE** S/G must remain available for heat removal.	
	SRO	**2. Determine If SGTR Present** If a SGTR has occurred as indicated by **ANY** of the following, • S/G activity • Main steam piping radiation • S/G level change when NOT feeding • S/G blowdown activity • **ONE** S/G level rising faster than the other with feed and steaming rates being essentially the same for **BOTH** • Feedflow mismatch between S/Gs • Steam flow vs. feed flow mismatch in a S/G **PRIOR** to the trip Then IDENTIFY and ISOLATE the **MOST** affected S/G. **REFER TO** Heat Removal Success Path HR-1 Steps 1 through 24 or HR- 2 Steps 1 through 28, and **RETURN TO** this success path when the MOST affected S/G is ISOLATED.	***SRO EVALUATES*** *and DETERMINES 2B has a SGTR and* **REFERS TO** Heat Removal Success Path HR- 2 Steps 1 through 28
2-EOP-15 HR-2		**The following actions from 2-EOP-15 RCS and CORE HEAT REMOVAL – HR-2**	
	SRO	**1. Ensure Safety Injection Actuation** If **ANY** of the following conditions exist, ☐ RCS pressure is less than 1736 psia ☐ Containment pressure is greater than 3.5 psig Then VERIFY SIAS has ACTUATED.	***SRO EVALUATES*** *and DETERMINES Safety Injection has actuated*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**2. Maximize SI Flow** If SIAS is present, Then PERFORM ALL of the following: **A**. VERIFY ALL available SI Pumps are RUNNING. **B**. VERIFY adequate SI flow. REFER TO Figure 2, Safety Injection Flow vs. RCS Pressure **C.** VERIFY ALL available Charging Pumps are RUNNING	***SRO EVALUATES and DETERMINES*** *Safety Injection flow is adequate* *ALL available SI Pumps are RUNNING* *Figure 2, Safety Injection Flow vs. RCS Pressure is met* *ALL available Charging Pumps are RUNNING*
	SRO	**3. Depressurize RCS for SI Flow** If Safety Injection flow is inadequate due to high RCS pressure, Then DEPRESSURIZE the RCS: **A**. CONTROL RCS temperature **B**. CONTROL pressurizer heaters and main or auxiliary spray **C.** OPERATE the PORVs or Pressurizer Vents AS NECESSARY	***SRO EVALUATES and DETERMINES*** *Safety Injection flow is adequate*
	SRO	**4. Maintain RCS Subcooling (SBO)** If Station Blackout has occurred, and at least **ONE** vital 4.16 KV AC bus is NOT energized, Then MAINTAIN RCS subcooling: **A.** PERFORM a plant cooldown **AS NECESSARY** to maintain RCS subcooling based on Rep CET temperature **B.** VERIFY the reactor will remain shutdown for 50°F less than the indicated TCOLD and boron concentration at the time of the event initiation, at 50°F intervals	***SRO DETERMINES*** *step is N/A*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**5. Cooldown RCS** If at least **ONE** Vital 4.16 KV bus is energized, Then PERFORM the following: **A.** COOLDOWN the RCS using SBCS **1.** If RCPs are operating, Then COOLDOWN not to exceed 100°F in **ANY** 1 hour period **2.** If RCPs are NOT operating, Then COOLDOWN not to exceed 50°F in **ANY** 1 hour period **3.** If RCPs are NOT operating and a S/G is ISOLATED for a SGTR event, Then COOLDOWN not to exceed 30°F in **ANY** 1 hour period **B.** BORATE the RCS until Shutdown Margin is greater than the value required by the COLR **REFER TO** 2-NOP-02.24, Boron Concentration Control	***SRO DIRECTS the ATC to*** *COOLDOWN not required due to a cooldown associated with the 2A MSSV being open*
	SRO	**6. Verify Single Phase Natural Circulation** If **NO** RCPs are operating, Then VERIFY natural circulation flow in at least **ONE** loop by **ALL** of the following: • Loop ΔT (THOT-TCOLD) less than 50°F • Hot leg temperature constant or lowering • Cold leg temperature constant or lowering • RCS subcooling is greater than minimum subcooling, based on Rep CET temperature • NO abnormal difference (greater than 20°F) between THOT and Rep CET temperature	***SRO EVALUATES*** *and DETERMINES Step is N/A*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**7. Ensure Two Phase Natural Circulation** If **NO** RCPs are operating, and single phase natural circulation can NOT be maintained, Then ENSURE **ALL** of the following conditions exist, • **ALL** available Charging pumps are RUNNING • SI flow is within the SI flow delivery curve. **REFER TO** Figure 2. Safety Injection Flow vs. RCS Pressure • At least **ONE** S/G is available for RCS heat removal with level being restored to or maintained between 60 and 70% NR • Rep CET temperature is less than 22°F superheated	***SRO EVALUATES** and DETERMINES this step is* **N/A**
		CAUTION Containment Conditions safety functions should be under **positive control** prior to blocking safeguards signals. Safety functions should be closely monitored for degradation. Manual actuation of ESFAS may be necessary should conditions warrant.	
	SRO	**8. Block MSIS** As the RCS cooldown and depressurization proceed, PERFORM the following: **A.** If MSIS is NOT present, Then BLOCK automatic initiation of MSIS.	***SRO EVALUATES and DETERMINES this step is N/A***
		CAUTION If there is a conflict between isolating a S/G with indications of S/G tube leakage or isolating a S/G with an unisolable steam leak, Then the S/G with the ESD should be isolated. At least **ONE** S/G must remain available for heat removal.	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**9. Determine If ESD Present** If an ESD has occurred as indicated by **ANY** of the following, • High steam flow from S/G • Lowering S/G pressure • Lowering S/G level • Lowering RCS cold leg temperature • Lowering Pressurizer pressure • Lowering Pressurizer level Then DETERMINE the **MOST** affected steam generator.	***SRO EVALUATES*** *and DETERMINES an ESD is present and the most affected S/G is the 2A*
	SRO	**10. If No ESD, GO TO Step 15** **If there are NO ESD indications,** **Then GO TO Step 15.**	***SRO EVALUATES and DETERMINES this step is N/A***
	SRO	**11. Isolate the MOST Affected S/G** If MSIS has NOT isolated the leak, Then ISOLATE the **MOST** affected S/G. **REFER TO** Appendix R, Steam Generator Isolation.	***SRO EVALUATES*** *and DETERMINES the 2A S/G is to be isolated and* ***DIRECTS*** *the BOP to ISOLATE the 2A S/G*
2-EOP-99 APP "R"		**The following actions are for Isolating Steam Generator 2A Using 2-EOP-99 APPENDIX "R" Section 1**	
Booth Operator Instructions: • **When called to perform the field operator steps for isolating the 2A S/G, Trigger: NPO ACTIONS FOR isolate 2A S/G** **Role Play:** • **When called as NPO to perform the field operator steps for isolating the 2A S/G then report back in 10 minutes that the steps are complete**			
	BOP	**1. ENSURE** HCV-08-1A, Main Steam Header 'A' Isolation Valve (MSIV), is CLOSED.	BOP **ENSURES HCV-08-1A, Main Steam Header 'A' Isolation Valve (MSIV), is CLOSED** STEP 2 If HCV-08-1A did not close remotely, Then PERFORM local closure. REFER TO Appendix I, MSIV Local Closure

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**3. ENSURE** MV-08-1A, MSIV Header 'A' Bypass Valve, is CLOSED**.**	***BOP ENSURES MV-08-1A, MSIV Header 'A' Bypass Valve, is CLOSED***
	BOP	**4. ENSURE** HCV-09-1A, Main Feedwater Header 'A' Isolation Valve, is CLOSED.	***BOP ENSURES HCV-09-1A, Main Feedwater Header 'A' Isolation Valve, is CLOSED***
	BOP	**5. ENSURE** HCV-09-1B, Main Feedwater Header 'A' Isolation Valve, is CLOSED.	***BOP ENSURES ENSURE HCV-09-1B, Main Feedwater Header 'A' Isolation Valve, is CLOSED.*** *Step 6.If BOTH HCV-09-1A and HCV-09-1B, Main Feedwater Isolation Valves to S/G 2A, are NOT CLOSED or suspected of leaking,* *Then PERFORM ANY of the following AS NECESSARY:* *☐ A. ENSURE ALL of the following valves are CLOSED:* *☐ MV-09-5, Stm Gen 2A Reg Block Valve* *☐ LCV-9005, 2A 15% Bypass* *☐ MV-09-3, 2A 100% Bypass* *☐ B. STOP BOTH Main Feedwater Pumps*
	BOP	**7. ENSURE** FCV-23-3, 2A SG Blowdown, is CLOSED.	***BOP ENSURES*** *FCV-23-3, 2A SG Blowdown, is CLOSED*
	BOP	**8. ENSURE** FCV-23-4, 2A SG Blowdown, is CLOSED.	***BOP ENSURES*** *FCV-23-4, 2A SG Blowdown, is CLOSED*
	BOP	**9. ENSURE** MV-08-18A, 2A S/G Atmos Dump Vlv, is CLOSED.	***BOP ENSURES*** *MV-08-18A, 2A S/G Atmos Dump Vlv, is CLOSED*
	BOP	**10. CLOSE** MV-08-14, 2A S/G ADV Isol. (Key 79)	***BOP ENSURES*** *MV-08-14, 2A S/G ADV Isol. (Key 79) CLOSED*
	BOP	**11. PLACE** the control switch for auxiliary feed, Pump 2A, in STOP.	***BOP ENSURES*** *the control switch for auxiliary feed, Pump 2A, is PLACED in STOP*
	BOP	**12. ENSURE** MV-09-9, Pump 2A Disch to SG 2A Valve, is CLOSED.	***BOP ENSURES*** *MV-09-9, Pump 2A Disch to SG 2A Valve, is CLOSED*
	BOP	**13. ENSURE** MV-09-11, Pump 2C Disch to SG 2A Valve, is CLOSED.	***BOP ENSURES*** *MV-09-11, Pump 2C Disch to SG 2A Valve, is CLOSED*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
NOTE to EVALUATOR: EVENT 8 Will present itself on the following step			
	BOP	**14. PLACE** MV-08-13, SG 2A Stm to AFW PP 2C, in CLOSE.	***BOP PLACES*** *MV-08-13, SG 2A Stm to AFW PP 2C, in CLOSE.*
	BOP		**RECOGNIZES** MV-08-13, SG 2A Stm to AFW PP 2C,did **NOT** CLOSE
	BOP	**STEP 15** If MV-08-13, S/G 2A Steam to AFW Pump 2C, is NOT CLOSED or suspected of leaking, AND feed flow from 2C AFW pump is NOT required, Then CLOSE MV 08-3, 2C Pump to ISOLATE steam to 2C AFW Pump. (Key 78)	**CLOESES** MV-08-13, SG 2A Stm to AFW PP 2C **SEE EVENT 8**
	BOP	**16. ENSURE** MV-08-19A, 2A S/G Atmos Dump Vlv, is CLOSED.	***BOP ENSURES*** *MV-08-19A, 2A S/G Atmos Dump Vlv, is CLOSED*
	BOP	**17. CLOSE** MV-08-15, 2A S/G ADV Isol. (Key 80)	***BOP*** *ENSURES MV-08-15, 2A S/G ADV Isol. (Key 80) CLOSED*
	BOP	**18.** If a SGTR is in progress, **Then NOTIFY** the SM that Control Room steps to isolate the affected S/G are complete for E-Plan purposes.	***BOP NOTIFIES*** *the SRO that the control room steps for isolating the 2A S/G are complete*
	BOP	**19. PERFORM** the following LOCAL operations:	***BOP DIRECTS*** *the field operator action to isolate the 2A S/G*
The Scenario can be terminated once control room actions to isolate 2A SG have been completed			
2-EOP-15 HR-2		**The following actions from 2-EOP-15 RCS and CORE HEAT REMOVAL –HR-2**	
	SRO	**12. Verify Correct S/G was Isolated** VERIFY the **MOST** affected S/G is isolated by observing **ALL** of the following: • S/G pressures • S/G levels • RCS cold leg temperatures	***SRO EVALUATES*** *and DETERMINES the correct 2AS/G has been isolated*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**13. Stabilize RCS Temperature** If there are **NO** indications of a LOCA or SGTR, Then STABILIZE RCS temperature by performing **ALL** of the following: **A.** STEAM the **LEAST** affected S/G using the ADV. **B.** CONTROL feedwater to the **LEAST** affected S/G. **C.** ENSURE the RCS is within the limits of Figure 1A or 1B, RCS Pressure Temperature. **D.** If **BOTH** of the following conditions are met, • NO RCPs are RUNNING • The limits of Figure 1A or 1B were exceeded Then PERFORM **BOTH** of the **1.** RECORD the temperature, pressure and time when control of RCS temperature was regained. **2.** MAINTAIN RCS Pressure and Temperature stable for a minimum of **TWO** hours.	***SRO DIRECTS*** *upon MSSV closure Stabilize RCS temp by fully opening both ADVs in Auto/Manual on the 2B S/G and setting the saturation pressure for the lowest indicated RCS Tcold and place the ADV controllers are in auto*
	SRO	**14. Cooldown RCS** If indication of a LOCA or SGTR exists, Then PERFORM the following: **A.** COOLDOWN the RCS using SBCS. **1.** If RCPs are operating, Then COOLDOWN not to exceed 100°F in **ANY** 1 hour period. **2.** If RCPs are NOT operating, Then COOLDOWN not to exceed 50°F in **ANY** 1 hour period. **3.** If RCPs are NOT operating, and a S/G is ISOLATED for a SGTR event, Then COOLDOWN not to exceed 30°F in **ANY** 1 hour period.. **B.** BORATE the RCS until Shutdown Margin is greater than the value required by the COLR. **REFER TO** 2-NOP-02.24, Boron Concentration Control.	***SRO EVALUATES*** *and* ***DETERMINES*** *a SGTR is in progress and* ***DIRECTS*** *a cooldown be commenced*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #	7	
Event Description:	**2A S/G Main Steam Line Break**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		CAUTION If there is a conflict between isolating a S/G with indications of S/G tube leakage or isolating a S/G with an unisolable steam leak, Then the S/G with the ESD should be isolated. At least **ONE** S/G must remain available for heat removal.	
	SRO	**15. Determine If SGTR Present** If a SGTR has occurred as indicated by **ANY** of the following, • S/G sample activities • Main Steam Line radiation monitoring trending prior to the trip • S/G level change when NOT feeding • SGBD radiation monitoring • **ONE** S/G level rising faster than the other with feed and steaming rates being essentially the same • Feed flow mismatch between S/Gs • Steam flow vs. feed flow mismatch in a S/G prior to the trip Then DETERMINE the MOST affected S/G.	***SRO EVALUATES*** *and DETERMINES a SGTR is in progress*
	SRO	**16. If No SGTR, GO TO Step 29** **If there are NO SGTR indications,** **Then GO TO Step 29.**	***SRO EVALUATES*** *and DETERMINES a SGTR is in progress*

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	4	Event #	8	
Event Description:	**MV-08-13 failed OPEN**						
Time	Position Competency	Procedure Step	Applicant's Actions or Behavior				

Note to Evaluator: MV-08-13 failed open is a trip of the valves breaker the malfunction is initiated when the operator places the control switch for MV-08-13 in the closed position.			
Booth Operator Instructions: • **None;** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**			
	BOP	**14. PLACE** MV-08-13, SG 2A Stm to AFW PP 2C, in CLOSE.	***BOP PLACES*** *MV-08-13, SG 2A Stm to AFW PP 2C, in CLOSE.*
	BOP		***RECOGNIZES*** *MV-08-13, SG 2A Stm to AFW PP 2C, De-energizes and did* ***NOT*** *CLOSE*
	BOP	**STEP 15** If MV-08-13, S/G 2A Steam to AFW Pump 2C, is NOT CLOSED or suspected of leaking, AND feed flow from 2C AFW pump is NOT required, Then CLOSE MV 08-3, 2C Pump to ISOLATE steam to 2C AFW Pump. (Key 78)	***CLOSES*** *MV-08-3, SG 2A Stm to AFW PP 2C*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #		
Event Description:	**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

2-EOP-99 APP "A"		**The following actions are for Sampling Steam Generators Using 2-EOP-99, APPENDIX "A"**	
	BOP	**1. If a LOOP has occurred, Then PERFORM BOTH of the following:** **A. ENSURE 2AB 480V Load Center is aligned to an energized bus.** **B. DISPATCH an operator to restore Instrument Air. REFER TO Appendix H, Operation of the 2A and 2B Instrument Air Compressors.**	***2AB Bus energized when 2A EDG output breaker is closed. Determines no additional action required***
		NOTE ☐ **HCV-14-9 (HCV-14-10) will open 5 seconds after HCV-14-8A (HCV-14-8B) starts to open** ☐ **When SIAS is present, placing the control switches in CLOSE and then OVERRIDE will open the CCW 'N' header valves, until SIAS is reset**	
	BOP	**2. If an INADVERTENT SIAS has closed the 'N' Header valves, Then PERFORM EITHER of the following:** ☐ RESTORE flow to the "A" CCW Header by **placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A** **HCV-14-9** **OR** ☐ RESTORE **flow to the 'B' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B** **HCV-14-10**	***Determines no action required, no inadvertent SIAS***
		CAUTION **Under SIAS conditions, the CCW 'N' header shall only be aligned to ONE essential header. This will maintain train separation while safeguards signals are still present.**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #		
Event Description:	**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**3. If a VALID SIAS has closed the 'N' Header valves, Then PERFORM the following:** **A. VERIFY both safety related CCW headers are operational.** **B. VERIFY 'N'-Header is intact (NO seismic event has occurred).** **C. ALIGN the 'N' Header to one Safety Related CCW Header by performing either of the following:** **RESTORE flow to the 'A' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A, HCV-14-9** **OR** **RESTORE flow to the 'B' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B, HCV-14-10**	**BOP restores "N" header flow**
	BOP	**4. If the 'N' Header has been restored, Then OPEN FCV-L-19-1-7 and FCV-L-19-1-9,** **SGBD Sample Valves by performing the following:** **A. If CIAS or high radiation has closed the SGBD Sample Valves, Then OPEN FCV-L-19-1-7 and FCV-L-19-1-9 by PLACING the control switch to CLOSE / OVERRIDE.** **B. OPEN FCV-L-19-1-7 and FCV-L-19-1-9, SGBD Sample Valves.**	**BOP** restores SGBD sample flow.
	BOP	**5. If the 'N' Header is in service, Then DIRECT Chemistry to perform S/G samples** **for isotopic activity and Tritium.**	**BOP** directs chemistry to perform required samples

Appendix D	Operator Action				Form ES-D-2
Op Test No.: L-19-1	Scenario #	4	Event #		
Event Description:	**APPENDICES**				

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**6. If S/Gs cannot be sampled, Then DIRECT Health Physics to conduct secondary plant local area radiation surveys.**	**BOP** determines step is N/A
		NOTE **The Safety Related CCW header NOT aligned to the 'N' Header will be operable to supply essential equipment.**	
	BOP	**7. DECLARE the Safety Related CCW header aligned to the 'N' Header, inoperable but available.**	**BOP** informs US to declare CCW header inoperable
	BOP	**8. If any of the following conditions occur prior to reaching cold shutdown or resetting SIAS,** • **Seismic event** • **'N' Header is found NOT intact** • **The operable Safety Related CCW header becomes inoperable** **Then ISOLATE the 'N' header.**	**BOP** monitors for these conditions, determines N/A at this time
2-EOP-99 APP "J"		**The following actions are for Restoring CCW to the RCPs Using 2-EOP-99, APPENDIX "J".**	
	BOP	**1. If a LOOP has occurred,** **Then PERFORM BOTH of the following:** ☐ A. ENSURE 2AB 480V Load Center is aligned to **an energized bus.** ☐ B. DISPATCH an operator to restore Instrument **Air. REFER TO Appendix H, Operation of the 2A and 2B Instrument Air Compressors.**	**BOP** determines LOOP has not occurred, the was 2AB bus energized with the 2A EDG breaker closure
	BOP	**2. ENSURE Instrument Air to Containment is available by PLACING HCV-18-1 to CLOSE / OVERRIDE and then to OPEN.**	**BOP** opens HCV-18-1

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	4	Event #		
Event Description:	**APPENDICES**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE ☐ HCV-**14-9 (HCV-14-10) will open 5 seconds after HCV-14-8A (HCV-14-8B) starts to open.** ☐ When SIAS is present, placing the control switches in CLOSE and then OVERRIDE will open the CCW "N" header valves, until SI**AS is reset.**	
	BOP	**3. If an INADVERTENT SIAS has occurred, Then RESTORE flow from Either 'A' or 'B' CCW Header to the 'N' Header by placing the control switches for the desired train to CLOSE and then to OVERRIDE:** **HCV-14-8A** **HCV-14-9** **OR** **HCV-14-8B** **HCV-14-10**	**BOP** determines no inadvertent SIAS occurred
		CAUTION **Under SIAS conditions, the CCW 'N' header shall only be aligned to ONE essential header. This will maintain train separation while safeguards signals are still present.**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	4	Event #		
Event Description:	**APPENDICES**					

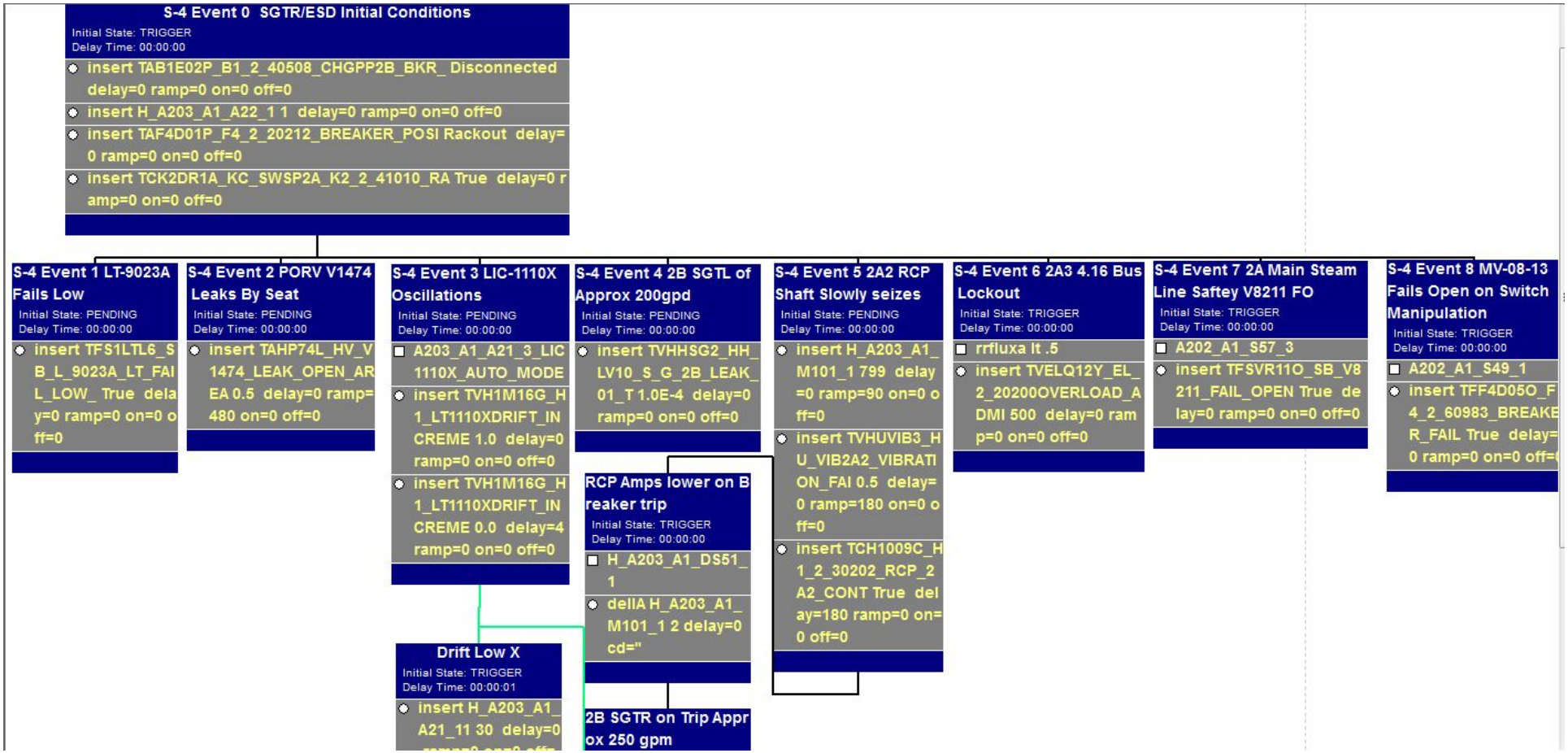
Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**4. If a VALID SIAS has closed the 'N' Header valves, Then PERFORM the following:** **A. VERIFY both safety related CCW headers are operational.** **B. VERIFY 'N'-Header is intact (NO seismic event has occurred).** **C. ALIGN the 'N' Header to one Safety Related CCW Header by performing either of the following:** **RESTORE flow to the 'A' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A, HCV-14-9** **OR** **RESTORE flow to the 'B' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B, HCV-14-10**	**BOP** realigns the "N" header restoring CCW flow
	BOP	**5. OPEN ALL of the following CCW to / from the RCP valves:** **☐HCV-14-1, CCW To RC PUMP** **☐HCV-14-2, CCW From RC PUMP** **☐HCV-14-7, CCW To RC PUMP** **☐HCV-14-6, CCW From RC PUMP**	**BOP** opens valves restoring CCW flow to RCPs
	BOP	**6. ENSURE V2507, RCP Bleedoff Relief Stop Vlv, is OPEN.**	**BOP** opens V2507

CAUTION

RCP Seal Cooler isolation valves automatically close on high Seal Cooler outlet temperature of 200°F. Maintaining the control switch in the OPEN position will override this function. CCW radiation monitors should be closely monitored for indication of RCS to CCW leakage should conditions warrant the valve(s) to be maintained in the open position. Consideration should be given to returning the control switch(es) to the AUTO position once the valves have been opened.

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	4	Event #		
Event Description:		**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**7. ENSURE ALL RCP Seal Cooler Isolation valves are OPEN:** **HCV-14-11-A1,CCW From 2A1 RCP Seal Cooler** **HCV-14-11-A2,CCW From 2A2 RCP Seal Cooler** **HCV-14-11-B1,CCW From 2B1 RCP Seal Cooler** **HCV-14-11-B2,CCW From 2B2 RCP Seal Cooler**	**BOP** verifies valves are open
		NOTE **Reactor Coolant Pumps must be secured if CCW flow is not restored within 10 minutes.**	
	BOP	**8. VERIFY CCW flow to running RCPs by any of the following:** ☐ DCS RCP Overview Screen ☐ FIS-14-15A/B/C/D, CCW From RCP Hx Flow ☐ L-6, RCP CCW Flow Low Trip, Annunciator clear.	**BOP** verifies CCW flow to RCPs
		NOTE **The Safety Related CCW header NOT aligned to the 'N' Header will be operable to supply essential equipment.**	
	BOP	**9. DECLARE the Safety Related CCW header aligned to the 'N' Header, inoperable but available.**	**BOP** informs US to declare CCW header is inoperable
	BOP	**10. If any of the following conditions occur prior to reaching cold shutdown or resetting SIAS,** ☐ Seismic event ☐ **'N' Header is found NOT intact** ☐ The operable Safety Related CCW header **becomes inoperable** **Then ISOLATE the 'N' header.**	**BOP** monitors for these conditions, not present at this time


S-4 Event 0 SGTR/ESD Initial Conditions
Initial State: TRIGGER
Delay Time: 00:00:00
insert TAB1E02P_B1_2_40508_CHGPP2B_BKR_ Disconnected delay=0 ramp=0 on=0 off=0
insert H_A203_A1_A22_1 1 delay=0 ramp=0 on=0 off=0
insert TAF4D01P_F4_2_20212_BREAKER_POSI Rackout delay=0 ramp=0 on=0 off=0
insert TCK2DR1A_KC_SWSP2A_K2_2_41010_RA True delay=0 ramp=0 on=0 off=0
S-4 Event 1 LT-9023A Fails Low
Initial State: PENDING
Delay Time: 00:00:00
insert TFS1LTL6_SB_L_9023A_LT_FAIL_LOW_ True delay=0 ramp=0 on=0 off=0
S-4 Event 2 PORV V1474 Leaks By Seat
Initial State: PENDING
Delay Time: 00:00:00
insert TAHP74L_HV_V1474_LEAK_OPEN_AREA 0.5 delay=0 ramp=480 on=0 off=0
S-4 Event 3 LIC-1110X Oscillations
Initial State: PENDING
Delay Time: 00:00:00
A203_A1_A21_3_LIC1110X_AUTO_MODE
insert TVH1M16G_H1_LT1110XDRIFT_INCREME 1.0 delay=0 ramp=0 on=0 off=0
insert TVH1M16G_H1_LT1110XDRIFT_INCREME 0.0 delay=4 ramp=0 on=0 off=0
S-4 Event 4 2B SGTL of Approx 200gpd
Initial State: PENDING
Delay Time: 00:00:00
insert TVHHSG2_HHLV10_S_G_2B_LEAK_01_T 1.0E-4 delay=0 ramp=0 on=0 off=0
S-4 Event 5 2A2 RCP Shaft Slowly seizes
Initial State: PENDING
Delay Time: 00:00:00
insert H_A203_A1_M101_1 799 delay=0 ramp=90 on=0 off=0
insert TVHUVIB3_HU_VIB2A2_VIBRATION_FAI 0.5 delay=0 ramp=180 on=0 off=0
insert TCH1009C_H1_2_30202_RCP_2A2_CONT True delay=180 ramp=0 on=0 off=0
S-4 Event 6 2A3 4.16 Bus Lockout
Initial State: TRIGGER
Delay Time: 00:00:00
rrfluxa lt .5
insert TVELQ12Y_EL_2_20200OVERLOAD_ADMI 500 delay=0 ramp=0 on=0 off=0
S-4 Event 7 2A Main Steam Line Saftey V8211 FO
Initial State: TRIGGER
Delay Time: 00:00:00
A202_A1_S57_3
insert TFSVR11O_SB_V8211_FAIL_OPEN True delay=0 ramp=0 on=0 off=0
S-4 Event 8 MV-08-13 Fails Open on Switch Manipulation
Initial State: TRIGGER
Delay Time: 00:00:00
A202_A1_S49_1
insert TFF4D05O_F4_2_60983_BREAKER_FAIL True delay=0 ramp=0 on=0 off=
RCP Amps lower on Breaker trip
Initial State: TRIGGER
Delay Time: 00:00:00
H_A203_A1_DS51_1
delIA H_A203_A1_M101_1 2 delay=0 cd="
2B SGTR on Trip Appr ox 250 gpm
Drift Low X
Initial State: TRIGGER
Delay Time: 00:00:01
insert H_A203_A1_A21_11 30 delay=0

QUANTITATIVE ATTRIBUTES

Malfunctions:

Before EOP Entry:

1. LT-9023A ("A" Channel Feedwater Level transmitter for 2B S/G) fails low
2. PORV V1474 ramps open
3. LIC-1110X oscillations
4. 2B SGTL (approx. 200 gpd)
5. 2A2 RCP shaft slowly seizes

After EOP Entry:

1. SGTR of 300 gpm
2. 2A3 4160 bus locks out
3. 2A Steam Generator MS line break
4. MV-08-13,S/G 2A Steam to AFW Pump 2C breaker trips

Abnormal Events:

1. LT-9023A ("A" Channel Feedwater Level transmitter for 2B S/G) fails low
2. PORV V1474 ramps open
3. LIC-1110X oscillations
4. 2B SGTL (approx. 200 gpd)

Major Transients:

1. 2A2 RCP shaft slowly seizes,

Critical Tasks:

1. Close PORV block valve
2. Align 2AB 480V LC to 'B' train to power to 2C Charging Pp

OPERATIONS SHIFT TURNOVER REPORT

DAYS Today

UNIT 2 CONTROL ROOM

Desk RCO: _____ **Board RCO:** _____

Protected Train: A **Online Risk:** GREEN

Unit 2 Identified RCS Leakage: .02 gpm **Unit 2 Unidentified RCS Leakage:** .06 gpm

Unit 2 Scheduled Activities per the OSP:

No scheduled surveillances

Unit 2 Unscheduled Surveillances:

No unscheduled surveillances

Upcoming ECOs to Hang or Release:

None

Tech Spec Action Statement:

1. 3.7.1.2 for 2A AFW Pp
2. 3.2.2, 3.2.4, 3.5.2 for 2B CHG Pp

Operator Work Around:

None

Locked in Annunciators:

1. G-44 2A AFW PUMP BKR FAILURE/ CS STOP/ SS ISOL
2. M-47 2B CHARGING PUMP SS ISOL/ V2554 OVRLD

Current Status:

1. 100% power, MOC, no scheduled surveillances, maintain 100% power
2. 2A Screen Wash Pump OOS,
3. Small amounts of sea grass has been observed in the intake, 2B Screen wash pump is running 2-NOP-21.15, INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green.
4. 2A AFW Pp OOS, Expected back this shift
5. 2B CHG Pp OOS, Clearance has just been hung due to an oil leak
6. LIC-1100Y OOS, FIN I&C trouble Shooting

Longstanding Problems:

None

Reactivity Turnover:

Adding 20 gallons of Primary Water every 4 hours. 60 total gallons added last shift. Expect to add another 60 gallons this shift.

Appendix D	Scenario Outline	Form ES-D-1

Facility:	St. Lucie	Scenario No.:	5	Op-Test No.:	L-19-1
Examiners:		Operators:	SRO:		
			ATC:		
			BOP:		
Initial Conditions:	100% power, MOC, no scheduled surveillances, maintain 100% power				
Turnover:	2A Screen Wash Pump OOS, 2-NOP-21.15 INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green 2A AFW Pp OOS				
Critical Tasks:	1. RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain Reactor Power in the bounds of the RPS Variable High Power trip set points. - Manually isolate leaking steam bypass valve prior to reaching an automatic reactor trip. 2. Initiate Once Through Cooling: When both S/G level are <15% WR and prior to S/G dryout.				

Event No.	Malf. No.	Event Type*	Event Description
1	1	I/ATC/SRO TS/SRO	**Malf:** LT1100X fails low **Action:** Select operable channel restore heaters **T.S.** 3.4.3 Heaters, 3.3.3.6 Accident monitoring and 3.2.5 DNB
2	2	C/BOP/SRO	**Malf:** V8802 fails open causing RX power to rise **Action**: SBCS permissive switch to 'OFF' to close V8802 **CT-1** Manually close leaking steam bypass valve prior to reaching an automatic reactor trip.
3	3	C/ATC/SRO TS/SRO	**Malf**: 2B Charging Pump Reducing Unit oil leak **Action:** Place 2B Chg Pp to stop TS 3.2.2. 3.2.4, 3.5.2
4	4	I/ATC/SRO	**Malf:** TIC-2223 Letdown Temperature Controller fails low **Action:** Manually Control TIC-2223 Letdown Temperature
5	5	C/BOP/SRO R/ATC/SRO	**Malf:** 2A Heater drain pp trip **Action:** Rapid Down Power
6	6	M/ALL	**Malf:** 2B Main Feedwater Pp recirc valve fails open LOOP W/ 2B EDG start failure **Action:** Trip Reactor, Attempt to restore 2B EDG
7	7	C/BOP/SRO	**Malf:** 2C AFW Pp mech trips on start non-recoverable **Action:** Enter AOP and attempt to restore feedwater
8	8	M/ALL C/BOP/SRO	**Action:** Initiate Once Through Cooling, 2A HPSI pump does not start **CT-2** When both S/G level are <15% WR and prior to S/G dryout.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Scenario 5 Summary

Event	Description
1	The crew will assume the shift at 100% power; LT1100X level transmitter for X Pressurizer Level control will fail low requiring the ATC will Select the operable (Y) pressurizer level control channel and then restore heaters. The SRO will enter 2-AOP-01.10 Pressurizer pressure and level control, verify the immediate operator actions are complete and direct restoration of the pressurizer heaters, Tech Specs 3.4.3 Pressurizer Heaters, 3.3.3.6 Accident monitoring and 3.2.5 DNB apply.
2	THIS IS A CRITICAL TASK; Steam Bypass control valve V8802 fails open on causing RCS temperature to lower and Reactor power to increase. The BOP will evaluate the secondary plant, identify the failed open valve and take the SBCS permissive switch to 'OFF' which will close V8802 and terminate the transient. The crew will enter 2-AOP-08.01 Steam Leak section 4.2.3. and/or 2-AOP-08.03, Steam Bypass Control System, section 4.2.3. CT-1 Manually close leaking steam bypass valve prior to reaching an automatic reactor trip on high power.
3	The crew will receive Ann M-31 for the 2B Charging Pump, dispatch a field operator and get a report of oil around the base of the 2B Charging pump and Reducing Unit oil level is low. The crew will place 2B Charging Pump to stop and declare it Out Of Service Tech Specs 3.2.2. 3.2.4, 3.5.2 apply.
4	THIS IS A MANUAL CONTROL OF AN AUTO SYSTEM FAILURE; TIC-2223 Letdown Temperature Controller will fail low, the ATC will take manual control of TIC-2223 and restore letdown temperature to pre failure value.
5	THIS IS A REACTIVITY EVENT; 2A Heater drain pump will indicate a seized shaft and will trip on high amps if not identified by the BOP and manually tripped. The crew will enter 2-AOP-22.01 Rapid Down Power and begin reducing power to ensure plant parameters are maintained within operating guidelines.
6	During the downpower the 2B Main Feedwater Pump recirc valve will fail open requiring a manual reactor trip due to insufficient S/G level. The SRO will direct a unit trip prior to automatic RPS actuation on low S/G level. On the trip a Loss Of Offsite Power occurs and the 2B Emergency Diesel Generator will trip on overspeed (non-recoverable). The crew will enter 2-EOP-01 Standard Post Trip Actions and transition to 2-EOP-06 Total Loss Of Feedwater.
7	Upon Aux feedwater actuation the 2C AFW Pp will experience a mechanical overspeed trip. The BOP will use 2-AOP-09.02 and attempt to restore feedwater, the field operator will report that the reset linkage has been destroyed and non-recoverable.
8	THIS IS A CRITICAL TASK; Upon both S/Gs reaching <15% wide range level the crew will Initiate Once Through Cooling, the 2A HPSI pump fails to auto start when SIAS is initiated and will require the BOP to manually start the 2A HPSI pump to regain SI flow for OTC CT-2 When both S/G level are <15% WR and prior to S/G dryout.
Termination Criteria	The scenario will be terminated after the crew completes once though cooling or at the lead evaluators discretion.

SITE: **ST. LUCIE** **Revision #:** **0**

LMS ID: **N/A** **LMS Rev. Date:** **N/A**

SEG TITLE: **L-19-1 SCENARIO 5**

SEG TYPE: ☐ **Training** ☒ **Evaluation**

PROGRAM: ☐ **LOCT** ☒ **LOIT** ☐ **Other:**

DURATION: **90 minutes**

Developed by: _____ _____
Instructor/Developer Date

Reviewed by: _____ _____
Instructor (Instructional Review) Date

Validated by: _____ _____
SME (Technical Review) Date

Approved by: _____ _____
Training Supervision Date

Approved by: _____ _____
Training Program Owner (Line) Date

Facility:	St. Lucie	Scenario No.:	5	Op-Test No.:	L-19-1
Examiners:		Operators:	SRO:		
			ATC:		
			BOP:		
Initial Conditions:	100% power, MOC, no scheduled surveillances, maintain 100% power				
Turnover:	2A Screen Wash Pump OOS, 2-NOP-21.15 INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green 2A AFW Pp OOS				
Critical Tasks:	1. RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – Maintain Reactor Power in the bounds of the RPS Variable High Power trip set points. - Manually isolate leaking steam bypass valve prior to reaching an automatic reactor trip. 2. INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY - Safeguards Equipment that is essential to the maintenance of Safety Functions has NOT auto-actuated when it should have. 'A' HPSI pump does not start on SIAS and must be manually started to meet Figure 2 of 2- EOP-99 to prevent unnecessary escalation of EAL. Initiate Once Through Cooling: When both S/G level are <15% WR and prior to S/G dryout.				

Event No.	Malf. No.	Event Type*	Event Description
1	1	I/ATC/SRO TS/SRO	**Malf:** LT1100X fails low **Action:** Select operable channel restore heaters **T.S.** 3.4.3 Heaters, 3.3.3.6 Accident monitoring and 3.2.5 DNB
2	2	C/BOP/SRO	**Malf:** V8802 fails open causing RX power to rise **Action**: SBCS permissive switch to 'OFF' to close V8802 **CT-1** Manually close leaking steam bypass valve prior to reaching an automatic reactor trip.
3	3	C/ATC/SRO TS/SRO	**Malf**: 2B Charging Pump Reducing Unit oil leak **Action:** Place 2B Chg Pp to stop TS 3.2.2. 3.2.4, 3.5.2
4	4	I/ATC/SRO	**Malf:** TIC-2223 Letdown Temperature Controller fails low **Action:** Manually Control TIC-2223 Letdown Temperature
5	5	C/BOP/SRO R/ATC/SRO	**Malf:** 2A Heater drain pp trip **Action:** Rapid Down Power
6	6	M/ALL	**Malf:** 2B Main Feedwater Pp recirc valve fails open LOOP W/ 2B EDG start failure **Action:** Trip Reactor, Attempt to restore 2B EDG
7	7	C/BOP/SRO	**Malf:** 2C AFW Pp mech trips on start non-recoverable **Action:** Enter AOP and attempt to restore feedwater
8	8	M/ALL C/BOP/SRO	**Action:** Initiate Once Through Cooling, 2A HPSI pump does not start **CT-2** When both S/G level are <15% WR and prior to S/G dryout.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

SIMULATOR EXERCISE GUIDE REQUIREMENTS

Terminal Objective Given specific plant conditions, the students will be able to mitigate events in accordance with plant procedures.

Enabling Objectives: None

Prerequisites:
1. Simulator
2. Applicants enrolled in Initial License Program

Training Resources:
1. Floor Instructor as Shift Technical Advisor
2. Simulator Booth Operator
3. NRC Evaluators

References:
1. 2-AOP-01.10, PRESSURIZER PRESSURE AND LEVEL
2. 2-AOP-08.01, STEAM LEAK
3. 2-AOP-02.03, CHARGING AND LETDOWN
4. 2-AOP-09.04, FEEDWATER, CONDENSATE, AND HEATER DRAIN PUMP ABNORMAL OPERATIONS
5. 2-AOP-22.01, RAPID DOWNPOWER
6. 2-EOP-01, Standard Post Trip Actions
7. 2-EOP-06, TLOF
8. 2-EOP-99, Appendices / Figures / Tables /Data Sheets
9. Unit-2 Technical Specifications

Protected Content: **NONE**

Evaluation Method: Simulator performance will be evaluated in accordance with NUREG 1021 rev. 11.

Operating Experience: N/A

Risk Significant Operator Actions:

UPDATE LOG: Indicate in the following table any minor changes or major revisions made to the material after initial approval.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER REVIEWER	DATE DATE

SCENARIO 5 OVERVIEW/SEQUENCE OF EVENTS

The crew will assume the shift at 100% power; 2A Screen Wash Pump OOS, 2-NOP-21.15 INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green 2A AFW Pp OOS. LT1100X level transmitter for X Pressurizer Level control will fail low requiring the ATC will Select the operable (Y) pressurizer level control channel and then restore heaters. The SRO will enter 2-AOP-01.10 Pressurizer pressure and level control, verify the immediate operator actions are complete and direct restoration of the pressurizer heaters, Tech Specs 3.4.3 Pressurizer Heaters, 3.3.3.6 Accident monitoring and 3.2.5 DNB apply.

Steam Bypass control valve V8802 fails open on causing RCS temperature to lower and Reactor power to increase. The BOP will evaluate the secondary plant, identify the failed open valve and take the SBCS permissive switch to 'OFF' which will close V8802 and terminate the transient. The crew will enter 2-AOP-08.01 Steam Leak section 4.2.3. and/or 2-AOP-08.03, Steam Bypass Control System, section 4.2.3.

The crew will receive Ann M-31 for the 2B Charging Pump, dispatch a field operator and get a report of oil around the base of the 2B Charging pump and Reducing Unit oil level is low. The crew will place 2B Charging Pump to stop and declare it Out Of Service

Tech Specs 3.2.2. 3.2.4, 3.5.2 apply.

TIC-2223 Letdown Temperature Controller will fail low; the ATC will take manual control of TIC-2223 and restore letdown temperature to pre failure value.

2A Heater drain pump will indicate a seized shaft and will trip on high amps if not identified by the BOP and manually tripped. The crew will enter 2-AOP-22.01 Rapid Down Power and begin reducing power to ensure plant parameters are maintained within operating guidelines.

During the downpower the 2B Main Feedwater Pump recirc valve will fail open requiring a manual reactor trip due to insufficient S/G level. The SRO will direct a unit trip prior to automatic RPS actuation on low S/G level. On the trip a Loss Of Offsite Power occurs and the 2B Emergency Diesel Generator will trip on overspeed (non-recoverable). The crew will enter 2-EOP-01 Standard Post Trip Actions transition to 2-EOP-06 Total Loss Of Feedwater.

Upon Aux feedwater actuation the 2C AFW Pp will experience a mechanical overspeed trip. The crew will transition to 2-EOP-06 Total Loss Of Feedwater. The BOP will use 2-AOP-09.02 and attempt to restore feedwater, the field operator will report that the reset linkage has been destroyed and non-recoverable.

Upon both S/Gs reaching <15% wide range level the crew will Initiate Once Through Cooling, the 2A HPSI pump fails to auto start when SIAS is initiated and will require the BOP to manually start the 2A HPSI pump to regain SI flow for OTC

Procedures Used	Tech Specs Entered
• 2-AOP-01.10, PRESSURIZER PRESSURE AND LEVEL • 2-AOP-08.01, STEAM LEAK • 2-AOP-02.03, CHARGING AND LETDOWN • 2-AOP-09.04, FEEDWATER, CONDENSATE, AND HEATER DRAIN PUMP ABNORMAL OPERATIONS • 2-AOP-22.01, RAPID DOWNPOWER • 2-EOP-01, Standard Post Trip Actions • 2-EOP-06, TLOF • 2-EOP-99, Appendices / Figures / Tables /Data Sheets • Unit-2 Technical Specifications	• 3.4.3, 3.3.3.6 , possible 3.2.5 • 3.2.2. 3.2.4, 3.5.2

Scenario Setup and Booth Operator Instructions:

- **ENSURE** Examination Security has been established.
- **ENSURE** the Simulator is unloaded
- **ENSURE** Lesson for SCENARIO 5 from Exam Flash drive is loaded as follows:
  - **Open**, folder L-19-1 NRC SCENARIO 5 lsn
  - **Copy**, L-19-1 NRC SCENARIO 5.lsn
  - **Open**, Lessons folder on simulator operator station desk top
  - **Paste**, L-19-1 NRC SCENARIO 5.lsn into the Instructor Lessons folder; NRC; L-19-1
- **LOAD** the Simulator
- **RESTORE** IC#1
  - **RUN** the Simulator
  - Place the 2A AFW pump control switch in the STOP position and Hang an ECO tag on switch
  - Place GUARDED EQUIPMENT as outlined Guarded Equipment procedure
  - Place the 2A Screen wash pump off
  - Place a Clearance tag on the 2A Screen wash pump
  - Start the 2B Screen wash pump
  - Place a marked up copy of 2-NOP-21.15 INTAKE INTRUSION MONITORING AND MITIGATION on the US desk
  - ENSURE the A Train Protected sign and a GREEN OLRM sign are placed RTGB-203.
  - ENSURE the CHEMISTRY sheet for MOC is placed on the Unit Supervisor Desk.
  - **FREEZE** the simulator
- **OPEN** and **EXECUTE** L-19-1 NRC SCENARIO 5.lsn
- **RUN** the Simulator and allow for stabilization
- **FREEZE** the simulator
- **UNFREEZE** the simulator prior to the candidates entering the simulator

Post scenario simulator restoration:

- **ENSURE** L-19-1 NRC SCENARIO 5.lsn are deleted from Simulator in accordance with Attachment 2 of Training Department Policy PSL-TRNG 142

BRIEF / TURNOVER INFORMATION

- Conduct simulator crew pre-scenario brief using TR-AA-L-19-10-1007-F06, Simulator Instructor Pre-Exercise Checklist.
- Brief the scenario evaluators
- Brief surrogates using TR-AA-L-19-10-1007-F11, Surrogate Brief Checklist, if necessary.
- Crew Shift Turnover Information: See Attached

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	1	
Event Description:	**LT1100X fails low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

T.S. 3.4.3	THE PRESSURIZER SHALL BE OPERABLE WITH A MINIMUM WATER LEVEL OF GREATER THAN OR EQUAL TO 27% INDICATED LEVEL AND A MAXIMUM WATER LEVEL OF LESS THAN OR EQUAL TO 68% INDICATED LEVEL AND AT LEAST TWO GROUPS OF PRESSURIZER HEATERS CAPABLE OF BEING POWERED FROM 1E BUSES EACH HAVING A NOMINAL CAPACITY OF AT LEAST 150 KW. ACTION: A. WITH ONE GROUP OF THE ABOVE REQUIRED PRESSURIZER HEATERS INOPERABLE, RESTORE AT LEAST TWO GROUPS TO OPERABLE STATUS WITHIN 72 HOURS OR BE IN AT LEAST HOT STANDBY WITHIN THE NEXT 6 HOURS AND IN HOT SHUTDOWN WITHIN THE FOLLOWING 6 HOURS.
T.S. 3.3.3.6	THE ACCIDENT MONITORING INSTRUMENTATION CHANNELS SHOWN IN TABLE 3.3-10 SHALL BE OPERABLE. ACTION: A.* WITH THE NUMBER OF OPERABLE ACCIDENT MONITORING CHANNELS LESS THAN THE REQUIRED NUMBER OF CHANNELS SHOWN IN TABLE 3.3-10, EITHER RESTORE THE INOPERABLE CHANNEL TO OPERABLE STATUS WITHIN 7 DAYS, OR BE IN HOT STANDBY IN 6 HOURS AND HOT SHUTDOWN IN 12 HOURS.

Note to Evaluator: The LT-1100X Pressurizer Level fails low is a malfunction initiated from the Booth upon direction by the evaluator.

Booth Operator Instructions:

- **Upon cue from Lead Examiner, trigger Event 1: LT1100X fails low**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications:

LT1110X will indicate low scale on RTGB 203

All Pressurizer heaters will De-energize and Letdown go to minimum.

Annunciators:

LA-11, H-17,29,30, M-5

EXAMINER: The SRO may announce Multiple Alarms to direct the crew to systematically evaluate the plant status.

	BOP/ATC		Acknowledge annunciators and communicate IAW plant policies.
	ATC		Recognize LT failed low,
	ATC		Recognizes the need for immediate operator action to select the operable Level control channel, announces their intention and takes the required immediate operator action to select the operable Level Control Channel
	SRO		Concurs with the announced immediate operator action announced by the ATC to select the operable Level Control Channel
	ATC/BOP		Evaluates plant response to actions taken

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	1	
Event Description:	**LT1100X fails low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP		Pulls ARP's and communicates/takes action as directed
	SRO		Announces and enters 2-AOP-01.10 Pressurizer Pressure and Level
	SRO		Directs actions of 2-AOP-01.10 Pressurizer Pressure and Level
2-AOP-01.10		**The following actions are taken from 2-AOP-01.10 "Pressurizer Pressure and Level"**	
4.1 Immediate Operator Actions:			
	ATC	**4.1 Immediate Operator Actions** **4. VERIFY** selected Pressurizer level control channel LIC-1110X(Y), LEVEL, NORMAL.	***4.1.4 CONTINGENCY ACTIONS*** ***ATC PLACES LEVEL CONTROL CHANNEL selector switch to non-affected level control channel.***
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
	SRO	**1. PERFORM** applicable section per Table 1. Table 1 Abnormal Condition / Section Pressurizer PORV or safety valve OPEN or leaking — Section 4.2.2 Selected Pressurizer pressure control channel failure — Section 4.2.3 Pressurizer Spray or Auxiliary Spray Valves OPEN or leaking — Section 4.2.4 Selected RRS channel failure — Section 4.2.5 Selected Pressurizer level control channel failure — Section 4.2.6 Pressurizer pressure or level abnormal — Section 4.2.7 Pressurizer heaters deenergized — Attachment 5	***SRO EVALUATES the indications determines the failure to be to the in-service Level control channel X failed low and proceeds to section 4.2.6***
4.2.6 Selected Pressurizer Level Control Channel Failure			
	SRO	**1. VERIFY LEVEL CONTROL CHANNEL** selector switch selected to non-affected level control channel.	***ATC PLACES LEVEL CONTROL CHANNEL selector switch to non-affected level control channel ATC performed this step as an immediate operator action***

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	1	
Event Description:	**LT1100X fails low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**2. VERIFY** Pressurizer level stable OR trending to Pressurizer level setpoint: ☐ LR-1110, PRESSURIZER LEVEL ☐ PR1108/LR1110X, LEVEL PRESSURE ☐ LIC-1110X(Y), LEVEL	***ATC VERIFIES pressurizer level is trending towards setpoint and controlled***
	SRO	**3. VERIFY** power to Pressurizer heaters.	***ATC IMPLEMENTS Attachment 5, Recovering Power to Pressurizer Heaters.***
	SRO	4. **IF letdown** is in service AND two or more charging pumps are operating, THEN NOTIFY Radiation Protection of the current charging pump alignment.	***SRO Makes notifications as needed***
	SRO	**5. GO TO** Section 4.2.1, Step 2.	***SRO PROCEEDS to appropriate step***
4.2.1 General Actions:			
	SRO	**2. WHEN** plant conditions have stabilized, THEN REVIEW Tech Specs for any required actions.	***SRO EVALUATES T.S 3.4.3, 3.3.3.6 & 3.2.5 as required***
	SRO	**3. WHEN** Section 3.0, EXIT CONDITIONS, are met, THEN EXIT this procedure.	***SRO EXISTS this procedure***
At the Lead Evaluator's direction, PROCEED to Event 2.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	2	
Event Description:	**V8802 fails open causing RX power to rise**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

CT-1	RESTORE PARAMETER/COMPONENT PRIOR TO RPS ACTUATION – MAINTAIN REACTOR POWER IN THE BOUNDS OF THE RPS VARIABLE HIGH POWER TRIP SET POINTS. -MANUALLY ISOLATE LEAKING STEAM BYPASS VALVE PRIOR TO REACHING AN AUTOMATIC REACTOR TRIP.

Note to Evaluator: The PCV-V8802 Steam Bypass To Condenser fails open is a malfunction initiated from the Booth upon direction by the evaluator.

Booth Operator Instructions:

- **Upon cue from Lead Examiner, trigger Event 2: V8802 fails open**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**
- **When called as the NPO to isolate V8802 go to the schematic for Main Steam, double click on V8307 and input selected value of 0 and click on insert**

Indications: Reactor Power trending up, RCS pressure and temp lowering

Annunciators:

	ATC		**IDENTIFIES** power rising and V8802 open
	SRO		**DIRECTS** the ATC to take action to close V8802 using the controller
	BOP		**PLACES** the controller for V8802 to the manual position and attempts to close V8802 **IDENTIFIES** no result and **PLACES** the PERMISSIVE Switch for SBCS to the **OFF** position
	BOP		**VERIFIES** that V8802 is closed and **EVALUATES** plant for being stable
	BOP		Acknowledge annunciators and communicates status IAW plant policies.
	SRO		**ANNOUNCES** and enters 2-AOP-08.03 Steam Bypass Control System
	SRO		**DIRECTS** actions of 2- AOP-08.03 Steam Bypass Control System

2-AOP-08.03 Steam Bypass Control System	**The following actions are taken from 2-AOP-08.03 Steam Bypass Control System**

4.1 Immediate Operator Actions:

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	2	
Event Description:	**V8802 fails open causing RX power to rise**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**1. VERIFY NO** SBCS valves have FAILED OPEN.	***SRO EVALUATES*** *and determines V8802 is OPEN and DIRECTS Contingency Actions as follows:*
	SRO	**1.1.A TAKE** the following actions as necessary to stabilize the plant: **PLACE** affected **SBCS** valve in **MANUAL** and **CLOSE**.	***SRO DIRECTS*** *determines V8802 is OPEN and DIRECTS the BOP to PLACE SBCS valveV8802 in MANUAL and CLOSE.* ***BOP*** *PLACES the controller for V8802 to the manual position and attempts to close V8802, IDENTIFIES no result*
	SRO	**1.1.B TAKE** the following actions as necessary to stabilize the plant: **PLACE SBCS** permissive switch in **OFF.**	***SRO DIRECTS*** *the BOP to PLACE SBCS permissive switch in OFF BOP OBSERVES V8802 going CLOSED*
	SRO	**1.1.C IF** all valves did **NOT CLOSE**, **THEN** PERFORM the FOLLOWING	***SRO OBSERVES*** *V8802 is* ***CLOSED*** *and Determines the step is N/A*
	SRO	**1.1.D DISPATCH** a field operator to manually isolate affected SBCS valve per Attachment 5 Local Action to Isolate Steam Bypass Valves	***SRO DIRECTS NPO*** *to Perform Att. 5 page 2 of 5 step 2 and isolate V8802*
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
At the Lead Evaluator's direction, PROCEED to Event 3.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	3	
Event Description:	**2B Charging Pump Reducing Unit oil leak**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

T.S. 3.1.2.2	AT LEAST TWO OF THE FOLLOWING THREE BORON INJECTION FLOW PATHS SHALL BE OPERABLE: ACTION: WITH ONLY ONE OF THE ABOVE REQUIRED BORON INJECTION FLOW PATHS TO THE REACTOR COOLANT SYSTEM OPERABLE, RESTORE AT LEAST TWO BORON INJECTION FLOW PATHS TO THE REACTOR COOLANT SYSTEM TO OPERABLE STATUS WITHIN 72 HOURS OR BE IN AT LEAST HOT STANDBY AND BORATED TO A SHUTDOWN MARGIN EQUIVALENT TO ITS COLR LIMIT AT 200 F WITHIN THE NEXT 6 HOURS
T.S. 3.1.2.4	AT LEAST TWO CHARGING PUMPS SHALL BE OPERABLE. ACTION: WITH ONLY ONE CHARGING PUMP OPERABLE, RESTORE AT LEAST TWO CHARGING PUMPS TO OPERABLE STATUS WITHIN 72 HOURS OR BE IN AT LEAST HOT STANDBY AND BORATED TO A SHUTDOWN MARGIN EQUIVALENT TO ITS COLR LIMIT AT 200F WITHIN THE NEXT 6 HOURS
T.S. 3.5.2	TWO INDEPENDENT EMERGENCY CORE COOLING SYSTEM (ECCS) SUBSYSTEMS SHALL BE OPERABLE WITH EACH SUBSYSTEM COMPRISED OF: D. ONE OPERABLE CHARGING PUMP*. ACTION: A.2. WITH ONE ECCS SUBSYSTEM INOPERABLE FOR REASONS OTHER THAN CONDITION A.1., RESTORE THE INOPERABLE SUBSYSTEM TO OPERABLE STATUS WITHIN 72 HOURS OR BE IN AT LEAST HOT STANDBY WITHIN THE NEXT 6

Note to Evaluator: The 2B Charging Pump Oil Level Low is a malfunction initiated from the Booth upon direction by the evaluator.

Booth Operator Instructions:

- **Upon cue from Lead Examiner, trigger Event 3: 2B Charging Pump Oil Level Low**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**
- **When the SNPO is dispatched to the 2B Charging pump report back in 5 minutes that the 2B Charging cubicle has oil on the floor and you can't see any oil in the pump.**

Indications:

Annunciators:

M-31 2B CHARGING PUMP TROUBLE

	ATC		**IDENTIFIES** Annunciators from the 2B Charging pump and reports to the SRO
	SRO		**DIRECTS** the ATC to dispatch a SNPO to the 2B Charging pump
	BOP		Acknowledges annunciators and communicates status IAW plant policies
	ATC		Evaluates plant for being stable
	SRO		Announces and enters 2-AOP-02.03, Charging And Letdown

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	3	
Event Description:	**2B Charging Pump Reducing Unit oil leak**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO		Directs actions of 2-AOP-02.03, Charging And Letdown
2-AOP-02.03		**The following actions are taken from 2-AOP-02.03, Charging And Letdown**	
4.1 Immediate Operator Actions: NONE APPLICABLE			
4.2 Subsequent Operator Actions **4.2.1 General Actions: NONE APPLICABLE**			
	SRO	**Dispatch** SNPO to evaluate the 2B Charging pump	***DIRECTS*** *the ATC to dispatch a SNPO to the 2B Charging pump*
	SRO	**DIRECT** placing the 2B Charging pump to stop	***DIRECTS*** *the ATC to place the 2B Charging pump to stop*
	SRO	**DECLARE** the 2B Charging pump inoperable	***SRO Evaluates*** *Tech Specs*
	SRO	**ENTER** appropriate Tech Specs for the condition	***SRO Enters T.S.*** • *3.1.2.2 Boration Flow Paths* • *3.1.2.4 Charging pp* • *3.5.2 ECCS Subsystems*
	SRO	**Performs** a Crew brief	***SRO BRIEFS*** *the crew on the status of the 2B Charging pump*
At the Lead Evaluator's direction, PROCEED to Event 4.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	4	
Event Description:	**TIC-2223 Letdown Temperature Controller fails low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
Note to Evaluator: The TIC 2223 Letdown Temp Fails Low is a malfunction initiated from the Booth upon direction by the evaluator.			
Booth Operator Instructions: • **Upon cue from Lead Examiner, trigger Event 4: TIC 2223 Fails Low** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action**			
Indications: CCW to L/D heat exchanger flow lowers, TIC-2223 LED is lit, TIC-2223 output indicates full closed **Annunciators: M-12 LETDOWN HX OUTLET TEMP HIGH/LOW**			
	ATC		Identifies controller issue with TIC 2223 and recommends taking manual control
	SRO		Directs the ATC to take manual control of TIC 2223
	BOP		Acknowledge annunciators and communicates status IAW plant policies.
	ATC		Evaluates plant for being stable
	BOP		Pulls ARPs and communicates/takes action as directed
	SRO		Announces and enters 2-AOP-02.03, Charging And Letdown
	SRO		Directs actions of 2-AOP-02.03, Charging And Letdown
2-AOP-02.03		**The following actions are taken from 2-AOP-02.03, Charging And Letdown**	
4.1 Immediate Operator Actions: None applicable			
4.2 Subsequent Operator Actions **4.2.1 General Actions:**			
	SRO	**1.** IF charging and letdown flow has been lost, THEN, **PERFORM** the following:	*Step is not applicable*
	SRO	**2.** **VERIFY** all applicable automatic actions have occurred. Attachment 1, Charging and Letdown Automatic Responses, contains a listing of expected automatic actions	*Step is not applicable*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	4	
Event Description:	**TIC-2223 Letdown Temperature Controller fails low**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**3. IF charging and letdown flow has been lost, THEN DETERMINE the cause**	*Step is not applicable*
	SRO	4. IF a charging system leak has occurred, THEN **ISOLATE** the leak and refer to applicable Technical Specifications for guidance	*Step is not applicable*
	SRO	5. **PERFORM** applicable section per Table	***SRO EVALUATES** the indications determines the failure to be TIC 2223 failed and proceeds to section 4.2.8*
4.2.8 Letdown HX Temperature Control Malfunction			
CAUTION ☐ Loss of component cooling water flow through the letdown heat exchanger can result in severe thermal stress and flashing in the heat exchanger unless letdown flow is immediately isolated. ☐ Component cooling water flow to the letdown heat exchanger shall be reestablished slowly with letdown flow still isolated to minimize the thermal stress on the heat exchanger.			
	SRO	**1. VERIFY** TIC-2223, TEMPERATURE, is responding as expected	***SRO DIRECTS** the ATC to **PLACE** V2520, ION EXCHANGER BYPASS VALVE, in BYPASS RESET to bypass letdown ion exchangers* ***SRO DIRECTS** the ATC to **PLACE** TIC-2223, TEMPERATURE, in MANUAL or HARD MANUAL* ***SRO VERIFIES** that the ATC has PLACED V2520 in BYPASS and PLACED TIC-2223 in manual and adjust the controller to maintain normal letdown temperature* ***SRO DIRECTS** system walk downs observing for leaks or lifting relief valves*
	SRO	**SRO NOTIFIES** the SM and requests I&C support	
	SRO		***SRO Exits this procedure***
	SRO	**SRO PERFORMS** CREW BRIEF	
At the Lead Evaluator's direction, PROCEED to Event 5.			

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	5	
Event Description:	2A Heater drain pp trip; Commence plant shutdown					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

Note to Evaluator: The 2A Heater Drain Pp High amps/trip malfunction initiated from the Booth upon direction by the evaluator.

Booth Operator Instructions:

- **NONE**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications: High AMPS on the 2A Heater Drain Pp
Annunciators:
F-25 4A LP HTR LEVEL HIGH/LOW
F-33 5A HP HTR LEVEL HIGH
F-35, 2A HTR DRN PUMP OVRLD/TRIP

	ATC		**IDENTIFIES** 2A Heater Drain Pp High amps and places the pump to stop
	SRO		**DIRECTS** the ATC to stop 2A Heater Drain Pp
2-AOP-09.04		**The following actions are taken from 2-AOP-09.04, FEEDWATER, CONDENSATE, AND HEATER DRAIN PUMP ABNORMAL OPERATIONS**	
4.1 Immediate Operator Actions:			
	SRO	**1. VERIFY** S/G NR levels between 60% and 70%.	***SRO EVALUATES*** *and determines S/G NR levels are between 60% and 70%.*
4.2.1 General Actions:			
	SRO	**1. PERFORM** applicable section per Table 1.	***SRO EVALUATES*** *and determines and proceeds to section 4.2.2*
4.2.2 MFW, Condensate, or Heater Drain Pump Trip			

NOTE

☐ SIAS trips the MFW pumps and the Heater Drain Pumps

☐ MFW pump low suction pressure alarms at 305 psig lowering and MFW **pump low suction pressure trip occurs at 230 psig lowering.**

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	5	
Event Description:	**2A Heater drain pp trip; Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**1. VERIFY SIAS NOT Present.** ☐R-6, SIAS CHANNEL A/B ACTUATION is CLEAR.	***SRO EVALUATES*** *and determines R-6, SIAS CHANNEL A/B ACTUATION is CLEAR.*
	SRO	**2. VERIFY** current power level can be supported by number of running MFW, condensate, and heater drain pumps**.**	***SRO EVALUATES*** *and determines 2A HDP is unavailable and* ***DIRECTS*** *a RAPID DOWNPOWER*
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, Rapid Downpower**	
4.1 Operator Actions:			
	SRO		***DIRECTS*** *Immediate Operator Actions for 2-AOP-22.01, RAPID DOWNPOWER*
	SRO	**1. BEGIN** boration per operator aid OR Attachment 1, RCS Boration Guidance.	***SRO DIRECTS ATC*** *to make boration 15 gallons per minute from a Boric Acid Makeup tank to the charging pump suction. Attachment 1, RCS Boration Guidance.*
ATTACHMENT 1 RCS Boration Guidance NOTE • Step 1 in this attachment is applicable when the CVCS is normally aligned, with NO RCS boration or dilution in progress. If other than normal alignment, use guidance of 2-NOP-02.24, Boron Concentration Control. • An Operator Aid has been placed at RTGB-205. Any revision to this section of the procedure shall verify the validity of the Operator Aid and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Operator Aid Placard.			
	ATC	**1. BORATE** the RCS by the following: **A. START** either Boric Acid Pump 2A or 2B.	***ATC STARTS*** *Boric Acid Pump* ***ATC VERIFIES*** *Boric Acid Pump STARTS*
	ATC	**1. BORATE** the RCS by the following: **B. PLACE** FCV-2210Y, BORIC ACID (RTGB-205), control switch in AUTO.	***ATC PLACES*** *FCV-2210Y, BORIC ACID control switch in AUTO*
	ATC	**1. BORATE** the RCS by the following: **C**. IF borating to the Charging Pump suction, THEN **OPEN** V2525, BORON LOAD CONTROL VALVE	***ATC PLACES*** *V2525, BORON LOAD control switch in OPEN* ***ATC IDENTIFIES*** *V2525, BORON LOAD* ***ATC REPORTS***

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	5	
Event Description:	**2A Heater drain pp trip; Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO		***SRO DIRECTS ATC*** ***The SRO may alternately***
	ATC	**1. BORATE** the RCS by the following: **D.** IF borating to the VCT, THEN **OPEN** V2512, REACTOR MAKEUP WATER STOP VLV	***ATC PLACES*** *V2512, REACTOR MAKEUP WATER STOP VLV control switch in OPEN* ***ATC VERIFIES*** *V2512, REACTOR MAKEUP WATER STOP VLV is OPEN*
	ATC	**1. BORATE** the RCS by the following: **E. ADJUST** FIC-2210Y, BORIC ACID, to the desired flowrate.	***ATC ADJUST****S FIC-2210Y, BORIC ACID, to the desired flowrate of 15 gpm*
	ATC	**1. BORATE** the RCS by the following: **F.** IF desired to maximize the boric acid flow rate, THEN **CLOSE** the running BAM pump recirc valve. • V2650, TANK 2A RECIRC VALVE • V2651, TANK 2B RECIRC VALVE	***ATC DETERMINES*** *not required*
	ATC	**1. BORATE** the RCS by the following: **G. CYCLE** V2513, VENT VALVE (RTGB-205) to maintain VCT pressure less than or equal to 30 psig.	***ATC CYCLES*** *V2513, VENT VALVE as necessary to maintain VCT pressure less than or equal to 30 psig*
	ATC	**1. BORATE** the RCS by the following: **H. CYCLE** V2500, DIVERT VALVE (RTGB-205) to WMS if necessary to maintain the desired VCT level.	***ATC CYCLES*** *V2500, DIVERT VALVE to WMS if necessary to maintain the desired VCT level*
	ATC		**ATC UPDATES** crew on Reactivity Addition
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWN POWER**	
	SRO	**2. PREPARE** turbine for load reduction per operations hard cards.	***SRO DIRECTS BOP*** *to set up the turbine for a target of 100 MW and load rate at 10 megawatts per minute per operations hard cards*
2-NOP-99.07		**The following actions are taken from 2-NOP-99.07 OPERATIONS HARD CARDS**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	5	
Event Description:	**2A Heater drain pp trip; Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		2-NOP-99.07 OPERATIONS HARD CARDS **ATTACHMENT 3 TURBINE ADJUSTMENTS TO MAINTAIN POWER NOTE** **A Hard Card has been placed at RTGB-201. Any revision to this section of the procedure shall verify the validity of the Hard Card and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Hard Card placecard.**	
	BOP	**TURBINE ADJUSTMENTS TO MAINTAIN POWER**	***BOP ENSURES*** *Ovation display 5551, TURBINE CONTROL SYSTEM - OPERATION PANEL, is open*
	BOP	**TURBINE ADJUSTMENTS TO MAINTAIN POWER TOUCH MODIFY** from RAMP INTERFACE group.	***BOP TOUCHES MODIFY*** *from RAMP INTERFACE group*
	BOP	**TURBINE ADJUSTMENTS TO MAINTAIN POWER ADJUST** values, as directed by SM/US, for the following on MODIFY RAMP SETPOINTS: (display 7055) • TARGET SELECT • RATE SELECT	***BOP ADJUSTS*** *values, as directed by SM/US, for the following on MODIFY RAMP SETPOINTS: (display 7055)* • *TARGET SELECT set at 100 MW* • *RATE SELECT set at 10 MW/min*
	BOP		***BOP NOTIFIES*** *SRO that the Turbine is set up with a Target of 100 MW at a rate of 10 MW/min*
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWNPOWER**	
	SRO	**3. INSERT** the Lead CEA Group approximately 6 inches to initially lower RCS temperature per operations hard cards.	***SRO DIRECTS ATC*** *to insert lead group CEAs 6 inches in Manual Sequential*
2-NOP-99.07		**The following actions are taken from 2-NOP-99.07, OPERATIONS HARD CARDS**	
		2-NOP-99.07 OPERATIONS HARD CARDS **ATTACHMENT 1 CEDMCS OPERATIONS NOTE** **A Hard Card has been placed at RTGB-204. Any revision to this section of the procedure shall verify the validity of the Hard Card and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Hard Card placecard.**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	5	
Event Description:	**2A Heater drain pp trip; Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC	**Moving CEAs in group** On CEDMCS Control Panel Group Select Switch, **SELECT** target group.	***ATC SELECTS*** *Target Group 5*
CAUTION When performing a rapid downpower due to a dropped CEA, then MANUAL GROUP (MG) shall be selected. This will prevent multiple CEA groups from moving.			
	ATC	**Moving CEAs in group** On CEDMCS Control Panel Mode Select Switch, **SELECT** mode of movement: MANUAL GROUP (MG) OR MANUAL SEQUENTIAL (MS)	***ATC SELECTS*** *MANUAL GROUP (MG) OR MANUAL SEQUENTIAL (MS) On CEDMCS Control Panel*
	ATC	**Moving CEAs in group** IF CEA Motion Inhibit is present, THEN PERFORM the following: PRESS and HOLD CMI BYPASS pushbutton. PRESS and RELEASE BYPASS ENABLE pushbutton.	***STEP*** *will be N/A* ***NO*** *CEA Motion Inhibit is present*
	ATC	**Moving CEAs in group** **POSITION** group as desired using INSERT/WITHDRAW Manual Control lever.	***ATC POSITIONS*** *group as directed to 6" inserted from previous position using INSERT/WITHDRAW Manual Control lever*
	ATC	**Moving CEAs in group** IF CMI BYPASS pushbutton is being held, THEN **RELEASE** CMI BYPASS pushbutton.	***STEP*** *will be N/A* ***NO*** *CEA Motion Inhibit is present*
	ATC	**Moving CEAs in group** **OBSERVE** RSPT AND Pulse Counter CEA position indications to verify CEA motion and alignment.	***ATC OBSERVES*** *RSPT AND Pulse Counter CEA position indications and verifies CEA motion and position*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	5	
Event Description:	**2A Heater drain pp trip; Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	ATC	**Moving CEAs in group** On CEDMCS Control Panel, **SELECT** OFF on Mode Select Switch when the desired height is reached.	***ATC SELECTS*** *OFF on Mode Select Switch when the desired height is reached*
	ATC	**Moving CEAs in group** **ENSURE** RSPT and Pulse Counter indications match.	***ATC ENSURES*** *RSPT and Pulse Counter indications match*
	ATC		***ATC Updates crew on Reactivity Addition***
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWNPOWER**	
4.2 Subsequent Operator Actions			
	SRO	**1. WHEN** Tavg begins to lower and is less than Tref, THEN **TOUCH** GO from RAMP INTERFACE group. (OVATION display 5551)	***DIRECTS ATC*** *to monitor Tavg and to notify him when it is lowering and less than Tref*
	ATC		***ATC NOTIFIES*** *the SRO that Tavg is lowering and less than Tref*
	SRO		***DIRECTS BOP*** *to* ***TOUCH GO*** *from RAMP INTERFACE group. (OVATION display 5551)*
	BOP		***BOP*** *to* ***TOUCHES GO*** *on the RAMP INTERFACE group to begin turbine load reduction per operations hard cards as follows:* *5.* ***TOUCH GO*** *from RAMP INTERFACE group. (display 5551)* *6.* ***MONITOR*** *turbine governor valves response on Ovation main operation window, TURBINE CONTROL SYSTEM – OPERATION PANEL. (display 5551)* ***BOP Updates crew on load reduction initiation.***
	SRO/ATC	SRO directs ATC to MAINTAIN T-avg and T-ref	***8. MAINTAIN*** *T-avg and T-ref as close as possible during load changes by adjusting either or both of the following:* • *Reactivity rate* • *Turbine load rate*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	5	
Event Description:	**2A Heater drain pp trip; Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**2. NOTIFY** plant personnel using Gai-tronics and boost function as follows: "Attention all personnel, Unit 2 has commenced a Rapid Downpower due to _____."	***DIRECTS BOP to NOTIFY*** *plant personnel using Gai-tronics and boost function as follows:* *"Attention all personnel, Unit 2 has commenced a Rapid Downpower due to excessive RCS leakage."*
	BOP		***NOTIFIES*** *plant personnel using Gai-tronics and boost function as follows:* *"Attention all personnel, Unit 2 has commenced a Rapid Downpower due to excessive RCS leakage."*
	SRO	**3. NOTIFY** System of the rapid downpower load reduction.	***DIRECTS BOP*** *to* ***NOTIFY*** *System of the rapid downpower*
	BOP		***NOTIFIES*** *System of the rapid downpower, via dedicated RED phone.*
NOTE OPS-530, Pre-Planned Power Change Guidance, delineates operations department policy for the use of pre-planned downpower profiles provided by the Plant Physics Curve Book.			
	SRO	**4. PERFORM** a Crew update to include the following: • Expected final power level • Initial boration rate • Initial load rate • Expected amount of boric acid addition • Expected amount of CEA motion using pre-planned downpower profiles in the Plant Physics Curve Book	***SRO UPDATES*** *crew with the following information:* • *Expected final power level Offline* • *Initial boration rate 15 GPM* • *Initial load rate of 10 MW/MIN* • *Expected amount of boric acid addition Per preplanned power guidance* • *Expected amount of CEA motion Per preplanned power guidance*
	SRO	**5. PLACE** Pressurizer on recirculation per operations hard cards.	***SRO should recognize*** *heaters are all on to maintain pressure from PZR safety valve leak. Recirculation should not be directed as this will lower pressure*
	SRO	**6. START** additional charging pump as required per operations hard cards.	***SRO DIRECTS ATC*** *to* ***START*** *a second charging pump per operations hard cards, if not previously started*
2-NOP-99.07		**The following actions are taken from 2-NOP-99.07, OPERATIONS HARD CARDS**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	5	
Event Description:	**2A Heater drain pp trip; Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		2-NOP-99.07 OPERATIONS HARD CARDS **ATTACHMENT 8 CHARGING PUMP OPERATIONS WHILE IN AN AOP NOTE** **A Hard Card has been placed at RTGB-201. Any revision to this section of the procedure shall verify the validity of the Hard Card and, if changes are necessary, a Label Request shall be initiated to incorporate these changes on a new Hard Card placecard.**	
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW** IF in MODE 1 or 2, THEN PLACE V2520, ION EXCHANGER BYPASS VALVE, in BYPASS to minimize reactivity effects of changing letdown temperature.	***BOP PLACES*** *V2520, ION EXCHANGER BYPASS VALVE, in BYPASS*
		START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW **NOTE** • When starting OR stopping a charging pump with LIC-2110, LETDOWN LEVEL, in Single Element Mode, it may be necessary to place the controller in Manual Mode to prevent pressurizer level from deviating too far from setpoint. • In Manual Mode, the letdown flow should be adjusted as necessary to maintain pressurizer level at setpoint. The controller should be returned to Auto when it reaches setpoint with the desired number of charging pumps running.	
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: START** charging pump by placing its control switch in START.	***BOP STARTS*** *Second charging pump by placing its control switch in START*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: PLACE** CHRG PUMP SEL RUNNING - B/U PP switch in proper position per operator aid.	***BOP PLACES*** *CHRG PUMP SEL RUNNING - B/U PP switch in proper position per operator aid*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: WHEN** 3 minutes has elapsed since pump start, THEN ENSURE associated recirc valve is CLOSED.	***BOP ENSURES*** *Second Charging Pp recirc valve is CLOSED*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	5	
Event Description:	**2A Heater drain pp trip; Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW:** WHEN letdown temperature stabilizes, THEN **ENSURE** V2520, ION EXCHANGER BYPASS VALVE, control switch is returned to AUTO.	***BOP ENSURES*** *V2520, ION EXCHANGER BYPASS VALVE, control switch is returned to AUTO after temp stabilizes*
	BOP	**START ADDITIONAL CHARGING PUMP(S) TO RAISE FLOW: NOTIFY** RP and SNPO of current charging pump alignment.	***BOP NOTIFIES*** *RP and SNPO of starting of the Second charging pump*
2-AOP-22.01		**The following actions are taken from 2-AOP-22.01, RAPID DOWNPOWER**	
		NOTE • The procedural limit for ASI control is +/- 0.5 of ESI. It is desired to maintain ASI within a control band of +/- 0.2 of ESI. • US may direct temporary operation outside of ASI limit.	
	SRO	**7. MAINTAIN** Axial Shape Index ±0.5 of ESI using CEAs.	***DIRECTS ATC*** *to maintain ASI to within +/- 0.2 of ESI using the sliding scale with lead group CEAs IAW 0-NOP-100.02 Axial Shape Index Control unless recommended otherwise by Reactor Engineering*
	ATC		***POSITIONS*** *lead group CEAs to control ASI to within +/- 0.2 from the ESI on the sliding scale IAW 0-NOP-100.02 Axial Shape Index Control*
		NOTE The procedural limit for Tave-Tref mismatch is +/- 6.6 degrees °F. It is desired to maintain a control band of +/- 2 degrees °F	
	SRO	**8. MAINTAIN** Tref and Tavg within 6.6 °F.	***DIRECTS ATC*** *to maintain Tave-Tref mismatch within +/- 2 degrees °F*
	SRO	**9.** IF reducing power by more than 20%, THEN **NOTIFY** SNPO to secure Zinc Injection per 2-NOP-02.26, Zinc Addition.	***DIRECTS BOP*** *to dispatch a SNPO to secure Zinc injection*
		NOTE Condenser back pressure is provided on OVATION displays 5559, TURBINE EXHAUST HOOD SPRAY AND CONDENSER VACUUM and 5605, CONDENSER VACUUM MONITORING. The condenser back pressure trip and alarm setpoints are variables that are dependent on power level.	
	SRO	**10. VERIFY** Condenser Back Pressure less than 8.859 inHgA.	***DIRECTS BOP*** *to report Condenser Backpressure*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	5	
Event Description:	**2A Heater drain pp trip; Commence plant shutdown**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE OVATION displays 5559, TURBINE EXHAUST HOOD SPRAY AND CONDENSER VACUUM and 5605, CONDENSER VACUUM MONITORING, indicate time remaining before an automatic Turbine Trip is initiated by DEH, when operating in the Restricted Operating Region.	
	SRO	**11. VERIFY** Condenser Back Pressure below alarm limits Acceptable Operating Region Attachment 4, Condenser Pressure Limitations. **OR** OVATION display 5605, CONDENSER VACUUM MONITORING.	***DIRECTS BOP*** *to monitor Condenser Backpressure*
	SRO	**12. VERIFY** CONDENSER DIFFERENTIAL pressure less than 2.0 inHgA. (OVATION display 5559 OR 5605)	***DIRECTS BOP*** *to monitor Condenser differential pressure*
	SRO	**13. VERIFY** parameters listed on Attachment 3, Rapid Downpower Parameters, are within limits.	***DIRECTS BOP*** *to monitor parameters listed on Attachment 3*
		NOTE Rapid Downpower may result in Pressurizer Pressure dropping below DNBR Limit.	
	SRO	**14. MAINTAIN** PZR pressure between 2225 and 2275 psia.	***DIRECTS ATC*** *to* ***MAINTAIN*** *PZR pressure between 2225 and 2275 psia by controlling HIC-1100*
		NOTE A large rate of change in Tavg may cause transient level variance.	
	SRO	**15. MAINTAIN** PZR level between 27% and 68%.	***DIRECTS ATC*** *to* ***MAINTAIN PZR*** *level between 27% and 68%*
	SRO	**16.** WHEN Final power level is achieved, THEN **GO TO** Section 4.2, Step 35 to STABILIZE the unit.	***SRO*** *will continue with procedure to remove the unit offline*

Appendix D			Operator Action						Form ES-D-2
Op Test No.:	L-19-1		Scenario #	5	Event #	6			
Event Description:	**2B Main Feedwater Pp recirc valve fails open LOOP W/ 2B EDG start failure**								

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
			Note to Evaluator: The 2B Main Feedwater Pp recirculation valve, FCV-09-1B fails open is a malfunction initiated from the Booth upon direction by the evaluator. The LOOP and 2B EDG failures are an auto trigger initiated upon reactor power lowering to <.5%
			Booth Operator Instructions: • **None; 2B Main Feedwater Pp recirc valve fails open LOOP W/ 2B EDG overspeed trip** **Role Play:** • **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.** • **If SNPO is dispatched to the 2B EDG report back in 5 minutes that the 2B EDG has an Over Speed Trip and the overspeed reset latch will not reset, you need mechanical assistance.**
			Indications: 2B S/G level lowering **Annunciators: G-9 2B S/G LEVEL HIGH/LOW**
	BOP		**RECOGNIZES** the Steam Generator level lowering
	BOP/SRO		**COMMUNICATES** Steam Generator level lowering and attempts recovery, recommends Reactor Trip
	SRO		**DIRECTS** Reactor Trip on Low S/G level
	ATC		**TRIPS** Reactor
	BOP/ATC		**Recognizes** LOOP
	ATC		**Confirms** reactor power is lowering and startup rate is negative. **Reports "Reactor Tripped"** **States evaluating CEAs or that all CEAs are inserted**
	BOP		**Verifies** all governor and throttle valves closed **Reports "Turbine Tripped"**
	BOP		**ANNOUNCE** on the Gai-tronics: Unit 2 Reactor has tripped **NOTIFY** the NPO to perform Appendix X, Section 1 of 2-EOP-99 **CONTACT** the SM, STA and Shift Comm. to report to the Control Room
	SRO		Performs Scan of RTGBs to quickly assess the plant status by systematically reviewing key safety parameters/system conditions of the control boards
	ATC		**Reports "All CEAs INSERTED" if not reported previously**
	SRO		**Directs ATC** to start remaining Charging Pumps as necessary

Appendix D		Operator Action					Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	6		
Event Description:	2B Main Feedwater Pp recirc valve fails open LOOP W/ 2B EDG start failure						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO		**Directs IMPLEMENTATION OF EOP-01, STANDARD POST TRIP ACTIONS**
2-EOP-01		**The following actions are taken from 2-EOP-01, Standard Post Trip Actions**	
4.1 Immediate Operator Actions: • **ATC: Verifies Reactor power lowering, Negative Startup rate, all CEAs and verifies no dilution is in progress inserted and communicates status to the Unit Supervisor. Starts backup charging pumps as necessary.** • **BOP: Verifies all governor and throttle valves closed and communicates status to the Unit Supervisor. Makes plant announcements and trip notifications.**			
4.0 Operator Actions:			
	SRO	**Step 1 VERIFY reactor trip:**	***SRO DIRECTS*** *VERIFY reactor trip, ATC Verifies:* ☐ *Reactor power LOWERING* ☐ *Startup Rate NEGATIVE* ☐ *All CEAs are fully INSERTED* ☐ *NO dilution is in progress*
	SRO	**Step 2 VERIFY turbine trip:**	***SRO DIRECTS VERIFY*** *turbine trip, BOP Verifies:* ☐ *All governor and throttle valves CLOSED.* ☐ *Main Generator breakers are OPEN* ☐ *Turbine speed LOWERING*
	SRO	**Step 3 VERIFY** Maintenance of Vital Auxiliaries:	***SRO DIRECTS VERIFY*** *Maintenance of Vital Auxiliaries, BOP Verifies:* ☐ *VERIFY station loads transferred to offsite electrical power* ***BOP*** *will Update the crew on the* ***LOOP*** ☐ *VERIFY all Vital and Non-Vital AC buses transfer from Auxiliary to Start-up Transformers AND are ENERGIZED* ***BOP*** *will Update the crew on the LOSS of the* ***2B EDG*** ***NOTE to EVALUATOR: the 2B EDG fails and will be unavailable for remainder of scenario,*** ☐ *VERIFY all Vital and Non Vital DC Buses are ENERGIZED* ☐ *VERIFY seal cooling to RCPs:*

Appendix D		Operator Action						Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	6			
Event Description:	**2B Main Feedwater Pp recirc valve fails open LOOP W/ 2B EDG start failure**							

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 4 VERIFY RCS Inventory Control:**	***SRO DIRECTS VERIFY*** *RCS Inventory Control, ATC Verifies:* ☐ *Pressurizer level is between 10 and 68%* ☐ *Pressurizer level is trending to between 30 and 35%*
	SRO	**Step 5 VERIFY RCS Pressure Control:**	***SRO DIRECTS VERIFY*** *RCS Pressure Control, ATC Verifies:* ☐ *Pressurizer pressure is between 1800 and L-19-100 psia* ☐ *Pressurizer pressure is trending to between 2225 and 2275 psia* **IF SIAS** has occurred the **SRO** will **DIRECT** two RCPs to be tripped and perform 2-EOP-99 App.J to restore CCW to the RCPs
	SRO	**Step 6 VERIFY Core Heat Removal:**	***SRO DIRECTS VERIFY*** *Core Heat Removal, ATC Verifies:* ☐ *At least one RCP is RUNNING and all RUNNING RCPs are supplied with CCW* ☐ *Loop ΔT is less than 10˚F* ☐ *RCS subcooling greater than or equal to 20°F* ☐ *NO indication of RCP cavitation*
	SRO	**Step 7 VERIFY RCS Heat Removal:**	***SRO DIRECTS*** *VERIFY RCS Heat Removal, ATC Verifies:* ☐ *VERIFY the following conditions exist on at least one S/G:* • *S/G NR level is between 20 and 81%* • *Feedwater is being supplied* ☐ *IF 2A or 2B AFW Pump is the ONLY source of Feedwater, THEN STOP one RCP in each loop* ☐ *VERIFY at least ONE of the following is supplying feedwater to the S/G(s):* • *Main or Auxiliary Feedwater* ☐ *VERIFY RCS TAVG is between 525 and 535°F* ☐ *VERIFY S/G pressure is between 850 and 930 psia (835 and 915 psig)*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	6	
Event Description:	**2B Main Feedwater Pp recirc valve fails open LOOP W/ 2B EDG start failure**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 8 VERIFY containment conditions:**	***SRO DIRECTS*** *VERIFY* containment conditions, *BOP Verifies:* ☐ *Containment pressure is less than 2 psig* ☐ *Containment temperature is less than 120°F* ☐ *Containment radiation level less than alarm values AND stable or lowering:* • *CIS Radiation Monitors* • *Containment Atmospheric Monitors* ☐ *Secondary plant radiation levels less than alarm values AND stable or lowering:* • *Condenser Air Ejector Monitor* • *S/G Blowdown Monitors* • *Main Steamline Monitors*
	SRO	**Step 9 DIRECT a field operator to perform the following:**	***SRO DIRECTS BOP*** *to perform step 9, BOP performs step 9:* ☐ *Directs NPO to perform Section 1 of Appendix X, Secondary Plant Post Trip Actions* ☐ *Directs SNPO to VERIFY SFP inventory and temperature are normal on all available indications*
	SRO	**Step 10 DIAGNOSE the event using Attachment 1, Diagnostic Flow Chart.**	***SRO DIAGNOSE*** *the event using Attachment 1, Diagnostic Flow Chart and determines an is in progress*
	SRO	**Step 11 GO TO the appropriate Emergency Operating Procedure.**	***SRO Performs*** *a crew brief and transitions to 2-EOP-06 TLOF* ***NOTE: 2-EOP-06 TLOF is discussed in Event 8***

At the Lead Evaluator's direction, PROCEED to Event 7.

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	5	Event #	7	
Event Description:	**2C AFW Pp mech trips on start non-recoverable**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		Note to Evaluator: The 2C AFW pump trip auto trigger is linked to the illumination of the red light for valve MV-08-12, SB 2B STM TO AFW PP 2C and occurs when the AFAS timer initiates a pump start signal.	
		Booth Operator Instructions: • **Event 7 is an auto trigger: 2C AFW Pp mech trips on start non-recoverable** **Role Play:** • **If NPO is dispatched to the 2C AFW Pp report back in 5 minutes that the 2C AFW Pp has a Mechanical Over Speed Trip** • **When called as the NPO to perform steps in 2-AOP-09.02 as directed using 1-3 minute intervals between directed steps. If directed to perform large sections of the procedure adjust the time intervals as needed to simulate realistic conditions and time requirements to perform the task** • **When directed to reset the 2C AFW Pump report that the mechanical overspeed trip linkage is broken at the tappet and that you need mechanical maintenance.**	
		Indications: No Feed flow from the 2C AFW pump **Annunciators: G-46 2C AFW PUMP TURBINE FAILURE/TRIP/ OVRLD/SS ISOL will be locked in, indicating a Mechanical Overspeed trip**	
	SRO		Will direct the BOP to perform 2-AOP-0.02 AUXILIARY FEEDWATER to restore feedwater to either S/G
		NOTE: The SRO will direct the BOP to perform the AOP as needed to restore AFW, it is expected that as the failures occur that the BOP relay their finding to the SRO and that the SRO direct the restoration path to be addressed by the BOP. Multiple potential success paths will be ongoing simultaneously and multiple resources will be dispatched to the AFW when the area has been reported as safe to approach.	
	2-AOP-09.02	**The following actions are taken from 2-AOP-09.02, AUXILIARY FEEDWATER**	
		4.2 Immediate Operator Actions: • **NONE**	
		4.0 Operator Actions:	
	BOP	**Step 1 IF** all of the following conditions exist: ☐ In MODE 2 ☐ All feedwater is lost,	***BOP RECOGNIZES** this step does not apply*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	7	
Event Description:	**2C AFW Pp mech trips on start non-recoverable**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**Step 2 IF** all of the following conditions exist: ☐ In MODE 3 ☐ SIAS NOT blocked ☐ All feedwater is lost ☐ NOT already implementing an optimal recovery procedure.	***BOP RECOGNIZES*** *that the crew will proceed to 2-EOP-06*
	BOP	**Step 3 IF** all of the following conditions exist: ☐ In MODE 3 through MODE 6 ☐ SIAS is blocked ☐NOT already implementing an optimal recovery procedure.	***BOP RECOGNIZES*** *this step does apply*
	BOP	**Step 4 VERIFY** AFAS, if required.	***BOP RECOGNIZES AFAS*** *has actuated*
	SRO	**Step 5 VERIFY** 2C Auxiliary Feedwater pump is NOT tripped.	***BOP RECOGNIZES*** *2C AFW pump has tripped and PERFORMS Attachment 1, Resetting 2C AFW Pump Following Overspeed Trip*
Attachment 1		**The following actions are taken from Attachment 1, Resetting 2C AFW Pump Following Overspeed Trip**	
STEP 1: IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN PERFORM the following:			
	BOP	**Step A CLOSE** MV-08-12, SG 2B STM TO AFW PP 2C.	***BOP CLOSES*** *MV-08-12, SG 2B STM TO AFW PP 2C*
	BOP	**Step B CLOSE** MV-08-13, SG 2A STM TO AFW PP 2C.	***BOP CLOSES*** *MV-08-13, SG 2A STM TO AFW PP 2C*

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	5	Event #	7	
Event Description:	**2C AFW Pp mech trips on start non-recoverable**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**Step C PERFORM** the following to reset and OPEN MV-08-3, 2C PUMP: • **CLOSE** MV-08-3, 2C PUMP. (RTGB-202 – Key 78) • IF 2C AFW pump tripped due to mechanical overspeed trip, THEN **PERFORM** the following: **a. RESET** the 2C Auxiliary Feedwater Pump mechanical overspeed linkage. **b. VERIFY** top surface of trip tappet nut is in line with the line marked on the head lever to ensure full • **PLACE** MV-08-3, 2C PUMP (2C Auxiliary Feedwater Pump), in OPEN. • **VERIFY** MV-08-3, THROTTLE / TRIP VALVE FOR AFW PUMP 2C, is OPEN.	***BOP CLOSES*** *MV-08-3, 2C PUMP. (RTGB-202)* ***BOP OPENS*** *MV-08-3, 2C PUMP. (RTGB-202)* ***NOP REPORTS*** *The Mechanical Overspeed linkage is broken at the tappet and that you need mechanical maintenance.* ***NOTE: The 2C AFW pump will remain unavailable, if calls are made for updates on the status of the 2C AFW pump; report that the linkage will need to be removed and taken to the shop for repairs, ETA 1 hour.***
Event 8 will present itself when the crew goes to OTC.			

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	5	Event #	8	
Event Description:		Initiate Once Through Cooling, 2A HPSI pump does not start					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior

CT-2	2.INITIATE/ACTUATE/START SAFEGUARDS EQUIPMENT THAT FAILS TO FUNCTION AUTOMATICALLY - SAFEGUARDS EQUIPMENT THAT IS ESSENTIAL TO THE MAINTENANCE OF SAFETY FUNCTIONS HAS NOT AUTO-ACTUATED WHEN IT SHOULD HAVE. 'A' HPSI PUMP DOES NOT START ON SIAS AND MUST BE MANUALLY STARTED TO MEET FIGURE 2 OF 2- EOP-99 TO PREVENT UNNECESSARY ESCALATION OF EAL INITIATE ONCE THROUGH COOLING: WHEN BOTH S/G LEVEL ARE <15% WR AND PRIOR TO S/G DRYOUT.

Note to Evaluator: The 2A HPSI PP failure to auto start on SIAS, is a breaker fail as is malfunction that is an auto trigger inserted upon lesson execution. The breaker fail as is malfunction, is deleted when the applicant positions the control switch for the 2A HPSI pump to the start position.

Booth Operator Instructions:

- **NONE**

Role Play:

- **If calls are made for information delivery or support, then verbal repeat back of information is the only required action.**

Indications: Both Steam Generator level lowering and no feedwater available
Annunciators: Multiple

	ALL		Recognizes Both Steam Generator level lowering and no feedwater available
	SRO		Enter 2-EOP-06, TLOF

2-EOP-06	**The following actions are taken from 2-EOP-06, TLOF**

4.3 Immediate Operator Actions: NONE

4.0 Operator Actions:

	SRO	**Step 1 MONITOR** the SFSCs and **VERIFY** the SFSC acceptance criteria are MET every 15 minutes.	***SRO DIRECTS*** *the STA to MONITOR the SFSCs and VERIFY the SFSC acceptance criteria are MET every 15 minutes.* ☐ *STA or Extra RCO performs SFSCs*
	SRO	**Step 2 IMPLEMENT** the Emergency Plan.	***SRO NOTIFIES*** *the Shift Manager to IMPLEMENT the Emergency Plan.*
	SRO	**Step 3 IMPLEMENT** place keeping.	***SRO IMPLEMENTS*** *the place keeper.*
	SRO	**Step 4 DIRECT HP** to perform secondary surveys.	***SRO DIRECTS*** *DIRECT HP to perform secondary surveys.*

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	5	Event #	8	
Event Description:		**Initiate Once Through Cooling, 2A HPSI pump does not start**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 5 Stop RCPs** and **Depressurize** **A. STOP** ALL RCPs. **B. COMMENCE** RCS depressurization to between 1800 and 1850 psia. **C. MAINTAIN** Pressurizer level between 10 and 68%.	***The SRO DIRECTS*** *the* ***ATC*** *Depressurize the RCS* *The ATC COMMENCES RCS depressurization to between 1800 and 1850 psia using aux sprays* *The ATC MAINTAINS Pressurizer level between 10 and 68%*
	SRO	**Step 6 Restore** Instrument Air If a LOOP has occurred, Then **PERFORM BOTH of the following:** **A. ENSURE** 2AB 480V Load Center is aligned to an energized bus. **B. DISPATCH** an operator to restore Instrument Air. REFER TO Appendix H, Operation of the 2A and 2B Instrument Air Compressors.	***SRO RECOGNIZES*** *that instrument air is not available and DIRECTS APP H be performed*
	SRO	**Step 7 VERIFY** RCP Seal Cooling as follows: • **VERIFY** CCW to the RCPs**.**	***SRO RECOGNIZES*** *that CCW is not available until IA is restored*
	SRO	**Step 8 ISOLATE** the following flowpaths to conserve S/G inventory: A. S/G Blowdown B. Secondary sampling	***SRO DIRECTS*** *the ATC to Close Blowdown isolation and sample valves* *the ATC to Closes Blowdown isolation and sample valves*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	8	
Event Description:	**Initiate Once Through Cooling, 2A HPSI pump does not start**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 9 RESTORE** a high-pressure feedwater source to at least one S/G: **A.** Attempt to **RESTORE** Auxiliary Feedwater to at least ONE S/G by considering ALL of the following: 1. If **BOTH** of the following conditions exist, • S/G levels are below 19.5% NR • AFAS has stopped timing Then **ENSURE** AFAS has ACTUATED. 2. If ANY of the following conditions exist, • Mechanical or electrical overspeed of the 2C AFW Pump has occurred • Steam binding of an AFW Pump is suspected • Crosstying of Auxiliary Feedwater Discharge Headers is desired Then **RESTORE** Auxiliary Feedwater components. REFER TO 2-AOP–09.02, Auxiliary Feedwater. B. If Offsite power is available, Then attempt to restore Main Feedwater to at least ONE S/G as follows: 1. **ENSURE** SIAS and MSIS are RESET. REFER TO Appendix P, Restoration of Components Actuated By ESFAS. 2. **ENSURE** ONLY ONE Condensate Pump is RUNNING. 3. **DEPRESS BOTH** pushbuttons to RESET the Low Power Feedwater Valves. 4. **ENSURE** BOTH Low Power Feedwater Valve Controllers are in MANUAL with MINIMUM output. 5. **ENSURE** ONLY ONE Main Feedwater Pump is RUNNING, with the control switch in RECIRC. 6. **ENSURE** the MFIVs in EACH intact feedwater header are OPEN. 7. **FEED** the S/G by use of ANY of the following flowpaths: • Low Power Feedwater Valve • 100% Bypass Valve • Main Feed Regulating and associated Block Valve	***SRO DIRECTS*** *BOP to continue efforts to restore AFW flow to either S/G* ***NOTE: The SRO will DIRECT the BOP to perform 2-AOP-09.02 which is described in Event 7***

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	8	
Event Description:	**Initiate Once Through Cooling, 2A HPSI pump does not start**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO	**Step 10 VERIFY** circulating water flow to the main condenser. • **If Circulating Water flow to the Main Condenser has been lost, Then ENSURE MSIVs are CLOSED.** • **STABILIZE** the Secondary Plant. REFER TO Appendix X, Secondary Plant Post Trip Actions, Section 2.	***The SRO RECOGNIZES*** *Circulating Water flow is unavailable and* ***DIRECTS*** *the ATC to perform Appendix X, Secondary Plant Post Trip Actions, Section 2 as time permits and to close the MSIVS* ***The ATC PERFORMS*** *Appendix X, Secondary Plant Post Trip Actions, Section 2 as time permits and closes the MSIVs*
	SRO	**Step 11 STABILIZE** the Secondary Plant per Appendix X, Secondary Plant Post Trip Actions, Section 2.	***The SRO DIRECTS STABILIZE t****he Secondary Plant per Appendix X as time permits*
	SRO	**Step 12 CHECK** if S/G heat sink is ADEQUATE:: • At least ONE S/G has a level of at least 15% WR • RCS TCOLD is stable or lowering	***The SRO RECOGNIZES*** *feedwater has been lost to both S/Gs and VERIFIES S/G levels approach are < 15% WR and lowering* ***The SRO DIRECTS*** *Once Through Cooling be established*
	SRO	**ESTABLISH OTC** **A.** IF the main condenser is available, **THEN ENSURE** all available steam bypass valves are OPEN.	*The* ***SRO RECOGNIZES*** *the main condenser is unavailable due to the loss of offsite power*
	SRO	**ESTABLISH OTC** **B.** ENSURE all available atmospheric dump valves are OPEN.	***The SRO DIRECTS*** *all available atmospheric dump valves are OPEN* ***ATC/BOP, OPENS*** *all available atmospheric dump valves*
	SRO	**ESTABLISH OTC** **C.** ENSURE SIAS and CIAS is ACTUATED.	***The SRO DIRECTS*** *SIAS and CIAS is ACTUATION* ***ATC/BOP, ACTUATES*** *SIAS and CIAS*
	SRO	**ESTABLISH OTC** **D. ENSURE** HPSI pumps are OPERATING.	***ATC/BOP RECOGNIZES*** *2A HPSI Pump did not* ***START, COMUNICATES*** *failure to the SRO and RECCOMENDS manual start of the 2A HPSI Pp*

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #	8	
Event Description:	**Initiate Once Through Cooling, 2A HPSI pump does not start**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	SRO		*The **SRO DIRECTS** the ATC/BOP to manually start the 2A HPSI Pump*
	SRO	**ESTABLISH OTC** **E.** ENSURE all cold leg injection valves are OPEN.	***The SRO DIRECTS** verification of all cold leg injection valves are OPEN* ***ATC/BOP VERIFYS** all cold leg injection valves are OPEN*
	SRO	**ESTABLISH OTC** **F.** ENSURE all available charging pumps are OPERATING.	***The SRO DIRECTS** verification of all available charging* ***ATC/BOP VERIFY** all available charging*
	SRO	**ESTABLISH OTC** **G.** ENSURE both PORV block valves are OPEN.	***The SRO DIRECTS** verification of both PORV block valves are OPEN* ***ATC/BOP VERIFYS** both PORV block valves are OPEN*
	SRO	**ESTABLISH OTC** **H.** WHEN HPSI pumps are OPERATING, THEN OPEN both PORVs as follows:	***The SRO DIRECTS** OPEN both PORVs* ***ATC/BOP OPEN** both PORVs as follows:* ***(1) ENSURE PORV** control switches are in **OFF.*** ***(2) PULL** at least two **RPS Hi Pzr** Press bistables.* ***(3) VERIFY b**oth **PORVs** are **OPEN.*** ***(4) IF one PORV is OPEN, THEN CONTINUE** steps to initiate **OTC.***
This Scenario can be terminated when Once Through Cooling has been established			

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	5	Event #		
Event Description:	**APPENDICES**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
2-EOP-99 APP "A"		**The following actions are for Sampling Steam Generators Using 2-EOP-99, APPENDIX "A"**	
	BOP	**1. If a LOOP has occurred, Then PERFORM BOTH of the following:** **A. ENSURE 2AB 480V Load Center is aligned to an energized bus.** **B. DISPATCH an operator to restore Instrument Air. REFER TO Appendix H, Operation of the 2A and 2B Instrument Air Compressors.**	***2AB Bus energized when 2A EDG output breaker is closed. Determines no additional action required***
		NOTE ☐ **HCV-14-9 (HCV-14-10) will open 5 seconds after HCV-14-8A (HCV-14-8B) starts to open** ☐ **When SIAS is present, placing the control switches in CLOSE and then OVERRIDE will open the CCW 'N' header valves, until SIAS is reset**	
	BOP	**2. If an INADVERTENT SIAS has closed the 'N' Header valves, Then PERFORM EITHER of the following:** ☐ RESTORE flow to the "A" CCW Header by **placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A** **HCV-14-9** **OR** ☐ RESTORE flow to the "B" CCW Header by **placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B** **HCV-14-10**	***Determines no action required, no inadvertent SIAS***
		CAUTION **Under SIAS conditions, the CCW 'N' header shall only be aligned to ONE essential header. This will maintain train separation while safeguards signals are still present.**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #		
Event Description:	**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**3. If a VALID SIAS has closed the 'N' Header valves, Then PERFORM the following:** **A. VERIFY both safety related CCW headers are operational.** **B. VERIFY 'N'-Header is intact (NO seismic event has occurred).** **C. ALIGN the 'N' Header to one Safety Related CCW Header by performing either of the following:** **RESTORE flow to the 'A' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A, HCV-14-9** **OR** **RESTORE flow to the 'B' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B, HCV-14-10**	**BOP restores "N" header flow**
	BOP	**4. If the 'N' Header has been restored, Then OPEN FCV-L-19-1-7 and FCV-L-19-1-9,** **SGBD Sample Valves by performing the following:** **A. If CIAS or high radiation has closed the SGBD Sample Valves, Then OPEN FCV-L-19-1-7 and FCV-L-19-1-9 by PLACING the control switch to CLOSE / OVERRIDE.** **B. OPEN FCV-L-19-1-7 and FCV-L-19-1-9, SGBD Sample Valves.**	**BOP** restores SGBD sample flow.
	BOP	**5. If the 'N' Header is in service, Then DIRECT Chemistry to perform S/G samples** **for isotopic activity and Tritium.**	**BOP** directs chemistry to perform required samples

Appendix D	Operator Action				Form ES-D-2
Op Test No.: L-19-1	Scenario #	5	Event #		
Event Description:	**APPENDICES**				

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**6. If S/Gs cannot be sampled, Then DIRECT Health Physics to conduct secondary plant local area radiation surveys.**	**BOP** determines step is N/A
		NOTE **The Safety Related CCW header NOT aligned to the 'N' Header will be operable to supply essential equipment.**	
	BOP	**7. DECLARE the Safety Related CCW header aligned to the 'N' Header, inoperable but available.**	**BOP** informs US to declare CCW header inoperable
	BOP	**8. If any of the following conditions occur prior to reaching cold shutdown or resetting SIAS,** • **Seismic event** • **'N' Header is found NOT intact** • **The operable Safety Related CCW header becomes inoperable** **Then ISOLATE the 'N' header.**	**BOP** monitors for these conditions, determines N/A at this time
2-EOP-99 APP "J"		**The following actions are for Restoring CCW to the RCPs Using 2-EOP-99, APPENDIX "J".**	
	BOP	**1. If a LOOP has occurred,** **Then PERFORM BOTH of the following:** ☐ A. ENSURE 2AB 480V Load Center is aligned to **an energized bus.** ☐ B. DISPATCH an operator to restore Instrument **Air. REFER TO Appendix H, Operation of the 2A and 2B Instrument Air Compressors.**	**BOP** determines LOOP has not occurred, the was 2AB bus energized with the 2A EDG breaker closure
	BOP	**2. ENSURE Instrument Air to Containment is available by PLACING HCV-18-1 to CLOSE / OVERRIDE and then to OPEN.**	**BOP** opens HCV-18-1

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #		
Event Description:	**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
		NOTE ☐ HCV-**14-9 (HCV-14-10) will open 5 seconds after HCV-14-8A (HCV-14-8B) starts to open.** ☐ When SIAS is present, placing the control**switches in CLOSE and then OVERRIDE will open the CCW 'N' header valves, until SIAS is reset.**	
	BOP	**3. If an INADVERTENT SIAS has occurred, Then RESTORE flow from Either 'A' or 'B' CCW Header to the 'N' Header by placing the control switches for the desired train to CLOSE and then to OVERRIDE:** **HCV-14-8A** **HCV-14-9** **OR** **HCV-14-8B** **HCV-14-10**	**BOP** determines no inadvertent SIAS occurred
		CAUTION **Under SIAS conditions, the CCW 'N' header shall only be aligned to ONE essential header. This will maintain train separation while safeguards signals are still present.**	

Appendix D		Operator Action				Form ES-D-2
Op Test No.:	L-19-1	Scenario #	5	Event #		
Event Description:	**APPENDICES**					

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**4. If a VALID SIAS has closed the 'N' Header valves, Then PERFORM the following:** **A. VERIFY both safety related CCW headers are operational.** **B. VERIFY 'N'-Header is intact (NO seismic event has occurred).** **C. ALIGN the 'N' Header to one Safety Related CCW Header by performing either of the following:** **RESTORE flow to the 'A' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8A, HCV-14-9** **OR** **RESTORE flow to the 'B' CCW Header by placing the control switches to CLOSE and then to OVERRIDE:** **HCV-14-8B, HCV-14-10**	**BOP** realigns the "N" header restoring CCW flow
	BOP	**5. OPEN ALL of the following CCW to / from the RCP valves:** **☐HCV-14-1, CCW To RC PUMP** **☐HCV-14-2, CCW From RC PUMP** **☐HCV-14-7, CCW To RC PUMP** **☐HCV-14-6, CCW From RC PUMP**	**BOP** opens valves restoring CCW flow to RCPs
	BOP	**6. ENSURE V2507, RCP Bleedoff Relief Stop Vlv, is OPEN.**	**BOP** opens V2507

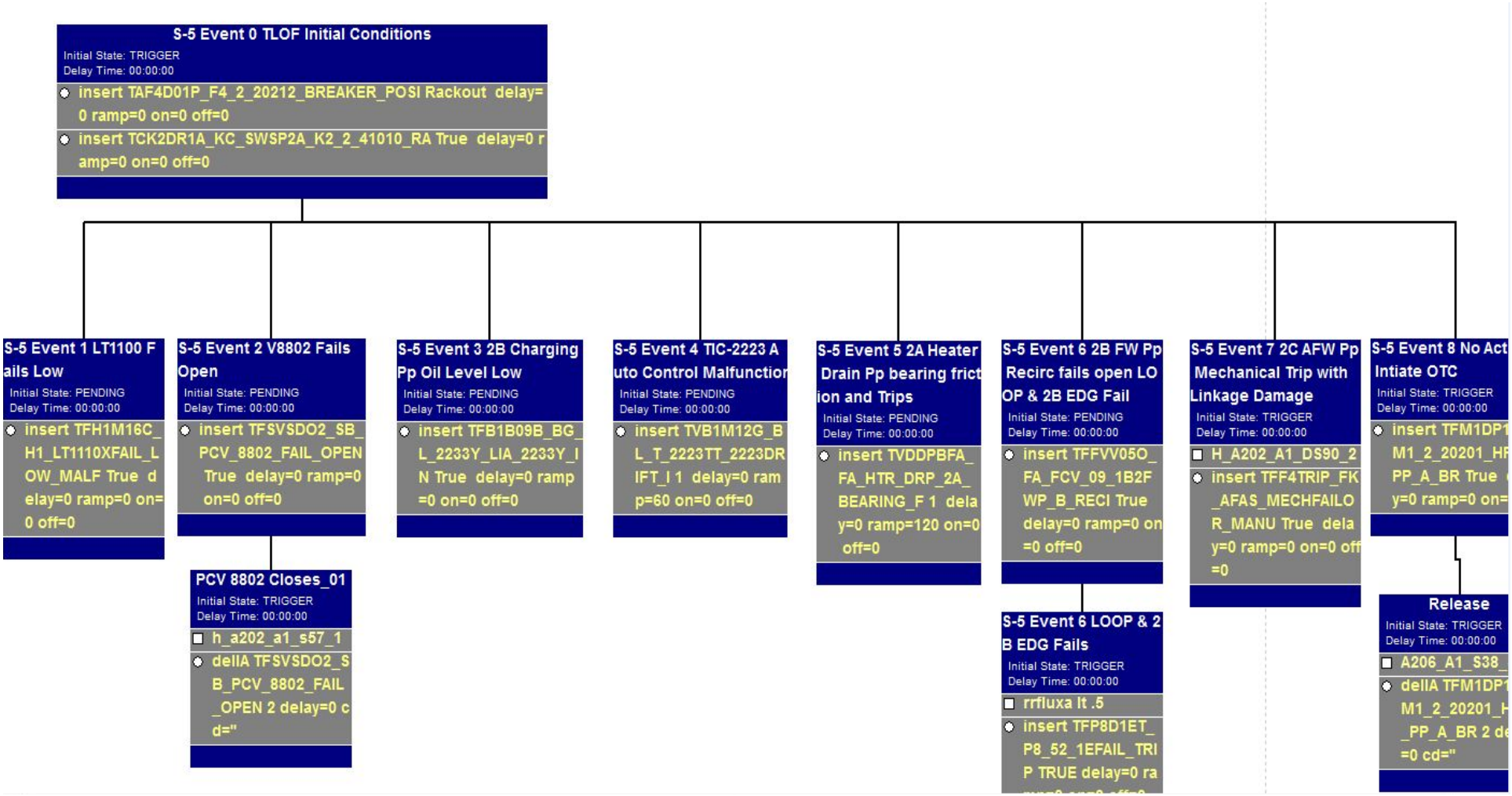
CAUTION

RCP Seal Cooler isolation valves automatically close on high Seal Cooler outlet temperature of 200°F. Maintaining the control switch in the OPEN position will override this function. CCW radiation monitors should be closely monitored for indication of RCS to CCW leakage should conditions warrant the valve(s) to be maintained in the open position. Consideration should be given to returning the control switch(es) to the AUTO position once the valves have been opened.

Appendix D			Operator Action				Form ES-D-2
Op Test No.:	L-19-1		Scenario #	5	Event #		
Event Description:	**APPENDICES**						

Time	Position / Competency	Procedure Step	Applicant's Actions or Behavior
	BOP	**7. ENSURE ALL RCP Seal Cooler Isolation valves are OPEN:** **HCV-14-11-A1,CCW From 2A1 RCP Seal Cooler** **HCV-14-11-A2,CCW From 2A2 RCP Seal Cooler** **HCV-14-11-B1,CCW From 2B1 RCP Seal Cooler** **HCV-14-11-B2,CCW From 2B2 RCP Seal Cooler**	**BOP** verifies valves are open
		NOTE **Reactor Coolant Pumps must be secured if CCW flow is not restored within 10 minutes.**	
	BOP	**8. VERIFY CCW flow to running RCPs by any of the following:** ☐ DCS RCP Overview Screen ☐ FIS-14-15A/B/C/D, CCW From RCP Hx Flow ☐ L-6, RCP CCW Flow Low Trip, Annunciator clear.	**BOP** verifies CCW flow to RCPs
		NOTE **The Safety Related CCW header NOT aligned to the 'N' Header will be operable to supply essential equipment.**	
	BOP	**9. DECLARE the Safety Related CCW header aligned to the 'N' Header, inoperable but available.**	**BOP** informs US to declare CCW header is inoperable
	BOP	**10. If any of the following conditions occur prior to reaching cold shutdown or resetting SIAS,** ☐ Seismic event ☐ 'N' Header is found NOT intact ☐ The operable Safety Related CCW header **becomes inoperable** **Then ISOLATE the 'N' header.**	**BOP** monitors for these conditions, not present at this time

SIMULATOR LESSON LAYOUT



QUANTITATIVE ATTRIBUTES

Malfunctions:

Before EOP Entry:

1. LT1100X fails low
2. V8802 fails open
3. 2B Charging Pp oil leak
4. TIC-2223 fails low
5. 2A Heater drain pp trip
6. 2B Main Feedwater Pp recirc valve fails open

After EOP Entry:

1. LOOP 2B EDG start failure
2. 2B EDG start failure
3. 2C AFW Pp mech trips
4. 2A HPSI pump fails to auto start

Abnormal Events:

1. LT1100X fails low
2. V8802 fails open
3. 2B Charging Pp oil leak
4. TIC-2223 fails low
5. 2A Heater drain pp trip

Major Transients:

1. 2B Main Feedwater Pp recirc valve fails open

Critical Tasks:

1. Manually close leaking steam bypass
2. Initiate OTC When both S/G level are <15% WR and prior to S/G dryout

OPERATIONS SHIFT TURNOVER REPORT

DAYS Today

UNIT 2 CONTROL ROOM

Desk RCO: _____ **Board RCO:** _____

Protected Train: A **Online Risk:** GREEN

Unit 2 Identified RCS Leakage: .02 gpm **Unit 2 Unidentified RCS Leakage:** .06 gpm

Unit 2 Scheduled Activities per the OSP:

No scheduled surveillances

Unit 2 Unscheduled Surveillances:

No unscheduled surveillances

Upcoming ECOs to Hang or Release:

None

Tech Spec Action Statement:

1. 3.7.1.2 for 2A AFW Pp

Operator Work Around:

None

Locked in Annunciators:

1. G-44 2A AFW PUMP BKR FAILURE/ CS STOP/ SS ISOL

Current Status:

1. 100% power, MOC, no scheduled surveillances, maintain 100% power
2. 2A Screen Wash Pump OOS,
3. Small amounts of sea grass has been observed in the intake, 2B Screen wash pump is running 2-NOP-21.15, INTAKE INTRUSION MONITORING AND MITIGATION Att. 3 has been performed and the Intake Risk Level is Green.
4. 2A AFW Pp OOS, Expected back this shift

Longstanding Problems:

None

Reactivity Turnover:

Adding 20 gallons of Primary Water every 4 hours. 60 total gallons added last shift. Expect to add another 60 gallons this shift.

JPM TITLE: **Emergency Boration Using Alternate Path**

JPM NUMBER: **L-19-1 NRC JPM S-1** **REV. 0**

TASK NUMBER(S) / TASK TITLE(S): **07002650 / PERFORM SPTAs - EMERGENCY BORATION - UNIT 2**

K/A NUMBERS / K/A VALUES: (RO SRO) **004 A2.14 / Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Emergency boration (3.8/3.9)**

Justification (FOR K/A VALUES <3.0): **N/A**

TASK APPLICABILITY:

☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [ ] Perform: [X]

EVALUATION LOCATION: In-Plant: [ ] Control Room: [ ]

Simulator: [X] Other: [ ]

Lab: [ ]

Time for Completion: 10 Minutes Time Critical: No

Alternate Path [NRC]: YES

Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS	YES	NO	N/A
1. Are all items on the signature page filled in correctly?	☒	☐	☐
2. Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3. Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4. Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5. Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6. Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7. If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8. Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9. Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10. Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11. Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12. Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13. Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14. Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15. Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16. If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☒	☐	☐

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

SIMULATOR SET-UP: *(Only required for simulator JPMs)*

SIMULATOR SETUP INSTRUCTIONS:

1. Ensure L-19-1 NRC JPM S-1 IC192 files and LSN are transferred to the simulator drive.
2. **RESTORE** IC-192, S-1 NRC SETUP
3. **PLACE** the Simulator in RUN.
4. **SELECT** and **OPEN** File: L-19-1 NRC JPM S-1 lsn
5. **EXECUTE** Lesson L-19-1 NRC JPM S-1.
6. **FREEZE** the Simulator
7. Ensure L-19-1 NRC JPM S-1 IC files and LSN are deleted from the simulator drive when the JPM is no longer being administered.

SIMULATOR MALFUNCTIONS: 2A EDG will TRIP when either 2A or 2B BAM Pump switches taken to RUN.

SIMULATOR OVERRIDES:

SIMULATOR REMOTE FUNCTIONS:

Required Materials:	▪ **2-EOP-01, Standard Post Trip Actions, Section 4.0, Operator Actions** ▪ **2-AOP-02.02, Emergency Boration Hard Card**
General References:	▪ **2-EOP-01, Standard Post Trip Actions, Section 4.0, Operator Actions** ▪ **2-AOP-02.02, Emergency Boration**
Task Standards:	**The applicant will perform the immediate Operator actions of 2-EOP-01 Standard Post Trip Actions, followed by responding to indications of 3 CEAs not fully inserted by Emergency Borating using an alternate path due to the loss of the "A" train power that feeds the 2A and 2B BAM Pumps.**

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- **Unit 2 was performing a up power from 95%**
- **A LOOP/reactor trip has just occurred**

INITIATING CUES:

- **You are the Board RCO**
- **The US directs you to perform the Board Operator immediate actions for 2-EOP-01, Standard Post Trip Actions**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).
NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

2-EOP-01, SPTAs, Section 4.0, Operator Actions	
Performance Step: 1 **Critical : NO**	**1. VERIFY** Reactor Trip: • Reactor power **LOWERING**
Standard:	Examinee will **VERIFY** reactor power is **LOWERING** using redundant indications
Evaluator Cue:	**NONE** **EVALUATOR NOTE: During this scenario, an instructor should play the part of the Desk RCO and keep the annunciators acknowledged to allow the candidate to focus on the task at hand.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 2 **Critical : NO**	**1.VERIFY** Reactor Trip: • Startup Rate is **NEGATIVE**
Standard:	Examinee will **VERIFY** Startup Rate is **NEGATIVE** using redundant indications
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 3 **Critical: YES**	**1.VERIFY** Reactor Trip: • ALL CEAs are fully **inserted**
Standard:	Examinee will **DETERMINE** that all CEAs are NOT fully inserted using Core Mimic, DCS and CEDS Control Panel and enter the contingency action
Evaluator Cue:	**NONE** **EVALUATOR NOTE: CEAs 13, 37 and 45 are FULLY WITHDRAWN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 4 **Critical : NO**	1.1 **CONTINGENCY PERFORM** the following B. IF any **CEA is NOT fully INSERTED, THEN INITIATE** emergency boration to achieve adequate SDM
Standard:	Examinee will **ENTER** 2-AOP-02.02, Emergency Boration using the Hard Card
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

2-AOP-02.02, Emergency Boration, Section 4.2, Subsequent Operator Actions
NOTE • This Procedure may contain steps that could adversely affect reactivity. Proper consideration and appropriate briefings shall occur prior to performance of steps that could challenge reactivity. • The following information is posted as an Operator Aid at RTGB-205 Panel "M". Any revision to this section of the procedure shall verify the validity of the Operator Aid and, if changes are necessary, an assignment to Ops Support Labeling Specialist to update and install revised Operator Aids must be initiated to incorporate these changes on a new Operator Aid placard.

Performance Step: 5 **Critical : NO**	1.**VERIFY** at least one charging pump is running with control switch in **START**
Standard:	Examinee will **OBSERVE** at least one Charging Pump is running
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

NOTE The MAKEUP MODE SELECTOR switch is required to be in MANUAL prior to switching the Boric Acid Pump control switches to preclude pump breaker trips.	
Performance Step: 6 **Critical : NO**	2. **VERIFY** the **MAKEUP MODE SELECTOR** switch is in **MANUAL**
Standard:	Examinee will **OBSERVE** the **MAKEUP MODE SELECTOR** switch in **MANUAL**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 7 **Critical : NO**	3. **VERIFY** V2525, **BORON LOAD CONTROL VALVE** is **CLOSED**
Standard:	Examinee will recognize that V2525 is OPEN and take action to CLOSE V2525 and VERIFY it is CLOSED by observing **GREEN Light ON, RED Light OFF**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

	NOTE Both Boric Acid Pumps are required to be placed in service when the combined Boric Acid Makeup Tank volumes are being credited as a borated water source. Otherwise, the pump associated with the Boric Acid Makeup Tank being credited as the borated water source should be started.
Performance Step: 8 **Critical : NO** **FAULTED STEP**	4**. PERFORM** the following to Emergency Borate using **V2514, EMERGENCY BORATE:** **A. START** at least one of the following: • **2A (Boric Acid Pump)** • **2B (Boric Acid Pump)**
Standard:	Examinee will **START** either the **2A or 2B BAM** Pump by positioning their respective switch to **RUN**
Evaluator Cue:	**The BOP has addressed the trip of the 2A EDG and it is not recoverable** **EVALUATOR NOTE:** Upon the Operator taking either BAM Pump switches to **RUN** the **2A EDG will TRIP** causing the unavailability of either BAM pump due to them being "A" train powered
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 9 **Critical : NO**	4.1 **CONTINGENCY PERFORM** the following **GO TO** Section 4.2, Step 5
Standard:	Examinee will **PROCEED to** Section 4.2, Step 5
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

	NOTE Both Boric Acid Gravity Feed valves are required to be placed in service when the combined Boric Acid Makeup Tank volumes are being credited as a borated water source. Otherwise, the Gravity Feed valve associated with the Boric Acid Makeup Tank being credited as the borated water source should be opened.
Performance Step: 10 **Critical: NO**	5. **IF** unable to Emergency Borate using **V2514, THEN PERFORM** the following**:** **A. STOP** the running **BORIC ACID PUMPS**
Standard:	Examinee will **POSITION** the 2A (2B) Boric Acid Pump handswitches to **STOP**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 11 **Critical : YES**	5. **IF** unable to Emergency Borate using **V2514, THEN PERFORM** the following**:** **B. OPEN at least one of the following:** **V2508 VALVE, (BA Gravity Feed)** **V2509 VALVE. (BA Gravity Feed)**
Standard:	Examinee will **POSITION V2508 AND/OR V2509** control switch to **OPEN**
Evaluator Cue:	**NONE** **EVALUATOR NOTE: Examinee may choose to open both gravity feed valves. (ONLY one is critical)**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 12 **Critical : YES**	5. **IF** unable to Emergency Borate using V2514, **THEN PERFORM** the following: **C. CLOSE** V2501, VCT OUTLET VALVE
Standard:	Examinee will **POSITION V2501**control switch to **CLOSED** and **VERIFY V2501** is closed
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 13 **Critical : NO**	6. **IF** the Boric Acid Makeup Tanks are unavailable OR both Gravity Feed Valves failed to Open THEN **PERFORM** the following:
Standard:	Examinee will **Recognize** this step is not required and proceed to the next step
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 14 **Critical : NO**	7. **ENSURE** Boration flow rate is greater than 40 gpm.
Standard:	Examinee will read Charging flow and identify that flow is greater than 40 GPM.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 15 **Critical : NO**	Examinee will **NOTIFY** the US that Reactivity Control has been verified and is being met with contingencies (1) Emergency Boration is in progress due to three rods stuck out and (2) V2514 would not open.
Standard:	
Evaluator Cue:	**US Acknowledges**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues: The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

STOP TIME _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: **ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.**

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit 2 was performing a up power from 95%
- A LOOP/reactor trip has just occurred

INITIATING CUES:

- You are the Board RCO
- The US directs you to perform the Board Operator immediate actions for 2-EOP-01, Standard Post Trip Actions

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM TITLE: RESPOND/BYPASS/TRIP A FAILED ESFAS CHANNEL

JPM NUMBER: C-2 **REV.** 0

TASK NUMBER(S) / TASK TITLE(S): 07069060/ Place an ESFAS Channel in trip (Unit 1)

K/A NUMBERS / K/A VALUES: (RO SRO) 013 K1.09 Knowledge of the physical connections and/or cause effect relationships between the ESFAS and the following systems: CIRS (3.3/3.7)

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:
☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** _____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [X] Perform: [ ]

EVALUATION LOCATION: In-Plant: [X] Control Room: [X]
Simulator: [ ] Other: [ ]
Lab: [ ]

Time for Completion: 15 Minutes Time Critical: No

Alternate Path [NRC]: YES
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS	YES	NO	N/A
1. Are all items on the signature page filled in correctly?	☒	☐	☐
2. Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3. Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4. Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5. Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6. Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7. If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8. Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9. Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10. Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11. Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12. Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13. Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14. Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15. Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16. If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☒	☐	☐

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:
- **Unit-1 Tech Specs**
- **1-AOP-99.01 LOSS of TECH SPEC INSTRUMENTATION**

General References:
- **Unit-1 Tech Specs**
- **1-AOP-99.01 LOSS of TECH SPEC INSTRUMENTATION**

Task Standards: **The applicant will take actions to bypass a failed ESFAS channel, recognize the bypass switch is failed, and then place the ESFAS channel to trip.**

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit-1 is 100% power
- Refueling Water Tank Level instrument LIS-07-2B is failed high

INITIATING CUES (IF APPLICABLE):

- The Unit Supervisor has directed you to perform section 4.2.16 step 2 of 1-AOP-99.01 to meet the requirements of Tech Spec 3.3.2

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

1-AOP-99.01 Section 4.2.16	
NOTE ☐ Bypassing ESFAS BTUs will require Key 63 for ESFAS cabinet door. ☐ The ESFAS bypass keyswitch and associated bistable trip unit are **NOT** in a true vertical alignment from each other in some cases. ☐ Per ADM-11.16, Transient Procedure Use and Adherence, an RWT level channel in the TRIPPED condition shall be limited to 48 hours minus the time the channel has been in bypass.	
Performance Step: 1 **Critical NO**	**1. CIRCLE** affected instrument: ☐ LIS-07-2A ☐ LIS-07-2B ☐ LIS-07-2C ☐ LIS-07-2D
Standard:	Examinee will **CIRCLE** affected instrument: LIS-07-2B
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 2 **Critical YES** **Faulted Step**	**2. PERFORM** one of the following for the affected BTU listed: RAS (Key 128) **A. BYPASS** affected BTU using keyswitch.
Standard:	Examinee will simulate **UNLOCKING** and opening the **ESFAS** cabinet door for the B Channel, **LOCATE** the BTU for LIS-07-2B, simulate **INSERTING** key 128 and simulate rotating the key to the **BYPASS** position
Evaluator Cue:	The keyswitch for LIS-07-2B will **NOT** rotate to the bypass position
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 3 **Critical NO**	**PLACE** system in a safe configuration and **NOTIFY** the US that the keyswitch for LIS-07-2B will **NOT** rotate to the bypass position
Standard:	Examinee will **REMOVE** the bypass key and **NOTIFY** the US that the keyswitch for LIS-07-2B will **NOT** rotate to the bypass position
Evaluator Cue:	**The Unit Supervisor Acknowledges the report, and directs applicant to perform required action to comply with Tech Specifications.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

1-AOP-99.01 Attachment 3, Tripping and Restoring Protection Bistables, Section 1.2
NOTE ☐ Most ESFAS BTUs have two isolation modules, one for each train. To place one of these affected BTUs in TRIP, both upper and lower isolation modules must be pulled for the affected instrument channel. ☐ A S/G pressure BTU is train-specific and only goes to the train associated with its respective S/G. This BTU has only one isolation card that must be pulled. For a failed S/G pressure channel, one of the two steps to loosen an isolation module may be considered N/A.
CAUTION Each ESFAS initiation channel has one SG Pressure MSIS isolation module and one SG Pressure BLOCK isolation module. Ensure all human performance tools are used when pulling an isolation module to trip the affected BTU for a SG Pressure MSIS input failure.

Performance Step: 4 **Critical YES**	**2. LOOSEN** hold-down screws on upper isolation module.
Standard:	Examinee will simulate **LOOSENING** hold-down screws on upper isolation module
Evaluator Cue:	**Hold-down screws on upper isolation module are loose**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 5 **Critical YES**	**3. LOOSEN** hold-down screws on lower isolation module.
Standard:	Examinee will simulate **LOOSENING** hold-down screws on lower isolation module
Evaluator Cue:	**Hold-down screws on lower isolation module are loose**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 6 **Critical YES**	**4.** Slowly **PULL** each module out until it begins to slide freely.
Standard:	Examinee will simulate Slowly **PULLING** each module out until it begins to slide freely.
Evaluator Cue:	**BOTH upper and lower modules are out and slide freely.**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 7 **Critical NO**	**5. VERIFY** any annunciators associated with this instrument being in a tripped condition are IN ALARM.
Standard:	Examinee will **VERIFY** the following alarms are in: R-10, ENGINEERED SAFEGUARDS ATI FAULT R-13, RWT LEVEL RAS CHANNEL TRIP S-19, RWT LEVEL HIGH-HIGH
Evaluator Cue:	**Alarms R-10, R-13, and S-19 are locked in.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 8 **Critical N**	**NOTIFY** the US that B CHANNEL RAS ESFAS BTU has been placed in the tripped configuration
Standard:	Examinee will **NOTIFY** the US that B CHANNEL RAS ESFAS BTU has been placed in the tripped configuration
Evaluator Cue:	**US acknowledges the communication**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues: **The JPM is complete.**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

REMEDIATION REQUIRED: **YES:** ☐ **NO:** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: **ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.**

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

- Unit-1 is 100% power
- Refueling Water Tank Level instrument LIS-07-2B is failed high

INITIATING CUES (IF APPLICABLE):

- The Unit Supervisor has directed you to perform section 4.2.16 step 2 of 1-AOP-99.01 to meet the requirements of Tech Spec 3.3.2

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM TITLE: Verify SIAS w/ Failed actuation modules

JPM NUMBER: L-19-1 NRC JPM S-3 **REV.** 0

TASK NUMBER(S) / TASK TITLE(S): 07200510 / Respond to Loss of Coolant Accident
07003030 / Verify Safety Injection System Operation

K/A NUMBERS / K/A VALUES: (RO SRO) 013 A2.01 / (4.6 4.8), 013 A4.01 / (4.5 4.8), 013 A4.03 / (4.5 4.7)

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:

☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** _____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: ☐ Perform: X

EVALUATION LOCATION: In-Plant: ☐ Control Room: ☐
Simulator: X Other: ☐
Lab: ☐

Time for Completion: 15 Minutes Time Critical: No

Alternate Path [NRC]: YES
Alternate Path [INPO]: No

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10.	Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11.	Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16.	If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☐	☐	☒

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE
	.				

SIMULATOR SET-UP: *(Only required for simulator JPMs)*

SIMULATOR SETUP INSTRUCTIONS:

1. **Ensure** L-19-1 NRC JPM S-3 IC-192 files and S-3 LSN are transferred to the simulator drive.
2. **RESTORE** IC-192, S-3 NRC SETUPJPM **DO NOT UNFREEZE** the Simulator.
3. **OPEN** the Lesson File L-19-1 NRC JPM S-3 and **EXECUTE** the Lesson.
4. **UNFREEZE** the Simulator, then **TRIGGER** Step 1.
5. **FREEZE** the Simulator after a few seconds.
6. Make a temporary **STOREPOINT** if more than one student will be taking the JPM.
7. The lesson does **NOT** need to be stopped and re-executed after the IC is restored for subsequent students.
8. **UNFREEZE** the Simulator when the student is ready. The audible alarms will be automatically reinstated. Acknowledge but do not reset the RCP seal alarms to prevent nuisance alarms.

SIMULATOR MALFUNCTIONS:

- SIAS fails to automatically actuate
- 2A HPSI Pump fails to automatically start
- LPSI Header Valve, HCV-3625, fails to open
- 2A Main Feedwater Pump fails to automatically stop

SIMULATOR OVERRIDES:

None

SIMULATOR REMOTE FUNCTIONS:

None

Required Materials:	2-EOP-03, “Loss of Coolant Accident”
	2-EOP-99, Table 1, Safety Injection Actuation Signal
General References:	2-EOP-03, “Loss of Coolant Accident”
	2-EOP-99, Table 1, Safety Injection Actuation Signal
Task Standards:	This JPM is complete when the student has manually initiated SIAS, verified component alignment IAW 2-EOP-99 Table1, aligned components that did not automatically align, and notified the US of task completion and contingencies taken.

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- A loss of coolant accident is in progress at Unit 2. 2-EOP-03 is being implemented.

INITIATING CUES (IF APPLICABLE):

- You are the Desk RCO. The US directs you to perform Steps 5 and 6 of 2-EOP-03, "Loss of Coolant Accident."

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

2-EOP-03, "Loss of Coolant Accident"	
Performance Step: 1 **Critical YES** **Faulted Step**	**5. VERIFY** SIAS is ACTUATED. 5.1 IF either of the following conditions are MET: • Pressurizer pressure lowers to less than 1736 psia • Containment pressure rises to greater than 3.5 psig THEN Manually **ACTUATE** SIAS.
Standard:	Examinee will **DETERMINE** that both channels A and B SIAS have failed to actuate, **AND** MANUALLY **ACTUATE** both channels A and B SIAS by: **DEPRESS** and **HOLD** the SIAS Channel 'A' pushbutton and **POSITION** the Channel 'A' SIAS control switch to **SIAS ON**. **DEPRESS** and **HOLD** the SIAS Channel 'B' pushbutton and **POSITION** the Channel 'B' SIAS control switch to **SIAS ON.**
	The applicant may elect to start the non-running SI pump, open the closed header injection valve, and trip the running feed pump at this point. This is allowed per ADM-11.16. If this occurs, it will satisfy Critical Performance Step 8, 11, 26.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

NOTE Per Flowserve Engineering evaluation, during an emergency, the High Pressure Safety Injection pumps can be operated for up to 24 hours with no Component Cooling Water supplied to the seal heat exchangers without resulting in a significant increase in seal leakage.	
Performance Step:2 **Critical NO**	**6. OPTIMIZE** SI as follows: **A. VERIFY** SIAS is ACTUATED
Standard:	Examinee will **VERIFY** both channels A and B SIAS actuation indicating lights illuminated.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:3 **Critical NO**	**6. OPTIMIZE** SI as follows: **B. VERIFY** all available SI pumps are RUNNING. **B.1** Manually **START/ALIGN** SIAS components per Table 1, Safety Injection Actuation Signal.
Standard:	Examinee will **DETERMINE** that 2A HPSI pump did not automatically start on SIAS. **AND** Begin **EVALUATING** SIAS components per Table 1 of 2-EOP-99.
Evaluator Note:	**The applicant may elect to start the non-running SI pump at this point. If this occurs, it will satisfy Critical Performance Step 8.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

2-EOP-99, Table 1, "Safety Injection Actuation Signal" ALTERNATE PATH	
Performance Step:4 **Critical NO**	**Section 1: RTGB-206** **1.** ENSURE **TWO** CCW Pumps RUNNING. ▪ 2A CCW Pump ▪ 2C CCW Pump ▪ 2B CCW Pump
Standard:	Examinee will **ENSURE** CCW Pumps 2A and 2B are **ON**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:5 **Critical NO**	**2.** ENSURE CCW Valves from SDC HX OPEN. ▪ HCV-14-3A ▪ HCV-14-3B
Standard:	Examinee will **ENSURE** HCV-14-3A and HCV-14-3B are **OPEN.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:6 **Critical NO**	**3.** ENSURE CCW 'N' Header Supply and Return Valves CLOSED (N/A if Appendix A or J performed). ▪ HCV-14-8A ▪ HCV-14-8B ▪ HCV-14-9 ▪ HCV-14-10
Standard:	Examinee will **OBSERVE** HCV-14-8A, 8B, 9, and 10 are **CLOSED**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:7 **Critical NO**	**4.** ENSURE CCW Header A/B CCW to Fuel Pool Hx CLOSED. ▪ MV-14-18 ▪ MV-14-17
Standard:	Examinee will **OBSERVE** HCV-14-18, and 17 are **CLOSED.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:8 **Critical YES** **Faulted Step**	**5.** ENSURE HPSI Pumps RUNNING. ▪ 2A HPSI Pump ▪ 2B HPSI Pump
Standard:	Examinee will **DETERMINE** that HPSI Pump 2A is **OFF** and 2B is **RUNNING** **AND** **POSITION** the 2A HPSI Pump control switch to **START**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:9 **Critical NO**	**6.** ENSURE HPSI Header Valves OPEN. ▪ HCV-3627 ▪ HCV-3617 ▪ HCV-3637 ▪ HCV-3647 ▪ HCV-3626 ▪ HCV-3616 ▪ HCV-3636 ▪ HCV-3646
Standard:	Examinee will **OBSERVE** HCVs-3627, -3617, -3637, -3647, -3626, -3616, -3636, and -3646 are **OPEN**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:10 **Critical NO**	**7.** ENSURE LPSI Pumps RUNNING. ▪ 2A LPSI Pump ▪ 2B LPSI Pump
Standard:	Examinee will **OBSERVE** LPSI Pump 2A and 2B are **RUNNING**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:11 **Critical YES** **Faulted Step**	**8.** ENSURE LPSI Header Valves OPEN. ▪ HCV-3625 ▪ HCV-3615 ▪ HCV-3635 ▪ HCV-3645
Standard:	Examinee will **DETERMINE** HCV-3625 is **CLOSED** and HCVs-3615, 3635 and 3645 are **OPEN** **AND** **POSITION** the control switch for HCV-3625 to **OPEN**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:12 **Critical NO**	**9.** ENSURE SI Loop Check Valve Leakage Valves CLOSED. ▪ HCV-3628 ▪ HCV-3618 ▪ HCV-3638 ▪ HCV-3648
Standard:	Examinee will **OBSERVE** HCV-3628, -3618, -3638 and -3648 are **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:13 **Critical NO**	**10.** ENSURE Hot Leg 2A / 2B Check Valve Leakage Valves CLOSED. ▪ V3572 ▪ V3571
Standard:	Examinee will **OBSERVE** V3572 and V3571 are **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:14 **Critical NO**	**11.** ENSURE SI to RWT / VCT Valves CLOSED. ▪ I-SE-03-2A ▪ I-SE-03-2B
Standard:	Examinee will **OBSERVE** I-SE-03-2A and I-SE-03-2B are **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:15 **Critical NO**	**12.** ENSURE SIT Fill / Drain Valves CLOSED. ▪ I-SE-03-1A / V3621 ▪ I-SE-03-1B / V3611 ▪ I-SE-03-1C / V3631 ▪ I-SE-03-1D / V3641
Standard:	Examinee will **OBSERVE** I-SE-03-1A / V3621, I-SE-03-1B / V3611, I-SE-03-1C / V3631 and I-SE-03-1D / V3641 are **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:16 **Critical NO**	**13.** ENSURE CCW To / From RCPs CLOSED (N/A if Appendix J performed). ▪ HCV-14-1 ▪ HCV-14-2 ▪ HCV-14-7 ▪ HCV-14-6
Standard:	Examinee will **OBSERVE** HCV-14-1, HCV-14-2, HCV-14-7, HCV-14-6 are **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

2-EOP-99, Table 1, "Safety Injection Actuation Signal" **SECTION 2**	
Performance Step:17 **Critical NO**	**1.** ENSURE Reactor Cavity Sump Isol. Valves CLOSED. • LCV-07-11A • LCV-07-11B
Standard:	Examinee will **OBSERVE** LCV-07-11A and LCV-07-11B are **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:18 **Critical NO** **Faulted Step**	**2. ENSURE** 2A / 2B Boric Acid Gravity Feed Valves OPEN. • V2508 • V2509
Standard:	Examinee will **DETERMINE** V2508 and V2509 are **OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:19 **Critical NO**	**3. ENSURE** Reactor Makeup Water Stop Valve CLOSED. • V2512
Standard:	Examinee will **OBSERVE** V2512 **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:20 **Critical NO**	**4. ENSURE** Boron Load Control Valve **CLOSED.** ▪ V2525
Standard:	Examinee will **OBSERVE** V2525 **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:21 **Critical NO**	**5.** ENSURE Boric Acid Tank 2A / 2B Recirc Valves CLOSED. • V2650 • V2651
Standard:	Examinee will **OBSERVE** V2650 and V2651are **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:22 **Critical NO**	**6. ENSURE** Emergency Borate Valve OPEN. • V2514
Standard:	Examinee will **OBSERVE** V2514 OPEN.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:23 **Critical NO**	**7. ENSURE** Boric Acid Pumps RUNNING. • 2A BAM Pump • 2B BAM Pump
Standard:	Examinee will **OBSERVE** both Boric Acid Pumps RUNNING.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:24 **Critical NO**	**8. ENSURE** Boric Acid Makeup Flow Control Valve CLOSED. • **FCV-2210Y**
Standard:	Examinee will **OBSERVE** FCV-2210Y is **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:25 **Critical NO**	**9.** ENSURE Letdown Valves CLOSED. • V2516 • V2515
Standard:	• Examinee will **OBSERVE** V2516 and V2515 are **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:26 **Critical NO**	**10.** ENSURE VCT Outlet Valve CLOSED. • V2501
Standard:	Examinee will **OBSERVE** FCV-2210Y is **CLOSED**.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:27 **Critical NO**	**11.** ENSURE at least **TWO** Charging Pumps RUNNING. • 2A Chg Pump • 2C Chg Pump • 2B Chg Pump
Standard:	Examinee will **VERIFY TWO** Charging Pumps RUNNING
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step:28 **Critical NO**	**12.** ENSURE Recirc Valves on the RUNNING Charging Pumps, are CLOSED. • V2555 • V2553 • V2554
Standard:	Examinee will **OBSERVE** the recirc valves for the TWO Charging Pumps RUNNING are closed
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

2-EOP-99, Table 1, "Safety Injection Actuation Signal" **SECTION 3**	
Performance Step:26 **Critical YES** **Faulted Step**	**1. ENSURE** Main Feedwater Pumps STOPPED. • 2A MFW Pump • 2B MFW Pump
Standard:	Examinee will **DETERMINE** that 2A Feedwater pump did not automatically stop on SIAS. **AND** **STOP** the 2A Feedwater Pump
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues: **THIS JPM IS TO BE TERMINATED AT THIS POINT IN THE EVOLUTION.**
END OF TASK

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

REMEDIATION REQUIRED: **YES:** ☐ **NO:** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: **ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.**

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

- A loss of coolant accident is in progress at Unit 2. 2-EOP-03 is being implemented.

INITIATING CUES (IF APPLICABLE):

- You are the Desk RCO. The US directs you to perform Steps 5 and 6 of 2-EOP-03, “Loss of Coolant Accident.”

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM TITLE: **RESTORE AFW FLOW TO THE 2A AND 2B S/Gs USING 2C AFW PUMP**

JPM NUMBER: **L-19-1 NRC JPM S-4** **REV. 0**

TASK NUMBER(S) / TASK TITLE(S): **07009040 / Reset AFW Pump Mechanical/Electrical Overspeed trip.**

K/A NUMBERS / K/A VALUES: (RO SRO) **061 A2.04 / Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: pump failure or improper operation (3.4/3.8)**

Justification (FOR K/A VALUES <3.0): **N/A**

TASK APPLICABILITY:

☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [ ] Perform: [X]

EVALUATION LOCATION: In-Plant: [ ] Control Room: [ ]

Simulator: [X] Other: [ ]

Lab: [ ]

Time for Completion: 15 Minutes Time Critical: No

Alternate Path [NRC]: YES

Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS	YES	NO	N/A
1. Are all items on the signature page filled in correctly?	☒	☐	☐
2. Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3. Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4. Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5. Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6. Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7. If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8. Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9. Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10. Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11. Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12. Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13. Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14. Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15. Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16. If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☒	☐	☐

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

SIMULATOR SET-UP: *(Only required for simulator JPMs)*

SIMULATOR SETUP INSTRUCTIONS:

1. Ensure L-19-1 NRC JPM S-4 IC192 files and LSN are transferred to the simulator drive.
2. **RESTORE** IC-192, S-4 NRC SETUP
3. **PLACE** the Simulator in **RUN**.
4. **SELECT** and **OPEN** File: L-19-1 NRC JPM S-4 lsn
5. **EXECUTE** Lesson L-19-1 NRC JPM S-4.
6. Ensure L-19-1 NRC JPM S-4 IC files and LSN are deleted from the simulator drive when the JPM is no longer being administered.

SIMULATOR MALFUNCTIONS: ELECTRICAL overspeed trip of the 2C AFW pump with a 30 second delay, when either MV-09-11 or MV-09-12 switches are taken to the open position.

SIMULATOR OVERRIDES:

SIMULATOR REMOTE FUNCTIONS:

Required Materials:	▪ **2-AOP-09.02 AUXILIARY FEEDWATER** ▪ **2-NOP-09.02 AUXILIARY FEEDWATER SYSTEM OPERATION** ▪
General References:	▪ **2-AOP-09.02 AUXILIARY FEEDWATER** ▪ **2-NOP-09.02 AUXILIARY FEEDWATER SYSTEM OPERATION** ▪
Task Standards:	**The applicant will establish AFW to both S/Gs using 2-AOP-09.02 AUXILIARY FEEDWATER**

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit 2 is in Mode 3 NOP/NOT preparing for startup, valve SE-09-2 closed on a loss of power. The NPO reports a high pitched noise coming from the 2B AFW pump motor, electrical maintenance has requested for the 2B AFW to be secured.

INITIATING CUES:

- You are the Board RCO
- The US directs you to establish AFW to the 2A and 2B Steam Generators with the 2C AFW pump IAW 2-NOP-09.02 Auxiliary Feedwater step 4.3.6 and then secure the 2B AFW pump. A NPO is stationed at the 2C AFW pump and reports the pump is ready for a start.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

2-NOP-09.02 AUXILIARY FEEDWATER SYSTEM OPERATION	
Performance Step: 1 **Critical : NO**	**4.3.6 START** the 2C AFW PUMP by performing the following: • OPEN MV-08-12, SG 2B STM TO AFW PP 2C • OPEN MV-08-13, SG 2A STM TO AFW PP 2C
Standard:	Examinee will **OPEN** both MV-08-12 and MV-08-13
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 2 **Critical : NO**	**4.3.7 VERIFY** turbine speed is stable between 3700 and 3800 rpm AND the governor is **NOT** hunting / oscillating.
Standard:	Examinee will **CALL** Field Operator to **VERIFY** turbine speed is stable between 3700 and 3800 rpm AND the governor is NOT hunting / oscillating
Evaluator Cue:	**Field Operator calls back and states turbine speed is 3700 rpm and stable.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 3 **Critical : NO**	**4.3.8 OPEN** the solenoid valve(s) in the header(s) to the S/Gs requiring feed: • SE-09-4, 2C PUMP DISCH TO 2A S/G VLV (KEY 85) • SE-09-5, 2C PUMP DISCH TO 2B S/G VLV (KEY 86)
Standard:	Examinee will **OPEN** both SE-09-4 and SE-09-5
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

CAUTION To avoid water hammer, when reinitiating flow to a steam generator that has lost all feedwater, the initial flow rate should be limited to less than or equal to 150 gpm for five minutes or until a level rise is observed. Failure to control flow to less than 150 gpm for at least five minutes or until a level rise is observed may require a visual inspection of the feed ring prior to startup. (Section 7.1.3, Management Directive 4)	
Performance Step: 4 **Critical : NO** **FAULTED STEP**	**4.3.9 THROTTLE** MV-09-11, PUMP 2C TO SG 2A, as necessary to establish and maintain desired flow to 2A S/G
Standard:	Examinee will **THROTTLE** MV-09-11, to attain <150 gpm initial flow to the 2A S/G.
Evaluator Cue:	**NONE** **Evaluator NOTE: When either MV-09-11 or MV-09-12 switches are taken to the open position, a 30 second delay is initiated to insert an ELECTRICAL overspeed trip of the 2C AFW pump.** **Examinee should recognize electrical overspeed by:** **MV-08-3 in closed position AND annunciator G-46 clearing when reset. (If this was a mechanical overspeed, annunciator G-46 would have locked in).**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 5 **Critical : NO** **FAULTED STEP**	**4.3.10 THROTTLE** MV-09-12, PUMP 2C TO SG 2B, as necessary to establish and maintain desired flow to 2A S/G
Standard:	Examinee will **THROTTLE** MV-09-1B, to attain approx. 200 gpm l flow to the 2B S/G.
Evaluator Cue:	**NONE** **Evaluator NOTE: When either MV-09-11 or MV-09-12 switches are taken to the open position, a 30 second delay is initiated to insert an ELECTRICAL overspeed trip of the 2C AFW pump.** **Examinee should recognize electrical overspeed by:** **MV-08-3 in closed position AND annunciator G-46 clearing when reset. (If this was a mechanical overspeed, annunciator G-46 would have locked in).**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 6 Critical: NO	Refer to Annunciator summary for G-46, 2C AFW Pump Turbine Failure/Trip/OVRLD/SS Isol.
Standard:	Examinee will **RECOGNIZE** directions from Annunciator summary If 2C AFW Pump Tripped, Then GO TO 2-AOP-09.02 AUXILIARY FEEDWATER
Evaluator Cue:	**The US directs you to perform 2-AOP-09.02 AUXILIARY FEEDWATER Attachment 1, to restore AFW flow to the 2A and 2B S/Gs using the 2C AFW pump.**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

2-AOP-09.02 AUXILIARY FEEDWATER Attachment 1	
NOTE • An electrical overspeed trip results in closed position indication for MV-08-3, 2C AFW PUMP THROTTLE/TRIP, and alarm reset on G-46. • A mechanical overspeed trip results in closed position indication for MV-08-3, 2C AFW PUMP THROTTLE/TRIP, and alarm G-46 locked in. • Attachment 6, Mechanical Overspeed Latching shows correct mechanical overspeed mechanism latching.	
Performance Step: 7 Critical :YES	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **A. CLOSE** MV-08-12, SG 2B STM TO AFW PP 2C. (RTGB-202)
Standard:	Examinee will **CLOSE** MV-08-12
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 8 Critical :YES	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **B. CLOSE** MV-08-13, SG 2A STM TO AFW PP 2C. (RTGB-202)
Standard:	Examinee will **CLOSE** MV-08-13
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 9 Critical :YES	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **C. PERFORM** the following to reset and OPEN MV-08-3, 2C PUMP: **(1) CLOSE** MV-08-3, 2C PUMP. (RTGB-202 - Key 78).
Standard:	Examinee will **PLACE** the control switch for MV-08-3 in the **CLOSE** position using key 78
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 10 Critical :NO	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **C. PERFORM** the following to reset and OPEN MV-08-3, 2C PUMP: **(2)** IF 2C AFW pump tripped due to mechanical overspeed trip, THEN **PERFORM** the following: **a. RESET** the 2C Auxiliary Feedwater Pump mechanical overspeed linkage. **b. VERIFY** top surface of trip tappet nut is in line with the line marked on the head lever to ensure full engagement.
Standard:	Examinee will **RECOGNIZE** that this step is N/A due to this being an electrical overspeed trip and continue to the next step
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 11 Critical :YES	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **C. PERFORM** the following to reset and OPEN MV-08-3, 2C PUMP: **(3) PLACE** MV-08-3, 2C PUMP (2C Auxiliary Feedwater Pump), in OPEN.
Standard:	Examinee will **PLACE** MV-08-3, 2C PUMP in OPEN
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 12 Critical : NO	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **C. PERFORM** the following to reset and OPEN MV-08-3, 2C PUMP: **(4) VERIFY** MV-08-3, THROTTLE / TRIP VALVE FOR AFW PUMP 2C, is OPEN.
Standard:	Examinee will **VERIFY** MV-08-3, 2C PUMP is OPEN, RED light ON and GREEN light OFF
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 13 Critical :NO	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **D.** IF 2C AFW pump is rotating and is required for immediate operation, THEN **PERFORM** the following: **(1) CLOSE** SE-08-2, SOLENOID OPERATED WARM-UP FOR S/G 2A TO AFW PUMP 2C. (Key 301) (TRSL/29/N-T3/W-TA) **(2)** IF the 2C AFW Pump continues rotating, THEN **CLOSE** SE-08-1, SOLENOID OPERATED WARM-UP FOR S/G 2B TO AFW PUMP 2C. (Key 301) (TRSL/29/N-T3/W-TA)
Standard:	Examinee will **CONTACT** the field operator for the status of the 2C AFW pump
Evaluator Cue:	The field operator reports the 2C AFW pump is **NOT** rotating
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	
Performance Step: 14 Critical :NO	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following:

	E. IF 2C AFW Pump is rotating and is **NOT** required for immediate operation, THEN **PERFORM** Attachment 5, Actions to Stop the 2C AFW PUMP From Rotating
Standard:	Examinee will **RECOGNIZE the** 2C AFW Pump is **NOT** rotating
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 15 **Critical :NO**	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **F. PERFORM** one of the following to drain oil from the underside of the governor main speed piston: **(1) WAIT** 3 minutes after pump stops rotating. OR **(2) PERFORM** the following: **a. PLACE** manual control knob on the side of the turbine governor in the FULLY COUNTER-CLOCKWISE idle speed position. **b. RETURN** manual control knob on the turbine governor to FULLY CLOCKWISE maximum speed position.
Standard:	Examinee will wait three minutes **OR** contact the field operator to **PLACE** manual control knob on the side of the turbine governor in the FULLY COUNTER-CLOCKWISE idle speed position and then **RETURN** manual control knob on the turbine governor to FULLY CLOCKWISE maximum speed position
Evaluator Cue:	The field operator reports the manual control knob of the turbine governor has been turned FULLY COUNTER-CLOCKWISE to the idle speed position and then **RETURNED** to the FULLY CLOCKWISE maximum speed position
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 16 Critical :NO	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **G. ENSURE** MV-09-11, PUMP 2C TO SG 2A is CLOSED. (RTGB-202)
Standard:	Examinee will **VERIFY** MV-09-11, PUMP 2C TO SG 2A is CLOSED
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 17 Critical :NO	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **H. ENSURE** MV-09-12, PUMP 2C TO SG 2B is CLOSED. (RTGB-202)
Standard:	Examinee will **VERIFY** MV-09-12, PUMP 2C TO SG 2B is CLOSED
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 18 Critical :YES	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **I.** IF both Steam Generators are intact AND **NOT** faulted, THEN **OPEN** the following valves simultaneously: **(1)** MV-08-13, SG 2A STM TO AFW PP 2C **(2)** MV-08-12, SG 2B STM TO AFW PP 2C
Standard:	Examinee will **RECOGNIZE** both Steam Generators are intact and **NOT** faulted and THEN **OPEN** MV-08-13 and MV-08-12 simultaneously
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

CAUTION Operation of the 2C AFW Pump should be avoided to minimize direct releases to the environment. If motor driven AFW pumps are NOT available, steam from the least affected S/G should be used.	
Performance Step: 19 **Critical : NO**	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **J.** IF either Steam Generator is faulted, THEN **OPEN** the steam supply valve from the NON-FAULTED S/G: **(1)** MV-08-13, SG 2A STM TO AFW PP 2C. OR **(2)** MV-08-12, SG 2B STM TO AFW PP 2C.
Standard:	Examinee will **RECOGNIZE** neither Steam Generator is faulted and continues to next step
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 20 **Critical : YES**	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **K.** IF flow is to be restored to 2A S/G, THEN **ENSURE** SE-09-4, 2C PUMP DISCH TO 2A S/G VLV, is OPEN. (Key 85)
Standard:	Examinee will **OPEN** SE-09-4
Evaluator Cue:	**NONE** **NOTE: Applicant previously opened this valve. If not opened earlier, then critical to ensure flow is achieved.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 21 **Critical : YES**	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **L.** IF flow is to be restored to 2B S/G, THEN **ENSURE** SE-09-5, 2C PUMP DISCH TO 2B S/G VLV, is OPEN. (Key 86)
Standard:	Examinee will **OPEN** SE-09-5
Evaluator Cue:	**NONE** **NOTE: Applicant previously opened this valve. If not opened earlier, then critical to ensure flow is achieved.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

CAUTION Initial feedwater flow should be controlled to less than 150 gpm for the first 5 minutes when using Aux Feed for water hammer and thermal shock concerns. Failure to control flow to less than 150 gpm for at least five minutes or until a level rise is observed may require a visual inspection of the feed ring prior to startup. (Section 6.1.3, Management Directive 1)	
Performance Step: 22 **Critical :YES**	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **M. THROTTLE** MV-09-11, PUMP 2C TO S/G 2A, to establish required flowrate to the 2A steam generator.
Standard:	Examinee will **THROTTLE** MV-09-11, to attain <150 gpm initial flow to the 2A S/G.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 23 **Critical :YES**	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **N. THROTTLE** MV-09-12, PUMP 2C TO S/G 2B, to establish required flowrate to the 2B steam generator.
Standard:	Examinee will **THROTTLE** MV-09-12, to attain <150 gpm initial flow to the 2B S/G.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 24 Critical :NO	**1.** IF 2C AFW pump tripped due to mechanical OR electrical overspeed trip, THEN **PERFORM** the following: **O.** IF SE-08-1 or SE-08-2, was CLOSED in Attachment 1, Step 1.D, THEN **PERFORM** the following: **(1) ENSURE** SE-08-1, SOLENOID OPERATED WARM-UP FOR S/G 2B TO AFW PUMP 2C, is OPEN. **(2) ENSURE** SE-08-2, SOLENOID OPERATED WARM-UP FOR S/G 2A TO AFW PUMP 2C, is OPEN.
Standard:	Examinee will **RECOGNIZE** that neither SE-08-1 or SE-08-2, was **NOT CLOSED** in Attachment 1, Step 1.D and continues to next step
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 25 Critical : NO	Examinee will **NOTIFY** the US that 2C AFW pump is running and supplying feed water to the 2A and 2B S/Gs
Standard:	Examinee will **NOTIFIES** the US that 2C AFW pump is running and supplying feed water to the 2A and 2B S/Gs
Evaluator Cue:	**US Acknowledges**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues: The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

STOP TIME _____

Applicant: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO-U** ☐ **SRO-I** **Date:** _____

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: **ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.**

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- **Unit 2 is in Mode 3 NOP/NOT preparing for startup, valve SE-09-2 closed on a loss of power. The NPO reports a high pitched noise coming from the 2B AFW pump motor, electrical maintenance has requested for the 2B AFW to be secured.**

INITIATING CUES:

- **You are the Board RCO**
- **The US directs you to establish AFW to the 2A and 2B Steam Generators with the 2C AFW pump IAW 2-NOP-09.02 Auxiliary Feedwater step 4.3.6 and then secure the 2B AFW pump. A NPO is stationed at the 2C AFW pump and reports the pump is ready for a start.**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM TITLE: OPERATE THE HYDROGEN PURGE SYSTEM - UNIT2

JPM NUMBER: L-19-1 NRC JPM S-5 **REV.** 0

TASK NUMBER(S) / TASK TITLE(S): 07025035/ALIGN HYDROGEN PURGE SYS

K/A NUMBERS / K/A VALUES: (RO SRO) 0028 A4.01/ Ability to manually operate and / or monitor in the control room: HRPS controls (4.0/4.0)

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:
☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [ ] Perform: [X]

EVALUATION LOCATION: In-Plant: [ ] Control Room: [ ]
Simulator: [X] Other: [ ]
Lab: [ ]

Time for Completion: 10 Minutes Time Critical: NO

Alternate Path [NRC]: NO
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10.	Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11.	Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16.	If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☐	☐	☒

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

SIMULATOR SET-UP:

1. **RESTORE** IC-24 from the JPM Group
2. **UNFREEZE** the Simulator.
3. **PLACE** the Hydrogen Analyzers in service IAW APP. M
4. **FREEZE** the Simulator.
5. **STORE** a Temporary IC set if more than one student will be performing the JPM.
6. No lesson is needed for this JPM.
7. **UNFREEZE** the Simulator when the student is ready. Acknowledge but do not reset non-JPM related alarms to prevent nuisance alarms.

SIMULATOR MALFUNCTIONS:

SIMULATOR OVERRIDES:

SIMULATOR REMOTE FUNCTIONS:

Required Materials:
- 2-EOP-99, Appendix N, Hydrogen Purge System Operation

General References:
- 2-EOP-99, Appendix N, Hydrogen Purge System Operation

Task Standards: This JPM is complete when the US has been notified that The Hydrogen Purge System has been placed in service in accordance with 2-AOP-26.02.

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

A Loss of Coolant Accident is in progress in Unit 2. 2-EOP-03 is being implemented. Containment hydrogen concentration is approximately 4% and the Technical Support Center has recommended that the Hydrogen Purge System be placed in operation.

INITIATING CUES:

You are the Desk RCO. The US directs you to place the Hydrogen Purge System in operation using 'B' side components in accordance with 2-EOP-99, Appendix N.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

2-EOP-99, Appendix N, Hydrogen Purge System Operation	
CAUTION Close coordination between the Technical Support Center and the Control Room is required to ensure personnel safety with regard to radioactive release rates, exposure and potential for hydrogen burn / explosion.	
Performance Step: 1 **Critical NO**	**ENSURE** FCV-25-35, Continuous Containment Purge Exhaust to Vent Stack is **CLOSED**
Standard:	Examinee **ENSURES** FCV-25-35 is **CLOSED**, Green light **ON**, Red light **OFF**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

NOTE If a CIAS is present FCV-25-20 and FCV-25-21 will need to be overridden open.	
Performance Step: 2 **Critical: YES**	**OPEN** the following valves: • FCV-25-20, Continuous Cntmt. Purge Isol. Valve • FCV-25-21, Continuous Cntmt. Suction
Standard:	Examinee **POSITIONS** FCV-25-20 and FCV-25-21 to **OPEN**, Green lights **OFF**, Red lights **ON**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 3 **Critical: YES**	**OPEN** H_2 Purge Discharge to the desired train SBVS: • FCV-25-34, H2 Purge Discharge to SBVS 'A' • FCV-25-29, H2 Purge Discharge to SBVS 'B'
Standard:	Examinee **POSITIONS** FCV-25-29 to **OPEN**, Green lights **OFF**, Red lights **ON**
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE: 'B' Train components are to be used per the cue.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 4 **Critical NO**	**ENSURE** FCV-25-9, Continuous Containment / Hydrogen Purge Control Valve Filter Inlet, is **CLOSED**
Standard:	Examinee **ENSURES** FCV-25-9, is **CLOSED** Green light **ON**, Red light **OFF**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 5 **Critical YES**	**THROTTLE OPEN** FCV-25-28, Continuous Containment / Hydrogen Purge Control Valve Bypass, 10 to 20%.
Standard:	Examinee **THROTTLES** FCV-25-28 **OPEN** until valve **INDICATES** 10% to 20% OPEN.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 6 **Critical NO**	**START** the desired train SBVS Fan.
Standard:	Examinee **RECOGNIZES** HVE-6B, is running Green light OFF, Red Light ON
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE: 'B' Train components are to be used per the cue.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

NOTE FCV-25-26 and FCV-25-36 will not open until a negative differential pressure exists between the Containment and outside air.	
Performance Step: 7 **Critical: NO**	**OPEN** the following valves: • FCV-25-26, Continuous Containment / Hydrogen Purge Makeup • FCV-25-36, Continuous Containment / Hydrogen Purge Makeup
Standard:	Examine **POSITIONS** FCV-25-26 and FCV-25-36 control switch to **OPEN**
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE:** Valves will not open at this time due to positive pressure in the containment. Valves will open when negative differential is reached after HVE-7B is started. Examinee should take the control switches for the valves to the open position.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 8 **Critical YES**	**START ONE** Hydrogen Purge Fan. • HVE-7A • HVE-7B
Standard:	Examinee **STARTS** HVE-7B, Green light OFF, Red Light ON
Evaluator Cue:	**NONE** **EVALUTOR NOTE: 'B' Train components are to be used per the cue.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 9 **Critical YES**	**ADJUST** FCV-25-28, Continuous Containment / Hydrogen Purge Control Valve Bypass, to maintain a flow rate of approximately 100 cfm.
Standard:	Examinee **POSITIONS** FCV-25-28 while MONITORING FI-25-2 and FR-25-2 to **OBTAIN** 100 cfm **FLOW**.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 10 **Critical NO**	**MONITOR** Plant Stack radiation levels and Containment hydrogen concentration during purge operation.
Standard:	Examinee **MONITORS** H_2 concentration for **LOWERING** trend and Plant Vent radiation level for **RISING** trend.
Evaluator Cue:	**H2 concentration is LOWERING slowly. Plant Vent radiation level is slowly RISING as expected.** **EVALUATOR'S NOTE:** This action takes a considerable amount of time to be observable. Once the student shows the ability to monitor these trends, give the verbal cue above.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 11 **Critical NO**	Notify the US that the Hydrogen Purge System has been placed in service per Appendix N, 2-EOP-99.
Standard:	**NOTIFY** the US that the hydrogen Purge System has been PLACED IN SERVICE per Appendix N, 2-EOP-99.
Evaluator Cue:	**US ACKNOWLEDGES.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues:

The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

A Loss of Coolant Accident is in progress in Unit 2. 2-EOP-03 is being implemented. Containment hydrogen concentration is approximately 4% and the Technical Support Center has recommended that the Hydrogen Purge System be placed in operation.

INITIATING CUES:

You are the Desk RCO. The US directs you to place the Hydrogen Purge System in operation using 'B' side components in accordance with 2-EOP-99, Appendix N.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM TITLE: VERIFY OFFSITE POWER

JPM NUMBER: L-19-1 NRC JPM S-6 **REV.** 0

TASK NUMBER(S) / TASK TITLE(S):

K/A NUMBERS / K/A VALUES: (RO SRO) 062 K1.04 / Knowledge of the physical connections and/or cause-effect relationship between the ac distribution system and the following system; Offsite power sources. (3.7/4.2)

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:

☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** _____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [X] Perform: [ ]

EVALUATION LOCATION: In-Plant: [ ] Control Room: [ ]

Simulator: [X] Other: [ ]

Lab: [ ]

Time for Completion: 10 Minutes Time Critical: No

Alternate Path [NRC]: No

Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS	YES	NO	N/A
1. Are all items on the signature page filled in correctly?	☒	☐	☐
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4. Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5. Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6. Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
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9. Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
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12. Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13. Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14. Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15. Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
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All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

SIMULATOR SET-UP: *(Only required for simulator JPMs)*

SIMULATOR SETUP INSTRUCTIONS:

1. Ensure L-19-1 NRC IC192 files are transferred to the simulator drive.
2. **RESTORE** IC-192, S-6 NRC SETUP
3. **PLACE** the Simulator in **RUN**.
4. Ensure L-19-1 NRC JPM S-6 IC files are deleted from the simulator drive when the JPM is no longer being administered.

SIMULATOR MALFUNCTIONS:

SIMULATOR OVERRIDES:

SIMULATOR REMOTE FUNCTIONS:

Required Materials:	▪ **Unit-2 Tech Specs** ▪ **2-NOP-99.07 OPERATIONS HARD CARDS**
General References:	▪ **Unit-2 Tech Specs** ▪ **2-NOP-99.07 OPERATIONS HARD CARDS**
Task Standards:	**The applicant will verify off-site power for both electrical trains using attachments 6 and 7 of 2-NOP-99.07**

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit-2 is 100% power
- The 2A EDG has been declared inoperable due to a blown control power fuse

INITIATING CUES (IF APPLICABLE):

- The Unit Supervisor has directed you to Verify Off-Site power to meet the surveillance requirements 4.8.1.1.1 a of Tech Spec 3.8.1.1 action b.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

<table>
<tr><th colspan="2">2-NOP-99.07 Attachment 6 A TRAIN OFF SITE POWER CHECK</th></tr>
<tr><td colspan="2"><u>NOTE</u>
Both 4160V Busses 2A3 and 2B3 need to be verified to satisfy Technical Specification 3.8.1.1.</td></tr>
<tr><td>Performance Step: 1
Critical : NO</td><td>1. VERIFY 4160V Bus 2A3 is aligned to receive or is receiving power from an offsite power source.
<table>
<tr><th>Component</th><th>Description</th><th>Acceptance Criteria</th></tr>
<tr><td colspan="3">Bus 2A3</td></tr>
<tr><td>2-20209
(4.16 KV 2A3)</td><td>Supply from 4.16 KV SWGR 2A2</td><td>CLOSED</td></tr>
</table></td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Standard:</td><td>Examinee will VERIFY 2-20209 Supply from 4.16 KV SWGR 2A2 CLOSED</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Evaluator Cue:</td><td>NONE</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Performance:</td><td>SATISFACTORY _____ UNSATISFACTORY _____</td></tr>
<tr><td>Comments:</td><td></td></tr>
</table>

Performance Step: 2
Critical: NO

1. VERIFY 4160V Bus 2A3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
Bus 2A3		
2-20109 (4.16 KV 2A2)	Feed to 4.16KV SWGR 2A3	CLOSED

Standard: Examinee will **VERIFY** 2-20109 Feed to 4.16KV SWGR 2A3 **CLOSED**

Evaluator Cue: **NONE**

Performance: **SATISFACTORY** _____ **UNSATISFACTORY** _____

Comments:

Performance Step: 3
Critical: NO

1. VERIFY 4160V Bus 2A3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
Bus 2A3		
2-20208 (4.16 KV 2A3)	Feed to 4.16 KV Bus 2AB	• IF 2AB powered from 2A3, THEN both CLOSED. • IF 2AB powered from 2B3, THEN both OPEN.
2-20505 (4.16 KV 2AB)	Incoming Feeder from 4.16 KV Bus 2A3	

Standard: Examinee will **VERIFY** 2-20208 Feed to 4.16 KV Bus 2AB and 2-20505 Incoming Feeder from 4.16 KV Bus 2A3 Both **CLOSED**

Evaluator Cue: **NONE**
NOTE: Power alignment will be to the "A" train

Performance: **SATISFACTORY** _____ **UNSATISFACTORY** _____

Comments:

Performance Step: 4 **Critical: NO**	**1. VERIFY** 4160V Bus 2A3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
	Bus 2A3	
2-20102 (4.16 KV 2A2)	Incoming Feeder From 2A S/U XFMR	Only one CLOSED
2-20101 (4.16 KV 2A2)	Incoming Feeder From UA Transf 2A	

Standard:	Examinee will **VERIFY** 2-20101 Incoming Feeder From UA Transf 2A **CLOSED**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 5 **Critical: NO**	**1. VERIFY** 4160V Bus 2A3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
	Bus 2A3	
4.16 KV BUS 2A2	4.16 KV Switchgear 2A2 (VM 916)	Voltage Indicated

Standard:	Examinee will **VERIFY** Voltage Indicated on 4.16 KV Switchgear 2A2 using VM 916
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 6 **Critical : NO**	**1. VERIFY** 4160V Bus 2A3 is aligned to receive or is receiving power from an offsite power source. **Component** / **Description** / **Acceptance Criteria** Bus 2A3 2-20605 (4.16 KV 2A4) / Incoming Feeder from S/U XFMR 2A / CLOSED
Standard:	Examinee will **VERIFY** 2-20605 Incoming Feeder from S/U XFMR 2A **CLOSED**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 7 **Critical : NO**	**1. VERIFY** 4160V Bus 2A3 is aligned to receive or is receiving power from an offsite power source. **Component** / **Description** / **Acceptance Criteria** Bus 2A3 2-20603 (4.16 KV 2A4) / Tie Breaker 4.16 KV SWGR 1A2, 2A2 / OPEN
Standard:	Examinee will **VERIFY** 2-20603 Tie Breaker 4.16 KV SWGR 1A2, 2A2 **OPEN**
Evaluator Cue:	**NONE** **NOTE: This breaker cubicle is used for alternate unit to unit crosstie and is empty**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 8 **Critical: NO**	**1. VERIFY** 4160V Bus 2A3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
Bus 2A3		
4.16 KV BUS 2A3	4160V SWGR Bus (VM 954)	Voltage Indicated

Standard:	Examinee will **VERIFY** Voltage Indicated on 4.16 KV Switchgear 2A3 using VM 954
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 9 **Critical: NO**	**2. DETERMINE** if 4160V Bus 2A3 (A Train) power is available as follows: **A. INSERT** Sync plug into 4.16 KV Bus 2A2 receptacle.
Standard:	Examinee will **INSERT** Sync plug into 4.16 KV Bus 2A2 receptacle
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 10 **Critical: YES**	**2. DETERMINE** if 4160V Bus 2A3 (A Train) power is available as follows: **B. ROTATE** Sync switch to ST-2A2 position.
Standard:	Examinee will **ROTATE** Sync switch to ST-2A2 position
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 11 **Critical : NO**	**2. DETERMINE** if 4160V Bus 2A3 (A Train) power is available as follows: **C. VERIFY** VM-888I, Incoming Volt, and VM-888R, Running Volt, are approximately matched.
Standard:	Examinee will **VERIFY** VM-888I, Incoming Volt, and VM-888R, Running Volt, are approximately matched
Evaluator Cue:	**NOTE: Examinee may report voltage differences to the US.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 12 **Critical : YES**	**2. DETERMINE** if 4160V Bus 2A3 (A Train) power is available as follows: **D. ROTATE** Sync switch to OFF position.
Standard:	Examinee will **ROTATE** Sync switch to the OFF position
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 13 **Critical : NO**	**2. DETERMINE** if 4160V Bus 2A3 (A Train) power is available as follows: **E. REMOVE** Sync plug from 4.16 KV Bus 2A2 receptacle.
Standard:	Examinee will **REMOVE** Sync plug from 4.16 KV Bus 2A2 receptacle.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

2-NOP-99.07 Attachment 7 B TRAIN OFF SITE POWER CHECK

NOTE

Both 4160V Busses 2A3 and 2B3 need to be verified to satisfy Technical Specification 3.8.1.1.

Performance Step: 14
Critical: NO

1. VERIFY 4160V Bus 2B3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
	Bus 2B3	
2-20411 (4.16 KV 2B3)	Supply from 4.16 KV Switchgear 2B2	CLOSED

Standard: Examinee will **VERIFY** 2-20411 Supply from 4.16 KV Switchgear 2B2 **CLOSED**

Evaluator Cue: **NONE**

Performance: **SATISFACTORY** _____ **UNSATISFACTORY** _____

Comments:

Performance Step: 15
Critical: NO

1. VERIFY 4160V Bus 2B3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
	Bus 2B3	
2-20309 (4.16 KV 2B2)	Feed to 4.16 KV Vital Switchgear 2B3	CLOSED

Standard: Examinee will **VERIFY** 2-20309 Feed to 4.16 KV Vital Switchgear 2B3 **CLOSED**

Evaluator Cue: **NONE**

Performance: **SATISFACTORY** _____ **UNSATISFACTORY** _____

Comments:

Performance Step: 16 **Critical: NO**	**1. VERIFY** 4160V Bus 2B3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
	Bus 2B3	
2-20409 (4.16 KV 2B3)	Feeder to 4.16 KV SWGR No. 2AB	• IF 2AB powered from 2A3, THEN both OPEN. • IF 2AB powered from 2B3, THEN both CLOSED.
2-20504 (4.16 KV 2AB)	Incoming Feeder from 4.16 KV Bus 2B3	

Standard:	Examinee will **VERIFY** 2-20409 Feeder to 4.16 KV SWGR No. 2AB and 2-20504 Incoming Feeder from 4.16 KV Bus 2B3 **OPEN**
Evaluator Cue:	**NONE** **NOTE: Power alignment will be to the "A" train**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 17 **Critical: NO**	**1. VERIFY** 4160V Bus 2B3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
	Bus 2B3	
2-20301 (4.16 KV 2B2)	Incoming Feeder From UA Transf. No. 2B	Only one CLOSED
2-20302 (4.16 KV 2B2)	Incoming Feeder From 2B S/U XFMR	

Standard:	Examinee will **VERIFY** 2-20301 Incoming Feeder From UA Transf. No. 2B **CLOSED**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 18 **Critical: NO**	**1. VERIFY** 4160V Bus 2B3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
Bus 2B3		
4.16 KV BUS 2B2	4.16 KV Switchgear 2B2 (VM 917)	Voltage Indicated

Standard:	Examinee will **VERIFY** Voltage Indicated on 4.16 KV Switchgear 2B2 using VM 917
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 19 **Critical: NO**	**1. VERIFY** 4160V Bus 2B3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
Bus 2B3		
2-20701 (4.16 KV 2B4)	Incoming Feeder from S/U XFMR 2B	CLOSED

Standard:	Examinee will **VERIFY** 2-20701 Incoming Feeder from S/U XFMR 2B **CLOSED**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 20 **Critical: NO**	**1. VERIFY** 4160V Bus 2B3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
Bus 2B3		
2-20703 (4.16 KV 2B4)	Tie Bkr 4.16 KV SWGR 1B2, 2B2	OPEN

Standard:	Examinee will **VERIFY** 2-20703 Tie Bkr 4.16 KV SWGR 1B2, 2B2 **OPEN**
Evaluator Cue:	**NONE** **NOTE: This breaker cubicle is used for alternate unit to unit crosstie and is empty**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 21 **Critical: NO**	**1. VERIFY** 4160V Bus 2B3 is aligned to receive or is receiving power from an offsite power source.

Component	Description	Acceptance Criteria
Bus 2B3		
4.16 KV BUS 2B3	4160V SWGR Bus (VM 964)	Voltage Indicated

Standard:	Examinee will **VERIFY** Voltage Indicated on 4.16 KV Switchgear 2B3 using VM 964
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 22 **Critical: NO**	**2. DETERMINE** if 4160V Bus 2B3 (B Train) power is available as follows: **A. INSERT** Sync plug into 4.16 KV Bus 2B2 receptacle.
Standard:	Examinee will **INSERT** Sync plug into 4.16 KV Bus 2B2 receptacle
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 23 **Critical: YES**	**2. DETERMINE** if 4160V Bus 2B3 (B Train) power is available as follows: **B. ROTATE** Sync switch to ST-2B2 position.
Standard:	Examinee will **ROTATE** Sync switch to ST-2B2 position.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 24 **Critical: NO**	**2. DETERMINE** if 4160V Bus 2B3 (B Train) power is available as follows: **C. VERIFY** VM-888I, Incoming Volt, and VM-888R, Running Volt, are approximately matched.
Standard:	Examinee will **VERIFY** VM-888I, Incoming Volt, and VM-888R, Running Volt, are approximately matched.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 25 **Critical: NO**	**2. DETERMINE** if 4160V Bus 2B3 (B Train) power is available as follows: **D. ROTATE** Sync switch to OFF position.
Standard:	Examinee will **ROTATE** Sync switch to OFF position.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 26 **Critical : NO**	**2. DETERMINE** if 4160V Bus 2B3 (B Train) power is available as follows: **E. REMOVE** Sync plug from 4.16 KV Bus 2B2 receptacle.
Standard:	Examinee will **REMOVE** Sync plug from 4.16 KV Bus 2B2 receptacle.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 27 **Critical: NO**	**NOTIFY** the US that off-site power checks have been completed satisfactory
Standard:	Examinee will **NOTIFY** the US that off-site power checks have been completed satisfactory
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues: **The JPM is complete.**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

REMEDIATION REQUIRED: **YES:** ☐ **NO:** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: **ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.**

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

- Unit-2 is 100% power
- The 2A EDG has been declared inoperable due to a blown control power fuse

INITIATING CUES (IF APPLICABLE):

- The Unit Supervisor has directed you to Verify Off-Site power to meet the surveillance requirements 4.8.1.1.1 a of Tech Spec 3.8.1.1 action b.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM TITLE: RESPOND TO HIGH RADIATION ALARM ON SPENT FUEL MONITORS - UNIT 2

JPM NUMBER: L-19-1 NRC JPM S-7 **REV.** 0

TASK NUMBER(S) / TASK TITLE(S): 07025090 / Align SFP Ventilation Trains
07067430 / Respond To Fuel Handling Accident (Dropped/Damaged Fuel)

K/A NUMBERS / K/A VALUES: (RO SRO) 072 K1.01/ Knowledge of the physical connections and/or cause-effect relationship between the ARM system and the following system: Plant ventilation systems (3.1/3.5)

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:
☒ RO ☒ SRO ☐ STA ☐ Non-Lic ☐ SRO CERT ☐ OTHER: ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [ ] Perform: [X]

EVALUATION LOCATION: In-Plant: [ ] Control Room: [ ]
Simulator: [X] Other: [ ]
Lab: [ ]

Time for Completion: 10 Minutes Time Critical: NO

Alternate Path [NRC]: YES
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10.	Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11.	Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16.	If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☐	☐	☒

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: (CAPRs, corrective actions, licensing commitments, etc. associated with this material)

{C001}

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

SIMULATOR SET-UP:

1. Ensure L-19-1 NRC JPM S-4 IC192 files and LSN are transferred to the simulator drive.
2. RESTORE IC-1.
2. UNFREEZE the Simulator.
3. SELECT and OPEN file L-19-1 NRC JPM S-7 lsn
4. EXECUTE the lesson for L-19-1 NRC JPM S-7
5. FREEZE the Simulator.
6. STORE a Temporary IC set if more than one student will be performing the JPM.
7. The lesson will NOT need to be stopped and re-executed for each student after restoring the IC.
8. UNFREEZE the Simulator when the student is ready to begin.

SIMULATOR MALFUNCTIONS:

SIMULATOR OVERRIDES:

SIMULATOR REMOTE FUNCTIONS:

Required Materials:
- 2-AOP-26.02, AREA RADIATION MONITORS, Section 4.2.4, Step 4

General References:
- 2-AOP-26.02, AREA RADIATION MONITORS

Task Standards: This JPM is complete when the US has been notified that the Fuel Handling Building ventilation line-up has been verified including contingency actions in accordance with 2-AOP-26.02.

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit 2 is at 100% power
- Refueling preparations are being made in the Fuel Handling Building with spent fuel movement in progress in the spent fuel pool
- The following Spent Fuel Pool Radiation Monitors are in High Alarm:
  - GAG007
  - GAG008
  - GAG009
  - GAG010
  - GAG011
  - GAG012
- 2-AOP-26.02, AREA RADIATION MONITORS is being implemented
- The alarms have been verified valid
- The fuel movement has been suspended and the Fuel Handling Building has been evacuated

INITIATING CUES:

- You are the Desk RCO
- The US has directed you to verify proper Fuel Handling Building ventilation line-up in accordance with 2-AOP-26.02, AREA RADIATION MONITORS, Section 4.2.4, Step 4

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

2-AOP-26.02, AREA RADIATION MONITORS,
Section 4.2.4, Fuel Handling Building Radiation Monitor Alarm, Step 4.
IF more than one HIGH Alarm in a train actuated, THEN VERIFY FHB ventilation transfer to SBVS as follows:

NOTE
Contingency actions are performed at HVAC Panel or locally as conditions allow.

Performance Step: 1 **Critical NO**	A. **ENSURE** the following fans, **STOPPED**: • HVS-6, FUEL POOL SUPPLY FAN. • HVS-7, FUEL HANDLING BLDG SUPPLY FAN. • HVE-15, FUEL HANDLING BLDG EXHAUST FAN. • HVE-16A, FUEL POOL EXHAUST FAN • HVE-16B, FUEL POOL EXHAUST FAN
Standard:	Examinee **ENSURES** each Fan's GREEN light ON and RED light OFF. If fan running, then places control switch in OFF and verifies GREEN light ON and RED light OFF.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 2 **Critical NO**	A. **ENSURE** the following fans, STOPPED: • HVE-17, FUEL BLDG H&V ROOM EXHAUST FAN (FHB/52/FH6/E-RAC)
Standard:	Examinee **DIRECTS** the SNPO to locally **STOP** HVE-17, FUEL BLDG H&V ROOM EXHAUST FAN.
Evaluator Cue:	**SNPO reports that HVE-17, FUEL BLDG H&V ROOM EXHAUST FAN, is STOPPED.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

NOTE
Fuses for dampers are behind HVAC Panel.

Performance Step: 3 **Critical NO**	B. **VERIFY** the following FHB dampers, **CLOSED**: • D-33, FUEL HDLG BLDG INLET DAMPER • D-35, FUEL HDLG BLDG OUTLET DAMPER • D-29, FUEL POOL INLET DAMPER • D-31, FUEL POOL OUTLET DAMPER • D-34, FUEL HDLG BLDG INLET DAMPER • D-36, FUEL HDLG BLDG OUTLET DAMPER • D-30, FUEL POOL INLET DAMPER • D-32, FUEL POOL OUTLET DAMPER
Standard:	Examinee **VERIFIES** Dampers D-29 through D-36 are **CLOSED**, Green light ON, Red light OFF.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 4 **Critical : NO** **Faulted Step**	C. **VERIFY** FCV-25-30, FUEL HANDLING EMERG VENT VLV, **OPEN.**
Standard:	Examinee **VERIFIES** position of FCV-25-30, Fuel Handling Emerg Vent Vlv by observing Green light ON and Red light OFF. Examinee **DETERMINES** FCV-25-30, Fuel Handling Emerg Vent Vlv, **CLOSED**.
Evaluator Cue:	**FCV-25-30 indicates Green light ON, Red Light OFF.** **EVALUTOR NOTE: FCV-25-30 failed to auto OPEN.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 5 **Critical YES**	**CONTINGENCY ACTION:** C.1 **OPEN** FCV-25-30, FUEL HANDLING EMERG VENT VLV. **Step is critical because without taking contingency action to OPEN FCV-25-30 the task cannot be completed.**
Standard:	Examine **POSITIONS** FCV-25-30 control switch to **OPEN** and **VERIFIES** Green light OFF, Red light ON. Examinee **OBSERVES** X-4 Alarms as delta-P lowers.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 6 **Critical: NO** **Faulted Step**	D. **VERIFY** FCV-25-32, SBVS ISOLATION VALVE, **CLOSED.**
Standard:	Examinee **VERIFIES** position of FCV-25-32, SBVS ISOLATION VALVE by observing Green light OFF and Red light ON. Examinee **DETERMINES** FCV-25-32, SBVS ISOLATION VALVE **OPEN**.
Evaluator Cue:	**NONE** **EVALUTOR NOTE: FCV-25-32 failed to auto CLOSE.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 7 **Critical YES**	**CONTINGENCY ACTION:** D.1 **CLOSE** FCV-25-32, SBVS ISOLATION VALVE. **Step is critical because without taking contingency action to CLOSING FCV-25-32 the task cannot be completed.**
Standard:	Examinee **POSITIONS** FCV-25-32 control switch to **CLOSE**. Examinee **VERIFIES** FCV-25-32 indicates Green light ON, Red Light OFF. Examinee **OBSERVES** V-20 & X4 Alarms.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 8 **Critical NO**	E. **VERIFY** HVE-6A, SBVS EXHAUST FAN, **ON**.
Standard:	Examinee **VERIFIES** HVE-6A, SBVS EXHAUST FAN, Green light OFF, Red light ON.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 9 **Critical: NO** **Faulted Step**	F. **VERIFY** FCV-25-31, FUEL HANDLING EMERG VENT VLV, **OPEN.**
Standard:	Examinee **VERIFIES** position of FCV-25-31, FUEL HANDLING EMERG VENT VLV by observing Green/Red indication lights. Examinee **DETERMINES** FCV-25-31, FUEL HANDLING EMERG VENT VLV, **CLOSED**.
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE: FCV-25-31 failed to auto OPEN.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 10 **Critical YES**	**CONTINGENCY ACTION:** F.1 OPEN FCV-25-31, FUEL HANDLING EMERG VENT VLV. **Step is critical because without taking contingency action to OPENING FCV-25-31 the task cannot be completed.**
Standard:	Examinee **POSITIONS** FCV-25-31 control switch to OPEN. Examinee **VERIFIES** FCV-25-31 indicates Green light OFF, Red Light ON.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 11 **Critical: NO** **Faulted Step**	G. **VERIFY** FCV-25-33, SBVS ISOLATION VALVE, **CLOSED**.
Standard:	Examinee **VERIFIES** position of FCV-25-33, SBVS ISOLATION VALVE by observing Green/Red indication lights. Examinee **DETERMINES** FCV-25-33, SBVS ISOLATION VALVE, **OPEN**.
Evaluator Cue:	**NONE** **EVALUTOR NOTE: FCV-25-33 failed to auto CLOSE.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 12 **Critical YES**	**CONTINGENCY ACTION:** G.1 CLOSE FCV-25-33, SBVS Isolation Valve. **Step is critical because without taking contingency action to CLOSING FCV-25-33 the task cannot be completed.**
Standard:	Examinee **POSITIONS** FCV-25-33 control switch to CLOSE. Examinee **VERIFIES** FCV-25-33 indicates Green light ON, Red Light OFF. Examinee **OBSERVES** V-21 & X4 Reflash Alarms.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 13 **Critical : NO** **Faulted Step**	H. **VERIFY** HVE-6B, SBVS EXHAUST FAN, is **ON**.
Standard:	Examinee **OBSERVES** HVE-6B, SBVS EXHAUST FAN Green light ON and Red light OFF. Examinee **DETERMINES** HVE-6B, SBVS EXHAUST FAN, FAILED to AUTO START.
Evaluator Cue:	**NONE** **EVALUTOR NOTE: HVE-6B, SBVS EXHAUST FAN, FAILED to AUTO START.**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	
Performance Step: 14 **Critical YES**	H. **CONTINGENCY ACTION:** H.1 **START** HVE-6B, SBVS EXHAUST FAN **Step is critical because without taking contingency action to START HVE-6B, SBVS EXHAUST FAN the task cannot be completed.**
Standard:	• Examinee **POSITIONS** HVE-6B, SBVS EXHAUST FAN control switch to **START.** • Examinee **VERIFIES** HVE-6B, SBVS EXHAUST FAN indicates Green light OFF, Red Light ON**.**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY UNSATISFACTORY**
Comments:	

Performance Step: 15 Critical N	**NOTIFY** the US that the Fuel Handling Building ventilation line-up has been verified in accordance with 2-AOP-26.02, section 4.2.4, step 4. FCV-25-30 and FCV-25-31 had to be manually opened, FCV-25-32 and FCV-25-33 had to be manually closed.
Standard:	Examinee **NOTIFIES** the US that the Fuel Handling Building ventilation line-up has been verified in accordance with 2-AOP-26.02, section 4.2.4, step 4. FCV-25-30 and FCV-25-31 had to be manually opened, FCV-25-32 and FCV-25-33 had to be manually closed.
Evaluator Cue:	**US ACKNOWLEDGES:**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues:

The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).
PLACEKEEPING COMMENTS:

EXAMINER NOTE: ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

TURNOVER SHEET

INITIAL CONDITIONS:

- Unit 2 is at 100% power
- Refueling preparations are being made in the Fuel Handling Building with spent fuel movement in progress in the spent fuel pool
- The following Spent Fuel Pool Radiation Monitors are in High Alarm:
  - GAG007
  - GAG008
  - GAG009
  - GAG010
  - GAG011
  - GAG012
- 2-AOP-26.02, AREA RADIATION MONITORS is being implemented
- The alarms have been verified valid
- The fuel movement has been suspended and the Fuel Handling Building has been evacuated

INITIATING CUES:

- You are the Desk RCO
- The US has directed you to verify proper Fuel Handling Building ventilation line-up in accordance with 2-AOP-26.02, AREA RADIATION MONITORS, Section 4.2.4, Step 4

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM TITLE: **ALIGN 2C CCW PUMP TO SUPPLY THE 'B' CCW HEADER – UNIT 2**

JPM NUMBER: **S-8** **REV. 0**

TASK NUMBER(S) / TASK TITLE(S): **07014060 / Respond to a Component Cooling Water System malfunction**

K/A NUMBERS / K/A VALUES: (RO SRO) **008 A2.01 / 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: Loss of CCW pump (3.3/3.6)**

Justification (FOR K/A VALUES <3.0): **N/A**

TASK APPLICABILITY:

☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: ☐ Perform: ☒ X

EVALUATION LOCATION: In-Plant: ☐ Control Room: ☐

Simulator: ☒ X Other: ☐

Lab: ☐

Time for Completion: 10 Minutes Time Critical: No

Alternate Path [NRC]: NO

Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS	YES	NO	N/A
1. Are all items on the signature page filled in correctly?	☒	☐	☐
2. Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3. Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4. Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5. Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6. Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7. If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8. Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9. Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10. Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11. Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12. Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13. Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14. Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15. Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16. If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☒	☐	☐

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER	DATE
				SUPERVISOR	DATE

SIMULATOR SET-UP: *(Only required for simulator JPMs)*

SIMULATOR SETUP INSTRUCTIONS:

1. Ensure L-19-1 NRC JPM S-8 IC 192 files are transferred to the simulator drive.
2. RESTORE IC-192
3. PLACE the Simulator in RUN.
4. Ensure L-19-1 NRC JPM S-8 IC 192 files are deleted from the simulator drive when the JPM is no longer being administered.

SIMULATOR MALFUNCTIONS:

SIMULATOR OVERRIDES:

SIMULATOR REMOTE FUNCTIONS:

Required Materials:	▪ **2-AOP-14.01 Component Cooling Water Abnormal Operation**
General References:	▪ **2-AOP-14.01 Component Cooling Water Abnormal Operation**
Task Standards:	**The applicant will perform the Operator actions of 2-AOP-14.01 Component Cooling Water Abnormal Operation and align the 2C CCW pump to the "B" header**

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit 2 is at 100% power. The 2B CCW pump has tripped and cannot be started. The 2C CCW pump is available to be aligned and started on the 2B CCW header.

INITIATING CUES:

- You are the Board RCO
- The US directs you to align and start the 2C CCW pump on the 2B header in accordance with 2-AOP-14.01 Component Cooling Water Abnormal Operation

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

2-AOP-14.01 Component Cooling Water Abnormal Operation	
Performance Step: 1 **Critical : NO**	4.3.2.1. **VERIFY** both the following conditions are met: • CCW Pump 2B tripped. • CCW Pump 2C available to supply CCW Header B
Standard:	Examinee will **VERIFY** 2B CCW pump not running AND 2C CCW pump is available
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	**EVALUATOR NOTE: During this scenario, an instructor should play the part of the Desk RCO and keep the annunciators acknowledged to allow the candidate to focus on the task at hand.**

Performance Step: 2 **Critical: NO**	4.2.3.2. **PLACE** the 2B CCW pump in Pull to Lock
Standard:	Examinee will **PLACE** the 2B CCW pump in Pull to Lock
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

CAUTION

If CCW is completely lost to a SDC HX, then SDC flow must be promptly isolated to limit flashing and prior to restoring CCW flow to limit thermal stress.

Performance Step: 3 Critical : NO	4.2.3.3. **VERIFY** SDC Loop 2B is NOT in service
Standard:	Examinee will **DETERMINE** that SDC is not in service, step is N/A
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 4 Critical: NO	4.2.3.4 **VERIFY** the 2C CCW pump is stopped.
Standard:	Examinee will **Determine** 2CCW pump is not running
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 5 Critical : NO	4.2.3.5. **VERIFY** the following CLOSED: • MV-14-1 PUMP 2C DISCH TO HEADER A • MV-14-3 HEADER A TO PUMP 2C
Standard:	Examinee will **DETERMINE:** • MV-14-1 PUMP 2C DISCH TO HEADER A is Open • MV-14-3 HEADER A TO PUMP 2C is Open
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 6 Critical : YES	4.2.3.5.1. **CLOSE** the following: • MV-14-1, PUMP 2C DISCH TO HEADER A • MV-14-3, HEADER A TO PUMP 2C
Standard:	Examinee will **CLOSE**: • MV-14-1, PUMP 2C DISCH TO HEADER A • MV-14-3, HEADER A TO PUMP 2C
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 7 **Critical : NO**	4.2.3.6 **VERIFY** the following OPEN: • MV-14-2, PUMP 2C DISCH TO HEADER B • MV-14-4, HEADER B TO PUMP 2C
Standard:	Examinee will **DETERMINE** : • MV-14-2, PUMP 2C DISCH TO HEADER A is Closed • MV-14-4, HEADER A TO PUMP 2C is Closed
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 8 **Critical : YES**	4.2.3.6.1. **OPEN** the following: • MV-14-2, PUMP 2C DISCH TO HEADER B • MV-14-4, HEADER B TO PUMP 2C
Standard:	Examinee will **OPEN:** • MV-14-2, PUMP 2C DISCH TO HEADER B • MV-14-4, HEADER B TO PUMP 2C
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 9 **Critical : NO**	4.2.3.7. **VERIFY** both the following conditions are met: • CCW Pump 2C electrically aligned to B Side. • 4160V Bus 2B3 **ENERGIZED**
Standard:	Examinee will **DETERMINE:** • The 2C CCW pump is **NOT** electrically aligned to the B side • The 4160V Bus 2B3 is **ENERGIZED**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 10 **Critical : NO**	4.2.3.7.1 **IF** in MODES 1 to 4 AND 4160V Bus 2B3 **ENERGIZED**, THEN **PERFORM** Attachment 2, Aligning 4160V Bus 2AB to B Side, prior to starting CCW Pump 2C on Header B
Standard:	Examinee **DETERMINES** the 2AB bus requires alignment to the B side and performs Attachment 2, Aligning 4160 V bus 2AB to B Side
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Attachment 2 of 2-AOP-14.01	
NOTE ☐ Tech Spec 3.7.3, Component Cooling Water System, applies until 480 VAC and 125 VDC busses are realigned. ☐ While aligning 4160V Bus 2AB to B side, the following annunciators will be received: ☐ B-48, 4.16KV SWGR 480V LC/MCC 2AB UV (RTGB-201) ☐ B-60, EMERG 125V DC / 4.16KV / 480V AB BUSES MISALIGNED (RTGB-201) ☐ S-16, EMERG 125VDC/4.16KV/480V AB BUSES MISALIGNED (RTGB-206)	
Performance Step: 11 **Critical : NO**	Att 2, step 1 **VERIFY** the following tie breakers are OPEN (RTGB 201): • Brk. 1-20501, 1AB 4.16KV Bus SBO X-Tie is OPEN • Brk. 2-20501, 2AB 4.16KV Bus SBO X-Tie is OPEN
Standard:	Examinee will **VERIFY:** • Brk. 1-20501, 1AB 4.16KV Bus SBO X-Tie is OPEN • Brk. 2-20501, 2AB 4.16KV Bus SBO X-Tie is OPEN
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 12 **Critical : NO**	Att 2, step 2 **VERIFY** the following pump control switches are in **PULL-TO-LOCK:** • Component Cooling Water Pump 2C (RTGB-206) • Intake Cooling Water Pump 2C (RTGB-202)
Standard:	Examinee will **VERIFY** the following pumps are in PULL-TO-LOCK: • Component Cooling Water Pump 2C (RTGB-206) • Intake Cooling Water Pump 2C (RTGB-202)
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 13 **Critical : YES**	Att 2, step 3 **ENSURE** 4160V Bus 2AB aligned to B side as follows: (RTGB-201) A. Bkr 2-20505, 4.16KV BUS TIE 2AB/2A3 OPEN B. Bkr 2-20208, 4.16KV BUS TIE 2A3/2AB OPEN C. Bkr 2-20409, 4.16KV BUS TIE 2B3/2AB CLOSED D. Bkr 2-20504, 4.16KV BUS TIE 2AB/2B3 CLOSED
Standard:	Examinee will **ENSURE:** A. Bkr 2-20505, 4.16KV BUS TIE 2AB/2A3 OPEN B. Bkr 2-20208, 4.16KV BUS TIE 2A3/2AB OPEN C. Bkr 2-20409, 4.16KV BUS TIE 2B3/2AB CLOSED D. Bkr 2-20504, 4.16KV BUS TIE 2AB/2B3 CLOSED
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Transition back to 2-AOP-14.01 Component Cooling Water Abnormal Operation	
Performance Step: 14 **Critical : YES**	4.2.3.8 **WHEN** both the following conditions are met: • IF SDC HX 2B was in service, THEN SDC HX 2B flow isolation is complete per Section 4.2.3 Step 3 • 4160V electrical alignment of CCW Pump 2C complete **THEN START** CCW Pump 2C.
Standard:	Examinee **RECOGNIZES** that SDC HX 2B was not in service and that the 4160V electrical alignment of CCW Pump 2C is complete (IAW Attachment 2) **STARTS** CCW Pump 2C
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 15 Critical : NO	4.2.3.9 **VERIFY** CCW Header B pressures and flows return to normal: • FIS-14-1B, HEADER FLOW • PIS-14-8B, HEADER PRESSURE
Standard:	Examinee **VERIFIES** the annunciators associated with CCW flows and pressures are clear and indications return to normal
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Terminating Cues: The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

STOP TIME _____

Applicant: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO-U** ☐ **SRO-I** **Date:** _____

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: **ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.**

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

TURNOVER SHEET

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

Unit 2 is at 100% power. The 2B CCW pump has tripped and cannot be started. The 2C CCW pump is available to be aligned and started on the 2B CCW header.

INITIATING CUES:

You are the Board RCO

The US directs you to align and start the 2C CCW on the 2B header in accordance with 2-AOP-14.01 Component Cooling Water Abnormal Operation

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM TITLE: **RELEASE 1A WASTE MONITOR TANK**

JPM NUMBER: **P-1** **REV. 0**

TASK NUMBER(S) / TASK TITLE(S): **07006110, Release 1A Waste Monitor Tank Contents**

K/A NUMBERS / K/A VALUES: (RO SRO) **068-K4.01 / Knowledge of design feature(s) and/or interlock(s) which provide for the following: Safety and environmental precautions for handling hot, acidic, and radioactive liquids (3.4/4.1)**

Justification (FOR K/A VALUES <3.0): **N/A**

TASK APPLICABILITY:
☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** _____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [X] Perform: [ ]

EVALUATION LOCATION: In-Plant: [X] Control Room: [ ]
Simulator: [ ] Other: [ ]
Lab: [ ]

Time for Completion: 10 Minutes Time Critical: No

Alternate Path [NRC]: No
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS	YES	NO	N/A
1. Are all items on the signature page filled in correctly?	☒	☐	☐
2. Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3. Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4. Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5. Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6. Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7. If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8. Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9. Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10. Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11. Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12. Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13. Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14. Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15. Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16. If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☒	☐	☐

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:

- **1-NOP-06.15 OXYGENATED WASTE SYSTEM**
- **1-NOP-06.01 CONTROLLED LIQUID RELEASE TO THE CIRCULATING WATER DISCHARGE**

General References:

- **1-NOP-06.15 OXYGENATED WASTE SYSTEM**
- **1-NOP-06.01 CONTROLLED LIQUID RELEASE TO THE CIRCULATING WATER DISCHARGE**

Task Standards: **The applicant will simulate lining up the oxygenated waste system to release the 1A Waste Monitor Tank to the Circulating Water Discharge.**

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

Unit 1 is at 100% power with all systems operable. The 1A Waste Monitor Tank level is 81%, the Unit Supervisor has directed it to be discharged.

- Section 4.1 of 1-NOP-06.01, Controlled Liquid Release to the Circulating Water Discharge, has been completed.
- Channel R-6627, Liquid Waste Monitor is in Service.
- Step 4.4.1.1 of 1-NOP-06.15, Oxygen Waste System, ENSURE Attachment 19, WMT Initial Alignment, has been completed.
- No maintenance is to be performed

INITIATING CUES (IF APPLICABLE):

You are the Unit 1 SNPO. You have been directed by the Unit 1 Unit Supervisor to place the 1A WMT on recirc. and then release the contents of 1A Waste Monitor Tank using the 1A Waste Monitor Pump, in accordance with section 4.2 of 1-NOP-06.01, Controlled Liquid Release to the Circulating Water Discharge. Begin with 1-NOP-06.15, Oxygen Waste System, Oxygenated Waste System Step 4.4.1.2

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

1-NOP-06.15 OXYGENATED WASTE SYSTEM	
NOTE Component locations are in the WMT area unless otherwise specified.	
Performance Step: 1 **Critical YES**	**2. ENSURE** HCV-06-6, WASTE MONITOR TANKS INLET, is selected to FILLING TANK B. (RAB/LIQ WST CNTL PN)
Standard:	Examinee will **SIMULATE** POSITIONING the Control Switch for HCV-06-6 to FILLING TANK B.
Evaluator Cue:	**Control Switch is in the FILLING TANK B position.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 2 **Critical NO**	**3. RECORD** 1A WMT level:_____
Standard:	Examinee will **RECORD** 81% on the procedure from the cue
Evaluator Cue:	**1A WMT Level indicates 81%**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 3 **Critical YES**	**4. START** 1A Waste Monitor Pump using local pushbutton. (Adjacent to pump in B-141C).
Standard:	Examinee will simulate **DEPRESSING** the local start pushbutton.
Evaluator Cue:	**The button has been depressed, and the pump is running.**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 4 **Critical NO**	**5.** IF pump fails to start, THEN **VERIFY** switch position per Section 2.1, Step 1.
Standard:	Examinee will **DETERMINE** step is N/A.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 5 **Critical YES**	**6. THROTTLE** V06220, 1A WASTE MONITOR PUMP DISCH RECIRC ISOL, to obtain between 20 psig and 25 psig on PI-06-47A,1A WASTE MONITOR TANK PUMP PRESS.
Standard:	Examinee will Simulate **POSITIONING** V06220 to attain 20 to 25 psig on PI-06-47A.
Evaluator Cue:	**V06220 is THROTTLED 1A Waste Monitor Pump Pressure is 23 psig as indicated on PI-06-47A.**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 6 **Critical NO**	**7.** IF unable to obtain between 20 psig and 25 psig on PI-06-47A, 1A WASTE MONITOR TANK PUMP PRESS, THEN STOP 1A Waste Monitor Pump AND RETURN to Section 4.4.1, Step 1 to verify lineup.
Standard:	Examinee will **DETERMINE** step is N/A.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 7 **Critical NO**	**8. ENSURE** 1A Waste Monitor Tank level in **NOT** lowering.
Standard:	Examinee will **OBSERVE** 1A Waste Monitor Tank level.
Evaluator Cue:	**1A Waste monitor Tank Level is 81% and steady.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 8 **Critical NO**	**9. NOTIFY** Chemistry and Control Room the 1A WMT is on Recirc with 1A Waste Monitor Pump.
Standard:	Examinee will **NOTIFY** the Control Room & Chemistry via radio or telephone.
Evaluator Cue:	**Chemistry acknowledges the communication.** **The Control Room acknowledges the communication.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 9 **Critical YES**	**10.** IF 1A WMT is to be released, **THEN GO** TO 1-NOP-06.01, Controlled Liquid Release to the Circulating Water Discharge.
Standard:	Examinee will **GO TO 1-NOP-06.01**
Evaluator Cue:	**TIME COMPRESS --- Chemistry reports sample results on the 1A WMT are acceptable. The US directs the SNPO to release the 1A WMT in accordance with 1-NOP-06.01 section 4.2.3 (per initial cue)**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

1-NOP-06.01 CONTROLLED LIQUID RELEASE TO THE CIRCULATING WATER DISCHARGE	
Performance Step: 10 **Critical NO**	**3.** IF Channel 43 (R-6627), LIQUID RADWASTE DISCHARGE MONITOR, is out of service, THEN **ENSURE** lineup has been independently verified using 1-NOP-06.15, Oxygenated Waste System.
Standard:	Examinee will **DETERMINE** step is N/A from the initial conditions.
Evaluator Cue:	**(If asked) The Liquid Waste Discharge Monitor is in service.**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 11 **Critical NO**	**4.** IF affected WMT is to be drained for maintenance (pump hand-switch will be placed in CUTOUT), THEN **ENSURE** lineup has been independently verified using 1-NOP-06.15, Oxygenated Waste System.
Standard:	Examinee will **DETERMINE** step is N/A from the initial conditions.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 12 **Critical YES**	**5. UNLOCK** and **OPEN** V21462, WASTE MONITOR PUMPS DISCH TO DISCH CANAL ISOL. (CCW/27/N-954/E-1732)
Standard:	Examinee will **SIMULATE OPENING** V21462, WASTE MONITOR PUMPS DISCH TO DISCH CANAL ISOL
Evaluator Cue:	**V21462 INDICATES OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

	2-NOP-06.01 Section 5.1, Demin Flush of RE-6627
Performance Step: 13 **Critical NO**	**6. PERFORM** Demin Flush of RE-6627 as follows: **6.A CLOSE** V06239, RE-6627 UPSTREAM ROOT. (CCW/26/N-957/E-1731)
Standard:	Examinee will **SIMULATE CLOSING** V06239
Evaluator Cue:	**V06239 INDICATES CLOSED**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 14 **Critical NO**	**6.B ENSURE** V06240, RE-6627 DOWNSTREAM ROOT, is OPEN. (CCW/26/N-957/E-1731)
Standard:	Examinee will **SIMULATE OPENING** V06240
Evaluator Cue:	**V06240 INDICATES OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 15 **Critical NO**	**6.C** Slowly **THROTTLE** V38175, DMW TO RE-6627 ISOL, OPEN three turns for one minute. (CCW/18/N-951/E-1731)
Standard:	Examinee will **SIMULATE OPENING** V38175 to three turns OPEN
Evaluator Cue:	**V38175 is three turns OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 16 **Critical NO**	**6.D CLOSE** V38175, DMW TO RE-6627 ISOL.
Standard:	Examinee will **SIMULATE CLOSING** V38175
Evaluator Cue:	**V38175 INDICATES CLOSED**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 17 **Critical NO**	**6.E OPEN** V06239, RE-6627 UPSTREAM ROOT.
Standard:	Examinee will **SIMULATE OPENING** V06239
Evaluator Cue:	**V06239 INDICATES OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 18 **Critical NO**	**6.F CLOSE** V06240, RE-6627 DOWNSTREAM ROOT.
Standard:	Examinee will **SIMULATE CLOSING** V06240
Evaluator Cue:	**V06240 INDICATES CLOSED**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 19 **Critical NO**	**6.G** Slowly **THROTTLE** V38175, DMW TO RE-6627 ISOL, OPEN three turns for one minute. (CCW/18/N-951/E-1731)
Standard:	Examinee will **SIMULATE OPENING** V38175 to three turns OPEN
Evaluator Cue:	**V38175 is three turns OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 20 **Critical NO**	**6.H CLOSE** V38175, DMW TO RE-6627 ISOL.
Standard:	Examinee will **SIMULATE CLOSING** V38175
Evaluator Cue:	**V38175 INDICATES CLOSED**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 21 **Critical NO**	**6.I OPEN** V06240, RE-6627 DOWNSTREAM ROOT.
Standard:	Examinee will **SIMULATE OPENING** V06240
Evaluator Cue:	**V06240 INDICATES OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 22 **Critical YES**	**7. OPEN** V06215, 1A WASTE MONITOR PUMP DISCH ISOL. (YD/22/N-1055/E-1719)
Standard:	Examinee will **SIMULATE OPENING** V06215
Evaluator Cue:	**V06215 INDICATES OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 23 **Critical NO**	**8.** IF PI-06-47A, WASTE MONITOR PUMP 1A PRESSURE INDICATOR, is NOT between 10 and 25 psig, THEN **PERFORM** the following: (YD/20/N-1040/E-1715) **A. CLOSE** V06215, 1A WASTE MONITOR PUMP DISCH ISOL. **B. STOP** 1A Waste Monitor Pump. (LOCAL PB) **C. RETURN** TO Section 4.2, Step 1.
Standard:	Examinee will **OBSERVE** PI-06-47A, 1A Waste Monitor Pump Press indicates 10 to 25 psig.
Evaluator Cue:	**PI-06-47A, 1A Waste Monitor Pump Press indicates 22 psig.**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

CAUTION Excessive fluctuation of flow observed on FR-6627, LIQUID WASTE FLOW, may be indicative of air trapped in sensing line of FE-6627, LIQUID WASTE DISCH FLOW. (RTGB-105)	
Performance Step: 24 **Critical NO**	**9.** IF US / SM determines FR-6627, LIQUID WASTE FLOW, is excessively fluctuating prior to OR during release, THEN **PERFORM** the following: **A. CLOSE** V06215, 1A WASTE MONITOR PUMP DISCH ISOL, to end release. **B. CONTACT** I&C to vent sensing lines of FE-6627, LIQUID WASTE DISCH FLOW. **C.** WHEN venting of FE-6627 sensing lines are complete, THEN **RETURN TO** Section 4.2, Step 7.
Standard:	Examinee will **DETERMINE** step is N/A.
Evaluator Cue:	**IF Asked the US / SM reports FR-6627, LIQUID WASTE FLOW, is SAT**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 25 **Critical NO**	**10. RECORD** the following at start of release: • Start Date/Time _____ • Level from LIS-06-47A1, WMST-A LEVEL on LIQUID WASTE CONTROL PANEL _____ (RAB/24/RA3Z/W-RAI)
Standard:	Examinee will **RECORD** Release Start Date/Time and WMST-A LEVEL
Evaluator Cue:	**Time is NOW and Level is 81%**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 26 **Critical NO**	**11.** IF Channel 43 (R-6627), LIQUID RADWASTE DISCHARGE MONITOR, is out of service, THEN **PERFORM** independent verification for the following valves: **A. VERIFY** V06215, 1A WASTE MONITOR PUMP DISCH ISOL, is OPEN. (YD/22/N-1055/E-1719) **B. VERIFY** V21462, WASTE MONITOR PUMPS DISCH TO DISCH CANAL ISOL, is OPEN. (CCW/27/N-954/E-1732)
Standard:	Examinee will **DETERMINE** step is N/A.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 27 **Critical NO**	**12.** IF Section 4.2, Step 11 was performed, THEN **ENSURE** Section 3.2, Step 4 is complete.
Standard:	Examinee will **DETERMINE** step is N/A.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 28 **Critical NO**	**13.** IF affected WMT is to be drained for maintenance (pump hand-switch will be placed in CUTOUT), THEN **PERFORM** independent verification for the following valves: **A. VERIFY** V06215, 1A WASTE MONITOR PUMP DISCH ISOL, is OPEN. (YD/22/N-1055/E-1719) **B. VERIFY** V21462, WASTE MONITOR PUMPS DISCH TO DISCH CANAL ISOL, is OPEN. (CCW/27/N-954/E-1732)
Standard:	Examinee will **DETERMINE** step is N/A.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 29 **Critical NO**	**14.** IF Section 4.2, Step 13 was performed, THEN **ENSURE** Section 3.2, Step 5 is complete.
Standard:	Examinee will **DETERMINE** step is N/A.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 30 **Critical NO**	**15. PLACE** magnetic “LIQUID RELEASE” placard beneath LIS-06-47A1, WMST-A LEVEL, on LIQUID WASTE CONTROL PANEL.
Standard:	Examinee will **SIMULATE** PLACING magnetic “LIQUID RELEASE” placard beneath LIS-06-47A1.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 31 **Critical NO**	**NOTIFY** the US that the 1A Waste Monitor Tank is being released using the 1A Waste Monitor Pump, in accordance with section 4.2 of 1-NOP-06.01, Controlled Liquid Release to the Circulating Water Discharge.
Standard:	Examinee will **NOTIFY** the US that 1A Waste Monitor Tank is being released
Evaluator Cue:	**US acknowledges the communication**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues: **The JPM is complete.**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

REMEDIATION REQUIRED: **YES:** ☐ **NO:** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: **ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.**

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

Unit 1 is at 100% power with all systems operable. The 1A Waste Monitor Tank level is 81%, the Unit Supervisor has directed it to be discharged.

- Section 4.1 of 1-NOP-06.01, Controlled Liquid Release to the Circulating Water Discharge, has been completed.
- Channel R-6627, Liquid Waste Monitor is in Service.
- Step 4.4.1.1 of 1-NOP-06.15, Oxygen Waste System, ENSURE Attachment 19, WMT Initial Alignment, has been completed.
- No maintenance is to be performed

INITIATING CUES (IF APPLICABLE):

You are the Unit 1 SNPO. You have been directed by the Unit 1 Unit Supervisor to place the 1A WMT on recirc. and then release the contents of 1A Waste Monitor Tank using the 1A Waste Monitor Pump, in accordance with section 4.2 of 1-NOP-06.01, Controlled Liquid Release to the Circulating Water Discharge. Begin with 1-NOP-06.15, Oxygen Waste System, Oxygenated Waste System Step 4.4.1.2

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

REVISION NO.:	PROCEDURE TITLE:	PAGE:
17	OXYGENATED WASTE SYSTEM	43 of 139
PROCEDURE NO.:	ST. LUCIE UNIT 1	
1-NOP-06.15		

4.4 Waste Monitor Tank (WMT) Operations

4.4.1 Recirc 1A WMT Via 1A Waste Monitor Pump

NOTE

Component locations are in the WMT area unless otherwise specified.

1. **ENSURE** Attachment 19, WMT Initial Alignment, has been performed.
2. **ENSURE** HCV-06-6, WASTE MONITOR TANKS INLET, is selected to FILLING TANK B. (RAB/LIQ WST CNTL PN)
3. **RECORD** 1A WMT level:_____
4. **START** 1A Waste Monitor Pump using local pushbutton. (Adjacent to pump in B-141C)
5. IF pump fails to start, THEN **VERIFY** switch position per Section 2.1, Step 1.
6. **THROTTLE** V06220, 1A WASTE MONITOR PUMP DISCH RECIRC ISOL, to obtain between 20 psig and 25 psig on PI-06-47A, 1A WASTE MONITOR TANK PUMP PRESS.
7. IF unable to obtain between 20 psig and 25 psig on PI-06-47A, 1A WASTE MONITOR TANK PUMP PRESS, THEN **STOP** 1A Waste Monitor Pump AND **RETURN** to Section 4.4.1, Step 1 to verify lineup.
8. **ENSURE** 1A Waste Monitor Tank level in **NOT** lowering.
9. **NOTIFY** Chemistry and Control Room the 1A WMT is on Recirc with 1A Waste Monitor Pump.
10. IF 1A WMT is to be released, THEN **GO TO** 1-NOP-06.01, Controlled Liquid Release to the Circulating Water Discharge.
11. IF 1A WMT is to be removed from Recirc without being released, THEN **PERFORM** the following:
    - **A.** **STOP** 1A Waste Monitor Pump using local pushbutton. (Adjacent to pump in B-141C).
    - **B.** **OPEN** V06220, 1A WASTE MONITOR PUMP DISCH RECIRC ISOL.

REVISION NO.:	PROCEDURE TITLE:	PAGE:
30	CONTROLLED LIQUID RELEASE TO THE CIRCULATING WATER DISCHARGE	9 of 37
PROCEDURE NO.: 1-NOP-06.01	ST. LUCIE UNIT 1	

4.2 **Discharge 1A WMT Using 1A Waste Monitor Pump**

1. ~~1.~~ **ENSURE** Section 4.1, Preparation for a Liquid Release, has been performed.

2. **ENSURE** 1A WMT is recirculating with 1A Waste Monitor Pump per 1-NOP-06.15, Oxygenated Waste System.

3. IF Channel 43 (R-6627), LIQUID RADWASTE DISCHARGE MONITOR, is out of service, THEN **ENSURE** lineup has been independently verified using 1-NOP-06.15, Oxygenated Waste System.

4. IF affected WMT is to be drained for maintenance (pump hand-switch will be placed in CUTOUT), THEN **ENSURE** lineup has been independently verified using 1-NOP-06.15, Oxygenated Waste System.

5. **UNLOCK** and **OPEN** V21462, WASTE MONITOR PUMPS DISCH TO DISCH CANAL ISOL. (CCW/27/N-954/E-1732)

6. **PERFORM** Demin Flush of RE-6627as follows:

   A. **CLOSE** V06239, RE-6627 UPSTREAM ROOT. (CCW/26/N-957/E-1731)

   B. **ENSURE** V06240, RE-6627 DOWNSTREAM ROOT, is OPEN. (CCW/26/N-957/E-1731)

   C. Slowly **THROTTLE** V38175, DMW TO RE-6627 ISOL, OPEN three turns for one minute. (CCW/18/N-951/E-1731)

   D. **CLOSE** V38175, DMW TO RE-6627 ISOL.

   E. **OPEN** V06239, RE-6627 UPSTREAM ROOT.

   F. **CLOSE** V06240, RE-6627 DOWNSTREAM ROOT.

   G. Slowly **THROTTLE** V38175, DMW TO RE-6627 ISOL, OPEN three turns for one minute.

   H. **CLOSE** V38175, DMW TO RE-6627 ISOL.

   I. **OPEN** V06240, RE-6627 DOWNSTREAM ROOT.

7. **OPEN** V06215, 1A WASTE MONITOR PUMP DISCH ISOL. (YD/22/N-1055/E-1719)

REVISION NO.:	PROCEDURE TITLE:	PAGE:
30	CONTROLLED LIQUID RELEASE TO THE CIRCULATING WATER DISCHARGE	10 of 37
PROCEDURE NO.:		
1-NOP-06.01	ST. LUCIE UNIT 1	**INITIAL**

4.2 Discharge 1A WMT Using 1A Waste Monitor Pump (continued)

8. IF PI-06-47A, WASTE MONITOR PUMP 1A PRESSURE INDICATOR, is **NOT** between 10 and 25 psig, THEN **PERFORM** the following: (YD/20/N-1040/E-1715)

A. **CLOSE** V06215, 1A WASTE MONITOR PUMP DISCH ISOL.

B. **STOP** 1A Waste Monitor Pump. (LOCAL PB)

C. **RETURN TO** Section 4.2, Step 1.

CAUTION

Excessive fluctuation of flow observed on FR-6627, LIQUID WASTE FLOW, may be indicative of air trapped in sensing line of FE-6627, LIQUID WASTE DISCH FLOW. (RTGB-105)

9. IF US / SM determines FR-6627, LIQUID WASTE FLOW, is excessively fluctuating prior to OR during release, THEN **PERFORM** the following:

A. **CLOSE** V06215, 1A WASTE MONITOR PUMP DISCH ISOL, to end release.

B. **CONTACT** I&C to vent sensing lines of FE-6627, LIQUID WASTE DISCH FLOW.

C. WHEN venting of FE-6627 sensing lines are complete, THEN **RETURN TO** Section 4.2, Step 7.

10. **RECORD** the following at start of release:

- Start Date/Time _____
- Level from LIS-06-47A1, WMST-A LEVEL on LIQUID WASTE CONTROL PANEL _____ (RAB/24/RA3Z/W-RAI)

REVISION NO.:	PROCEDURE TITLE:	PAGE:
30	CONTROLLED LIQUID RELEASE TO THE CIRCULATING WATER DISCHARGE	11 of 37
PROCEDURE NO.:		
1-NOP-06.01	ST. LUCIE UNIT 1	INITIAL

4.2 Discharge 1A WMT Using 1A Waste Monitor Pump (continued)

11. IF Channel 43 (R-6627), LIQUID RADWASTE DISCHARGE MONITOR, is out of service, THEN **PERFORM** independent verification for the following valves:

A. **VERIFY** V06215, 1A WASTE MONITOR PUMP DISCH ISOL, is OPEN. (YD/22/N-1055/E-1719)

_____ IV

B. **VERIFY** V21462, WASTE MONITOR PUMPS DISCH TO DISCH CANAL ISOL, is OPEN. (CCW/27/N-954/E-1732)

_____ IV

12. IF Section 4.2, Step 11 was performed, THEN **ENSURE** Section 3.2, Step 4 is complete.

_____ US / SM

13. IF affected WMT is to be drained for maintenance (pump hand-switch will be placed in CUTOUT), THEN **PERFORM** independent verification for the following valves:

A. **VERIFY** V06215, 1A WASTE MONITOR PUMP DISCH ISOL, is OPEN. (YD/22/N-1055/E-1719)

_____ IV

B. **VERIFY** V21462, WASTE MONITOR PUMPS DISCH TO DISCH CANAL ISOL, is OPEN. (CCW/27/N-954/E-1732)

_____ IV

14. IF Section 4.2, Step 13 was performed, THEN **ENSURE** Section 3.2, Step 5 is complete.

_____ US / SM

15. **PLACE** magnetic "LIQUID RELEASE" placard beneath LIS-06-47A1, WMST-A LEVEL, on LIQUID WASTE CONTROL PANEL.

CAUTION

When pump hand-switch is in CUTOUT, an Operator should remain on location to stop pump when desired level is reached to prevent pump damage.

16. IF 1A WMT is to be drained for maintenance, THEN **ENSURE** 1A WASTE MONITOR PUMP TANK PUMP A PROCESSING switch is in CUTOUT. (LIQUID WASTE CONTROL PANEL)

REVISION NO.:	PROCEDURE TITLE:	PAGE:
30	CONTROLLED LIQUID RELEASE TO THE CIRCULATING WATER DISCHARGE	12 of 37
PROCEDURE NO.:		
1-NOP-06.01	ST. LUCIE UNIT 1	

4.2 Discharge 1A WMT Using 1A Waste Monitor Pump (continued)

17. PERFORM the following during liquid release:

- **MONITOR** FR-6627, LIQUID WASTE FLOW, to maintain release flow as follows:
  - **ADJUST** FIC-6627,LIQUID WASTE FLOW, Manual Control Knob, to maintain less than 50 gpm on FR-6627. (RTGB-105)
  - **ENSURE** X-5, LIQUID RADWASTE MONITOR LOW FLOW, is CLEAR. (RADIATION MONITOR PANEL)
- **VERIFY** Channel 43 (R-6627), LIQUID RADWASTE DISCHARGE MONITOR, activity (uCi/ml) level is below Liquid Radwaste Monitor Settings on LRP. (RADIATION MONITOR PANEL)
- **MONITOR** Liquid Waste Control Panel alarms.
- **MONITOR** 1A WMT for lowering level.
- **MONITOR** 1B WMT to ensure level is **NOT** lowering.
- IF an unexplained level change in 1B WMT occurs, THEN **IMPLEMENT** 1-AOP-06.02, Uncontrolled Release of Radioactive Liquids.

JPM TITLE: **RESTORE INSTRUMENT AIR USING THE 2A IA COMPRESSOR**

JPM NUMBER: **P-2** **REV. 0**

TASK NUMBER(S) / TASK TITLE(S): **03018220, Place Instrument Air Compressor "A" or "B" in service**

K/A NUMBERS / K/A VALUES: (RO SRO) **078-K4.02 / Knowledge of IAS design feature(s) and/or interlock(s) which provide for the following: Cross-over to other air systems (3.2/3.5)**

Justification (FOR K/A VALUES <3.0): **N/A**

TASK APPLICABILITY:

☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** _____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [X] Perform: [ ]

EVALUATION LOCATION: In-Plant: [X] Control Room: [ ]

Simulator: [ ] Other: [ ]

Lab: [ ]

Time for Completion: 10 Minutes Time Critical: No

Alternate Path [NRC]: No

Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS	YES	NO	N/A
1. Are all items on the signature page filled in correctly?	☒	☐	☐
2. Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3. Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4. Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5. Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6. Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7. If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8. Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9. Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10. Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11. Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12. Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13. Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14. Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15. Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16. If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☒	☐	☐

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:
- **2-EOP-99 APP. H**

General References:
- **2-EOP-99 APP. H**

Task Standards: **The applicant will simulate placing the 2A Instrument Air Compressor in service.**

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

Unit 2 has experience a LOOP

INITIATING CUES (IF APPLICABLE):

You are the Unit 2 NPO. You have been directed by the Unit 2 Unit Supervisor to place the 2A Instrument air compressor in service IAW 2-EOP-99 Appendix H, Operation of the 2A and 2B Instrument Air Compressors. Step 4 of Section 1 placing Emergency Turbine Cooling Water in service has been completed by an extra NPO.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

IAW 2-EOP-99 Appendix H Operation of the 2A and 2B Instrument Air Compressors Section 1	
Performance Step: 1 **Critical NO**	**1.** ENSURE the following breakers are **ON**. • Bkr 41331(MCC 2A6) Instr Air Compr 2A
Standard:	Examinee will **Verify** the following breakers **ON**: • Bkr 41331(MCC 2A6) Instr Air Compr 2A
Evaluator Cue:	**Breaker 41331 indicates ON**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 2 **Critical No**	**1.** ENSURE the following breakers are **ON**. • Bkr 42414(MCC 2AB) Instr Air Compr Cooler Fan
Standard:	Examinee will **Verify** the following breakers are **ON**: • Bkr 42414(MCC 2AB) Instr Air Compr Cooler Fan
Evaluator Cue:	**Breaker 42414 indicates ON**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 3 **Critical YES**	**1.** ENSURE the following breakers are ON. • Bkr 42416(MCC 2AB) Cooling System Water Pump
Standard:	Examinee will **Simulate** placing the following breakers are **ON**: • Bkr 42416(MCC 2AB) Cooling System Water Pump
Evaluator Cue:	**Breaker 42416 indicates ON**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 4 **Critical YES**	**2.** At breaker 2-41331(MCC-2A6-breaker) INSTR AIR COMPR 2A, **PRESS** the 2A IAC PWR RST push button.
Standard:	Examinee will Simulate **PRESSING** the 2A IAC PWR RST push button
Evaluator Cue:	**2A IAC PWR RST push button has been depressed**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 5 **Critical NO**	**3. VERIFY** 2A IAC POWER ON light is lit on breaker 2-41331
Standard:	Examinee will **VERIFY** 2A IAC POWER ON light is lit
Evaluator Cue:	**2A IAC POWER ON light is lit**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 6 Critical NO	**4.** If TCW is **NOT** available Then **PERFORM** the following:
Standard:	**The Extra NPO reports that step 4 is complete.**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 7 Critical NO	**5.** If TCW is available Then **PERFORM** the following:
Standard:	Per the **CUE** sheet this step is N/A, Examinee will proceed to STEP 6
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 8 Critical YES	**6.** Locally START 2A Instrument Air Compressor as follows: **A. PLACE** the 2A IAC selector switch in **ON**
Standard:	Examinee will Simulate **PLACING** the 2A IAC selector switch in **ON**
Evaluator Cue:	**2A IAC selector switch is in ON**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 9 **Critical No**	**6.** Locally START 2A Instrument Air Compressor as follows: **B. RESET** any warning alarms or trips
Standard:	Examinee will Simulate **RESETTING** any warning alarms or trips
Evaluator Cue:	**No warning lights or alarms are present on the control screen**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 10 **Critical YES**	**6.** Locally START 2A Instrument Air Compressor as follows: **C. PRESS** the Regulator Start button at the 2A IAC CNTLR
Standard:	Examinee will Simulate **PRESSING** the Regulator Start button at the 2A IAC CNTLR
Evaluator Cue:	**2A IAC started**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 11 **Critical NO**	**6.** Locally START 2A Instrument Air Compressor as follows: **D. VERIFY** 2A IAC starts and loads at 106 psig
Standard:	Examinee will **VERIFY** the 2A IAC starts and loads at 106 psig
Evaluator Cue:	**2A IAC started and is loading at 106 psig**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 12 **Critical NO**	**NOTIFY** the Unit-2 control room that the 2A I/A compressor is running.
Standard:	Examinee will **NOTIFIES** the Unit-2 control room that the 2A I/A compressor is running
Evaluator Cue:	**US acknowledges the communication**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues:	**The JPM is complete.**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

REMEDIATION REQUIRED: **YES:** ☐ **NO:** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: **ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.**

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

Unit 2 has experience a LOOP

INITIATING CUES (IF APPLICABLE):

You are the Unit 2 NPO. You have been directed by the Unit 2 Unit Supervisor to place the 2A Instrument air compressor in service IAW 2-EOP-99 Appendix H Operation of the 2A and 2B Instrument Air Compressors. Step 4 of Section 1 placing Emergency Turbine Cooling Water in service has been completed by an extra NPO.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

APPENDIX H
OPERATION OF THE 2A AND 2B INSTRUMENT AIR COMPRESSORS
(Page 1 of 4)

Section 1: Placing 2A Instrument Air Compressor in Service

☐ **1.** ENSURE the following breakers are aligned as indicated.

Component ID	Component Name	POSITION (√)
Bkr 41331 (MCC 2A6)	Instr Air Compr 2A	ON ___
Bkr 42414 (MCC 2AB)	Instrument Air Compressor Cooler Fan	ON ___
Bkr 42416 (MCC 2AB)	Cooling System Water PP	ON ___

☐ **2.** At breaker 2-41331 (MCC 2A6), INSTR AIR COMPR 2A, PRESS the 2A IAC PWR RST pushbutton.

☐ **3.** VERIFY the 2A IAC PWR ON light is lit on breaker 2-41331.

☐ **4.** If TCW is NOT available,
Then PERFORM the following:

☐ **A.** ENSURE the Instrument Air Compressor Head Tank level is at least 3/4 full.

☐ **B.** ALIGN 2A Instrument Air Compressor for **emergency** cooling and operation:

Component ID	Component Name	POSITION (√)
V13383	Air Comprs Outlet Hdr Isol (TGB/32/N-24/E-B)	CLOSE ___
V13380	Air Comprs Inlet Hdr Isol(TGB/31/N-24/W-B)	CLOSE ___
V13417	Air Compr Coolers Inlet Hdr from Recirc Pump Isol (TGB/31/N-24/E-B)	OPEN ___
V13420	Air Compr Coolers to Fan Cooler Isol (TGB/32/N-24/E-B)	OPEN ___
V13424	2A Recirc Pump from / to 2A Expan Tank Isol (TGB/22/N-24/E-B)	OPEN ___
V13419	Air Compr Coolers to Fan Cooler Isol (TGB/25/N-24/E-B)	OPEN ___
V13418	2A Recirc Pump Disch Isol (TGB/22/N-24/E-B)	OPEN ___
V18109	Instr Air Rcvr Inlet from 2A Aftercooler Isol (TGB/29/S-22/W-A)	OPEN ___
V18660	2C / 2D Instr Air Comps Disch Isol (TGB/29/S-22/W-A)	CLOSE ___

REVISION NO.:	PROCEDURE TITLE:	PAGE:
60	APPENDICES / FIGURES / TABLES / DATA SHEETS	62 of 176
PROCEDURE NO.: 2-EOP-99	ST. LUCIE UNIT 2	

APPENDIX H
OPERATION OF THE 2A AND 2B INSTRUMENT AIR COMPRESSORS
(Page 2 of 4)

Section 1: Placing 2A Instrument Air Compressor in Service (continued)

☐ **C.** START the Emergency Cooling System Recirculation Pump. (inside Box B2R68) (TGB/25/24/B)

☐ **D.** START the Emergency Cooling System Radiator Fan. (inside Box B2R68) (TGB/25/24/B)

☐ **5.** If TCW is available,
Then ALIGN 2A Instrument Air Compressor for operation:

Component ID	Component Name	POSITION (√)
V18109	Instr Air Rcvr Inlet from 2A Aftercooler Isol (TGB/29/S-22/W-A)	OPEN ___
V18660	2C / 2D Instr Air Comps Disch Isol (TGB/29/S-22/W-A)	CLOSE ___

☐ **6.** Locally START the 2A Instrument Air Compressor as follows:

☐ **A.** PLACE 2A IAC selector switch in ON.

☐ **B.** RESET any warning alarms or trips.

☐ **C.** PRESS the Regulator Start button at the 2A IAC CNTLR.

☐ **D.** VERIFY 2A IAC starts and loads at 106 psig.

☐ **7.** NOTIFY Unit 2 Control Room that 2A Instrument Air Compressor is running.

End of Section 1

JPM TITLE: ALIGN UNIT 2 CST TO SUPPLY 1A AFW PUMP

JPM NUMBER: P-3 **REV.** 0

TASK NUMBER(S) / TASK TITLE(S): 03105050 and 07009055, Align AFW System in Response to Component Malfunction/Failure

K/A NUMBERS / K/A VALUES: (RO SRO) 061A1.03 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the AFW controls including: Interactions when multi-unit systems are cross tied (3.1/3.6)

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:

☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** _____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [X] Perform: [ ]

EVALUATION LOCATION: In-Plant: [X] Control Room: [ ]

Simulator: [ ] Other: [ ]

Lab: [ ]

Time for Completion: 10 Minutes Time Critical: No

Alternate Path [NRC]: No

Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS	YES	NO	N/A
1. Are all items on the signature page filled in correctly?	☒	☐	☐
2. Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3. Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4. Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5. Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6. Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7. If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8. Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9. Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10. Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11. Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12. Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13. Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14. Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15. Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16. If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☒	☐	☐

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR #	PREPARER SUPERVISOR	DATE DATE

Required Materials:
- **1-AOP-09.02 AUXILIARY FEEDWATER**

General References:
- **1-AOP-09.02 AUXILIARY FEEDWATER**

Task Standards: **The applicant will simulate lining up the Unit-2 CST to supply the 1A AFW pump**

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

The Unit 1 CST in unavailable due to being damaged from a vertical tornado missile. The Unit 2 CST is available.

INITIATING CUES (IF APPLICABLE):

You are an extra NPO. The Unit 1 Unit Supervisor has directed you to perform the NPO actions for BOTH Unit 1 and Unit 2 to line up the Unit 2 CST to supply the 1A AFW Pump IAW 1-AOP-09.02, “Auxiliary Feedwater,” Attachment 5.

The RCO has disabled ALL Auxiliary Feedwater Pumps.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

1-AOP-09.02 AUXILIARY FEEDWATER, ATT. 5 UNIT 2 NPO ACTIONS	
NOTE Valve wrenches are located on the north wall by the northeast door.	
Performance Step: 1 **Critical YES**	**2.1** At the Unit 2 CST, **PERFORM** the following to establish a flow path from the Unit 2 CST to Unit 1 AFW pumps: **A.** IF starting 1A AFW Pump OR 1B AFW Pump, THEN **OPEN** V12802, 2A/2B AFW PUMP SUCT TO / FROM UNIT 1 ISOL. (Southeast side of Tank)
Standard:	Examinee will **SIMULATE OPENING** V12802
Evaluator Cue:	**V12802 is OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 2 **Critical YES**	**2.2 OPEN** V12805, CST CROSSTIE TO UNIT 1 ISOL. (Near South door by the wall)
Standard:	Examinee will **SIMULATE OPENING** V12805
Evaluator Cue:	**V12805 is OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 3 **Critical NO**	**2.3 NOTIFY** Unit 1 NPO that Unit 2 CST local actions are COMPLETE.
Standard:	Examinee will **NOTIFY** the Unit 1 NPO that Unit 2 CST local actions are COMPLETE.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 4 **Critical NO**	**2.4 REPORT** to Unit 1 Steam Trestle to assist with valve lineup.
Standard:	Examinee will **PROCEED to Unit-1**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

1-AOP-09.02 AUXILIARY FEEDWATER, ATT. 5 UNIT 1 NPO ACTIONS	
Performance Step: 5 **Critical YES**	**3.1 PERFORM** the following from the Steam Trestle to ISOLATE recirc flow to the Unit 1 CST for the selected AFW pump to feed steam generators: • 1A AFW Pump: **CLOSE** V09100, 1A AFW PUMP RECIRC ISOL. (TRSL/22/N-T5/W-TA)
Standard:	Examinee will **SIMULATE CLOSING** V09100
Evaluator Cue:	**V09100 is CLOSED**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

NOTE A valve wrench and pipe wrench are located to the left of the east door inside the CST Building.	
CAUTION A catastrophic failure of the Unit 1 CST may cause the CST building to be inaccessible due to high water level, nitrogen concentration in the atmosphere, or loss of security card reader access. Available indications such as low nitrogen pressure or water issuing from the CST building door should be used before entering the building.	
Performance Step: 6 **Critical YES**	**3.2** To supply 1A and 1B AFW Pumps, **PERFORM** the following: **A.** WHEN RCO has disabled <u>all</u> Auxiliary Feedwater Pumps per Attachment 5, Section 4.0, Step 1, THEN **CLOSE** V12497, CST OUTLET TO 1A/1B AFW PUMP SUCT ISOL.
Standard:	Examinee will **SIMULATE CLOSING** V12497
Evaluator Cue:	**V12497 is CLOSED** **NOTE:** Per cue sheet the RCO has disabled all Auxiliary Feedwater Pumps If asked by applicant, no water is issuing from the door.
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 7 **Critical YES**	**3.2** To supply 1A and 1B AFW Pumps, **PERFORM** the following: **B**. WHEN Unit 2 NPO has completed both Attachment 5, Section 2 actions: • V12802, 2A/2B AFW PUMP SUCT TO / FROM UNIT 1 ISOL is OPEN • V12805, CST CROSSTIE TO UNIT 1 ISOL is OPEN THEN **OPEN** V12177, TO/FROM UNIT 2 FROM 1A/1B AFW PUMP SUCT ISOL. (Southeast side of Unit 1 CST Building by the wall)
Standard:	Examinee will **SIMULATE OPENING** V12177
Evaluator Cue:	**V12177 is OPEN**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 8 **Critical NO**	**3.2** To supply 1A and 1B AFW Pumps, **PERFORM** the following: **C**. **REMOVE** vent cap from V12827, 1B AFW PUMP SUCT PRESS. (Southeast side of Unit 1 CST between Tank and Wall)
Standard:	Examinee will **SIMULATE REMOVING** vent cap from V12827
Evaluator Cue:	Vent cap for V12827 is **REMOVED**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 9 **Critical NO**	**3.2** To supply 1A and 1B AFW Pumps, **PERFORM** the following: **D. VENT** the AFW suction piping until a steady stream of water issues by opening and closing V12827, 1A/1B AFW SUCT FROM CST VENT
Standard:	Examinee will **SIMULATE VENTING** from V12827
Evaluator Cue:	A solid stream of water is issuing from the vent on V12827
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 10 **Critical NO**	**3.2** To supply 1A and 1B AFW Pumps, **PERFORM** the following: **E. INSTALL** vent cap on V12827, 1A/1B AFW PUMP SUCT FROM CST VENT.
Standard:	Examinee will **SIMULATE REMOVING** vent cap from V12827
Evaluator Cue:	Vent cap for V12827 is **REMOVED**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 11 **Critical NO**	**3.2** To supply 1A and 1B AFW Pumps, **PERFORM** the following: **E. NOTIFY** Unit 1 Control Room that 1A and 1B AFW Header is aligned to Unit 2 CST.
Standard:	Examinee will **SIMULATE NOTIFYING** Unit 1 Control Room
Evaluator Cue:	Unit 1 Control Room Acknowledges
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues: **The JPM is complete.**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

REMEDIATION REQUIRED: **YES:** ☐ **NO:** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: **ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.**

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

The Unit 1 CST in unavailable due to being damaged from a vertical tornado missile. The Unit 2 CST is available.

INITIATING CUES (IF APPLICABLE):

You are an extra NPO. The Unit 1 Unit Supervisor has directed you to perform the NPO actions for BOTH Unit 1 and Unit 2 to line up the Unit 2 CST to supply the 1A AFW Pump IAW 1-AOP-09.02, "Auxiliary Feedwater," Attachment 5.

The RCO has disabled ALL Auxiliary Feedwater Pumps.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

REVISION NO.:	PROCEDURE TITLE:	PAGE:
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PROCEDURE NO.:	ST. LUCIE UNIT 1	
1-AOP-09.02		

ATTACHMENT 5
Supplying Unit 1 AFW Pumps From the Unit 2 CST
(Page 3 of 12)

2.0 UNIT 2 NPO ACTIONS

NOTE

Valve wrenches are located on the north wall by the northeast door.

1. At the Unit 2 CST, **PERFORM** the following to establish a flowpath from the Unit 2 CST to Unit 1 AFW pumps:

   A. IF starting 1A AFW Pump OR 1B AFW Pump, THEN **OPEN** V12802, 2A/2B AFW PUMP SUCT TO / FROM UNIT 1 ISOL. (Southeast side of Tank)

   B. IF starting 1C AFW Pump, THEN **OPEN** V12801, 2C AFW PUMP SUCT TO / FROM UNIT 1 ISOL. (Northeast side of Tank)

2. **OPEN** V12805, CST CROSSTIE TO UNIT 1 ISOL. (Near South door by the wall)

3. **NOTIFY** Unit 1 NPO that Unit 2 CST local actions are COMPLETE.

4. **REPORT** to Unit 1 Steam Trestle to assist with valve lineup.

REVISION NO.:	PROCEDURE TITLE:	PAGE:
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PROCEDURE NO.:		
1-AOP-09.02	ST. LUCIE UNIT 1	

ATTACHMENT 5
Supplying Unit 1 AFW Pumps From the Unit 2 CST
(Page 4 of 12)

3.0 UNIT 1 NPO ACTIONS

1. **PERFORM** the following from the Steam Trestle to ISOLATE recirc flow to the Unit 1 CST for the selected AFW pump to feed steam generators:

   - 1A AFW Pump: **CLOSE** V09100, 1A AFW PUMP RECIRC ISOL. (TRSL/22/N-T5/W-TA)
   - I1B AFW Pump: **CLOSE** V09101, 1B AFW PUMP RECIRC ISOL. (TRSL/22/N-T6/W-TA)
   - 1C AFW Pump: **CLOSE** V09399, 1C AFW PUMP RECIRC ISOL. (TRSL/23/N-T3/W-TA)

NOTE

A valve wrench and pipe wrench are located to the left of the east door inside the CST Building.

CAUTION

A catastrophic failure of the Unit 1 CST may cause the CST building to be inaccessible due to high water level, nitrogen concentration in the atmosphere, or loss of security card reader access. Available indications such as low nitrogen pressure or water issuing from the CST building door should be used before entering the building.

2. To supply 1A and 1B AFW Pumps, **PERFORM** the following:

   A. WHEN RCO has disabled all Auxiliary Feedwater Pumps per Attachment 5, Section 4.0, Step 1,
   THEN **CLOSE** V12497, CST OUTLET TO 1A/1B AFW PUMP SUCT ISOL.
   (Southeast side of Unit 1 CST)

REVISION NO.:	PROCEDURE TITLE:	PAGE:
13	AUXILIARY FEEDWATER	33 of 43
PROCEDURE NO.:		
1-AOP-09.02	ST. LUCIE UNIT 1	

ATTACHMENT 5
Supplying Unit 1 AFW Pumps From the Unit 2 CST
(Page 5 of 12)

3.0 UNIT 1 NPO ACTIONS (continued)

2. (continued)

B. WHEN Unit 2 NPO has completed both Attachment 5, Section 2.0 actions:

- V12802, 2A/2B AFW PUMP SUCT TO / FROM UNIT 1 ISOL, is OPEN.

AND

- V12805, CST CROSSTIE TO UNIT 1 ISOL, is OPEN.

THEN **OPEN** V12177, TO/FROM UNIT 2 FROM 1A/1B AFW PUMP SUCT ISOL. (Southeast side of Unit 1 CST Building by the wall)

C. **REMOVE** vent cap from V12827, 1A/1B AFW PUMP SUCT FROM CST VENT. (Southeast side of Unit 1 CST between Tank and Wall)

D. **VENT** the AFW suction piping until a steady stream of water issues by opening and closing V12827, 1A/1B AFW PUMP SUCT FROM CST VENT.

E. **INSTALL** vent cap on V12827, 1A/1B AFW PUMP SUCT FROM CST VENT.

F. **NOTIFY** Unit 1 Control Room that 1A and 1B AFW Header is aligned to Unit 2 CST.

JPM TITLE: RO CALC BORON FOR WITHDRAWAL OF DROPPED CEA

JPM NUMBER: L-19-1 NRC JPM A-1R **REV.** 0

TASK NUMBER(S) / TASK TITLE(S): 07002440/ Calculate Boron Concentration Change
07066110/ Recover A Misaligned CEA

K/A NUMBERS / K/A VALUES: (RO SRO) Task 2.1.25 RCO (3.9) Ability to interpret reference materials, such as graphs, curves, tables, etc

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:
☒ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: ☐ Perform: X

EVALUATION LOCATION: In-Plant: ☐ Control Room: ☐
Simulator: ☐ Other: X
Lab: ☐

Time for Completion: 15 Minutes Time Critical: NO

Alternate Path [NRC]: NO
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10.	Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11.	Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16.	If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☐	☐	☒

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:
- 1-AOP-66.01 Dropped or Misaligned CEA Abnormal Operations
- Unit-1 Daily Chemistry Sheet
- 1-NOP-02.24 Boron Concentration Control

General References:
- 1-AOP-66.01 Dropped or Misaligned CEA Abnormal Operations
- Unit-1 Daily Chemistry Sheet
- 1-NOP-02.24 Boron Concentration Control

Task Standards: This JPM is complete when the applicant has calculated the total amount of Boric acid required to maintain power stable @ 92% while withdrawing CEA #7.

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

At 0100, Unit-1 is 100% power when CEA #7 in "B" shutdown group dropped, with its associated rod bottom light lit, all remaining "B" shutdown group are at 136", EFPH is 5000. 1-AOP-66.01 Dropped or Misaligned CEA Abnormal Operations has been entered. Attachment 5, CEA Functional Test and Operability Determination has been completed, CEA #7 is OPERABLE.

At 0110, Unit-1 is 92% power and stable Step 6.A. of Attachment 1, Dropped CEA Recovery with Reactor Critical, is being implemented for Shutdown Bank "B" CEA #7.

INITIATING CUES:

You are the Desk RCO. The Unit Supervisor directs you to calculate the boric acid rate required to recover the worst case dropped rod over a 10 minute period, using the 1A BAMT, per Ops-520, Briefing Sheet 1, Reactivity Management.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

Briefing Sheet 1, Reactivity Management	
Performance Step: 1 **Critical YES**	**CALCULATE the RCS Boron concentration increase required.** Applicant determines Worst Case Dropped Rod Worth (Physics Curve Book B.4)
Standard:	Applicant determines value to be **172 pcm** from Figure B.4, St. Lucie Unit 1 Cycle 28
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	Highest Single Dropped CEA Worth = 172 pcm

Performance Step: 2 **Critical: YES**	**CALCULATE the RCS Boron concentration increase required.** Applicant determines HFP Boron Worth (Physics Curve Book C.1)
Standard:	Applicant determines value to be **8.39 pcm/ppm** from Figure C.1, St. Lucie Unit 1 Cycle 28
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	Hot Full Power Differential Boron Worth at 5000 EFPH is 8.39 pcm/ppm

Performance Step: 3 **Critical: YES**	**CALCULATE the RCS Boron concentration increase required.** Applicant calculates the RCS Boron concentration increase required is **20.5 ppm**. (172pcm/8.39pcm/ppm)
Standard:	Applicant calculates the RCS Boron concentration increase required is 20.5 ppm. Worst Case Dropped Rod Worth divided by HFP Boron Worth.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	Applicant calculates the RCS Boron concentration increase required is 20.5 ppm. Worst Case Dropped Rod Worth divided by HFP Boron Worth.

Performance Step: 4 **Critical YES**	**CALCULATE the amount of boric acid needed from the selected BAMT:** $V_{BAMT} = V_{RCS} * \ln(Cb_{BAMT}-Cb_{RCSi} / Cb_{BAMT}-Cb_{RCSf})$
Standard:	Applicant calculates the required volume of boric acid to be added is $V_{BAMT} = V_{RCS} * \ln(Cb_{BAMT}-Cb_{RCSi} / Cb_{BAMT}-Cb_{RCSf})$ $V_{BAMT} = 62,500 * \ln((5,870-843) / (5,870 – 863.5))$ 255.4 gallons of boric acid
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	Applicant calculates the required volume of boric acid is 255.4 gallons

Performance Step: 5 **Critical YES**	**CALCULATE the initial Boration Rate necessary to recover the dropped rod:** Applicant determines the boration rate.
Standard:	Applicant determines that the boration rate is 25.54 gpm (**25-26.2 gpm)**
Evaluator Cue:	**NOTE** **The acceptable range takes into consideration the rounding of the calculation results**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	62500x ℓn $\frac{\text{BAM TK – Initial RCS Boron Conc}}{\text{BAM TK – Final RCS Boron Conc}}$ ⇨ 62500x ℓn $\frac{5870ppm – 843ppm}{5870ppm – 863.5ppm}$ 62500x ℓn 1.00409 ⇨ 62500x .004086 ⇨ 255.39 gal boric acid ⇨ **255.39/10 min = 25.5 gpm**

Terminating Cues: **This JPM is complete when the applicant has calculated the total amount of Boric acid required to maintain power stable @ 92% while withdrawing CEA #7.**

The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

At 0100, Unit-1 is 100% power when CEA #7 in "B" shutdown group dropped, with its associated rod bottom light lit, all remaining "B" shutdown group are at 136", EFPH is 5000.
1-AOP-66.01 Dropped or Misaligned CEA Abnormal Operations has been entered. Attachment 5, CEA Functional Test and Operability Determination has been completed, CEA #7 is OPERABLE.

At 0110, Unit-1 is 92% power and stable Step 6.A. of Attachment 1, Dropped CEA Recovery with Reactor Critical, is being implemented for Shutdown Bank "B" CEA #7.

INITIATING CUES:

You are the Desk RCO. The Unit Supervisor directs you to calculate the boric acid rate required to recover the worst case dropped rod over a 10 minute period, using the 1A BAMT, per Ops-520, Briefing Sheet 1, Reactivity Management.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

REVISION NO.:	PROCEDURE TITLE:	PAGE:
8	DROPPED OR MISALIGNED CEA ABNORMAL OPERATIONS	17 of 34
PROCEDURE NO.: 1-AOP-66.01	ST. LUCIE UNIT 1	

ATTACHMENT 1
Dropped CEA Recovery With Reactor Critical
(Page 3 of 4)

NOTE

- If it can be done within the allowable time, it is desirable to pace the recovery to take at least 10 minutes.
- If Attachment 1, Step 6 can **NOT** be performed successfully, then Attachment 1, Step 5 shall be performed.

6. **WITHDRAW** dropped CEA as follows:

A. **RECORD** and **MAINTAIN** ΔT power less than or equal to power level recorded in Section 4.2, Step 4 or 70%, whichever limit is in effect, by borating. (Section 6.1.3, Management Directive 2)

Power level to maintain: **92** %

NOTE

Topics for Dropped CEA Recovery on Briefing Sheet 1, Reactivity Management, of OPS-520, Briefing, Data And Check Sheets, contains the amount and rate of boration while withdrawing the CEA.

B. **COMMENCE** borating per Operator Aid - RCS Boration Guide, posted at RTGB-105.

C. **SELECT** CEAPDS POSITION BACKUP DISPLAY to monitor affected CEA.

D. On CEA POSITION DISPLAYS panel, **SELECT** affected group using desired scale (FULL or +/-15 INCHES).

E. On MODE SELECTION panel, **SELECT** MANUAL INDIVIDUAL (MI).

F. On INDIVIDUAL CEA SELECTION panel, **SELECT** affected CEA.

G. On GROUP SELECTION panel, **SELECT** affected group.

Briefing Sheet 1
Reactivity Management
(Page 1 of 2)

Beginning of Shift Reactivity Review (Control Room Personnel Only - **Shiftly**)

- ☐ Water / Acid / CEA / Turbine changes during past shift
- ☐ EFPH _____ Boron _____ ppm Xenon trend _____ pcm ASI trend/stability _____
- ☐ Water / Acid / CEA / Turbine changes expected this shift
- ☐ Water / Acid to change temperature 0.1°F Water _____ gal. Acid _____ gal
- ☐ Blend ratio _____/1
- ☐ Operations reactivity evolutions planned this shift
- ☐ Maintenance activities potentially challenging reactivity
- ☐ Operator Work Arounds impacting reactivity
- ☐ Reactor Power Band _____ RCS Temperature Band _____

Topics Specific to Boron Concentration Control (**Shiftly**)

- ☐ Flow Path (VCT or charging pump suction)
- ☐ Amount to be added
- ☐ Volume Control Tank inventory management (as required)
- ☐ Ion Exchanger vs RCS boron concentration differences (delithiations)
- ☐ Expected Annunciators (M-26 for dilutions, N-40 for borations, M-2 for diverting)

Topics for Dropped CEA Recovery (Calculation on page 2, **1st day of shift rotation**)

- ☐ RCS Boron increase required for worst case dropped CEA _____ ppm
- ☐ Amount of Boric Acid required _____ gal
- ☐ Required Boration Flowrate required for CEA recovery _____ gpm
- ☐ Contingencies for dropped/misaligned CEA

Topics for Power Maneuvers (Profile for 100-92% at 10 mw shall be reviewed shiftly)

- ☐ Reactor Engineering predictions for borations/dilutions during power maneuver
- ☐ Turbine Ramp Rate
- ☐ ASI change anticipation
- ☐ Expected dilution/boration to support stabilization

Topics Specific to CEA Control (required for planned CEA movement)

- ☐ Group height vs reactivity effect
- ☐ CEA positioning vs ASI control/effect

Topics Specific to Turbine Control (required for planned maneuvers)

- ☐ Ovation Controls setup (Target, Rate)
- ☐ Tavg / Tref bands

Brief Closure (**Shiftly**)

- ☐ Review Roles and Responsibilities
- ☐ Critical Steps
- ☐ Contingencies
- ☐ Any Questions

Briefing Sheet 1
Reactivity Management
(Page 2 of 2)

Determine the initial Boration Rate necessary to recover a dropped rod (taking at least 10 minutes per 1/2-AOP-66.01 as follows:

1. Calculate the RCS Boron concentration increase required (equivalent to the worth of the dropped rod):

   $\frac{\text{Worst Case Dropped Rod Worth (Physics Curve Book B.4)}}{\text{HFP Boron Worth (Physics Curve Book C.1)}}$ = _____ pcm / pcm/ppm

   RCS Boron concentration increase required = _____ ppm

2. Calculate the amount of boric acid needed from the selected BAMT:

   Amount of boric acid needed = $V_{BAMT} = V_{RCS} \times \ln\left(\frac{Cb_{BAMT} - Cb_{RCSi}}{Cb_{BAMT} - Cb_{RCSf}}\right)$

   Unit 1 V_{RCS} = 62,500 gallons @ NOP NOT

   Unit 2 V_{RCS} = 66,891 gallons @ NOP NOT

   Amount of boric acid needed = _____ gallons

3. Calculate the initial Boration Rate necessary to recover the dropped rod:

   Boration Rate = $\frac{\text{Amount of boric acid needed}}{\text{(at least) 10 minutes}}$ = _____ gpm

DAILY CHEMISTRY REPORT

ST. LUCIE UNIT # 1

PRIMARY CHEMISTRY

DATE: 10/1/2018

	REACTOR COOLANT SYSTEM									
Parameter	**Boron**	**Lithium**	**Chloride**	**Fluoride**	**Oxygen**	**Gross Act.**	**DEQ I-131**	**DEQ Xe-133**	**Hydrogen**	**Surge Boron**
Units	*ppm*	*ppm*	*ppb*	*ppb*	*ppb*	*uci/ml*	*uci/ml*	*uCi/ml*	*cc/kg*	*ppm*
Limits	See COP-05.04 for limits									
Result	**843**	**3.37**	**3.26**	**0.82**	**< 5**	**1.59E-01**	**2.09E-04**	**0.22**	**44.45**	**848**
Date	**9/30/2018**	**9/30/2018**	**9/30/2018**	**9/30/2018**	**9/30/2018**	**9/30/2018**	**9/30/2018**	**9/26/2018**	**9/30/2018**	**9/26/2018**

RCS Boron Sample Time: 19:40 I-131 = 7.32E-05 I-134 = 1.87E-03 Iodine Sample Date: 9/30/2018
Zinc Pump Stroke: 3.00 Iodine Ratio = **1.24E-01** Xe Ratio = **0.70** Chg. Pmp. 1
* Xe Ratio >1.0 should be investigated for potential fuel defect

	RWST		SFP		BAMT'S		SIT'S			
Parameter	**Boron**	**Silica**	**Boron**	**Silica**	**A Boron**	**B Boron**	**1A1**	**1A2**	**1B1**	**1B2**
Units	*ppm*	*ppb*	*ppm*	*ppb*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*
Limits	See COP-05.04 for limits									
Result	**2177**	**No Data**	**2206**	**No Data**	**5870**	**5776**	**2101**	**2102**	**2099**	**2097**
Date	**9/24/2018**	**No Data**	**9/27/2018**	**No Data**	**9/30/2018**	**9/30/2018**	**9/7/2018**	**9/7/2018**	**9/7/2018**	**9/7/2018**
Time	9:00 AM						9:00 AM	9:00 AM	9:00 AM	9:00 AM

SECONDARY CHEMISTRY

	STEAM GENERATORS						
Parameter	Chloride	Fluoride	Sulfate	Cation Conductivity	Sodium	Gross Act	B/D Rate
Units	*ppb*	*ppb*	*ppb*	*umhos/cm*	*ppb*	*uci/ml*	*GPM*
Limits	See COP-05.04 for limits						
1A Result	**0.84**	**0.21**	**0.90**	**0.39**	**0.39**	**< 9.770E-07**	**40**
Date	9/30/2018	9/30/2018	9/30/2018	9/30/2018	9/30/2018	10/1/2018	10/1/2018
1B Result	**0.75**	**0.28**	**0.99**	**0.44**	**0.44**	**< 9.77E-07**	**40**
Date	9/30/2018	9/30/2018	9/30/2018	9/30/2018	9/30/2018	10/1/2018	10/1/2018

	CONDENSATE		FEED			
Parameter	Cation Conductivity	Diss. O2	pH	Ammonia	Iron	Copper
Units	*umhos/cm*	*ppb*		*ppm*	*ppb*	*ppb*
Limits	See COP-05.04 for limits					
Result	**0.20**	**15.00**	**10.04**	**17.35**	**0.50**	**0.010**
Date	9/30/2018	9/30/2018	9/30/2018	9/30/2018	9/26/2018	9/26/2018

Unit 1 Projected Steam Generator Leak Rate Calculations(Info Only)

Using the Air Ejector Monitor

Leakrate	**Projected Reading**	
5 gpd =	**68**	*cpm*
30 gpd =	**309**	*cpm*
75 gpd =	**742**	*cpm*
100 gpd =	**982**	*cpm*
150 gpd =	**1464**	*cpm*
1 GPM =	**13881**	*cpm*
Current =	**<1**	*gpd*

Air Ejector Set Point Basis:
Alert: 2X Average Background
High: 3X Average Background

Using the Blow Down Monitors

Leakrate	**Projected Reading**		
	A S/G	**B S/G**	
5 gpd =	**205**	**256**	*cpm*
30 gpd =	**428**	**753**	*cpm*
75 gpd =	**831**	**1647**	*cpm*
100 gpd =	**1054**	**2144**	*cpm*
150 gpd =	**1501**	**3137**	*cpm*
1 GPM =	**13034**	**28767**	*cpm*
Current =	**<1**	**<1**	*gpd*

Blow Down Set Point Basis:
Alert: 2X Average Background

FLORIDA POWER & LIGHT CO.

Nuclear Fuel
Nuclear Engineering Department

St. Lucie Unit 1 Cycle 28 Operation Data for the Nuclear Design Report

Engineering Evaluation

PSL-ENG-SEFJ-18-001
Revision 0

Quality Related

REVIEW AND APPROVAL RECORD

PLANT: PSL **UNIT:** 1

TITLE: St. Lucie Unit 1 Cycle 28 Operation Data for the Nuclear Design Report

SAFETY CLASSIFICATION: Quality Related

LEAD DISCIPLINE: Nuclear Fuel

ENGINEERING ORGANIZATION: Nuclear Engineering

REVIEW/APPROVAL:
NOTE: NAMS EC Milestones 101 through 199 may be used instead of signing below.

GROUP	INTERFACE TYPE			PREPARED	VERIFIED	APPROVED	FPL/NextEra APPROVED*
	INPUT	REVIEW	N/A				
MECH			X				
ELECT			X				
I&C			X				
CIVIL			X				
CSI			X				
NUC FUEL	X			See EC Milestones	See EC Milestones	See EC Milestones	N/A

* For Contractor Evals As Determined By Engineering Manager

FPL/NextEra ENGINEERING MANAGER APPROVAL: See EC Milestones **DATE:** See EC Milestones

OTHER INTERFACES

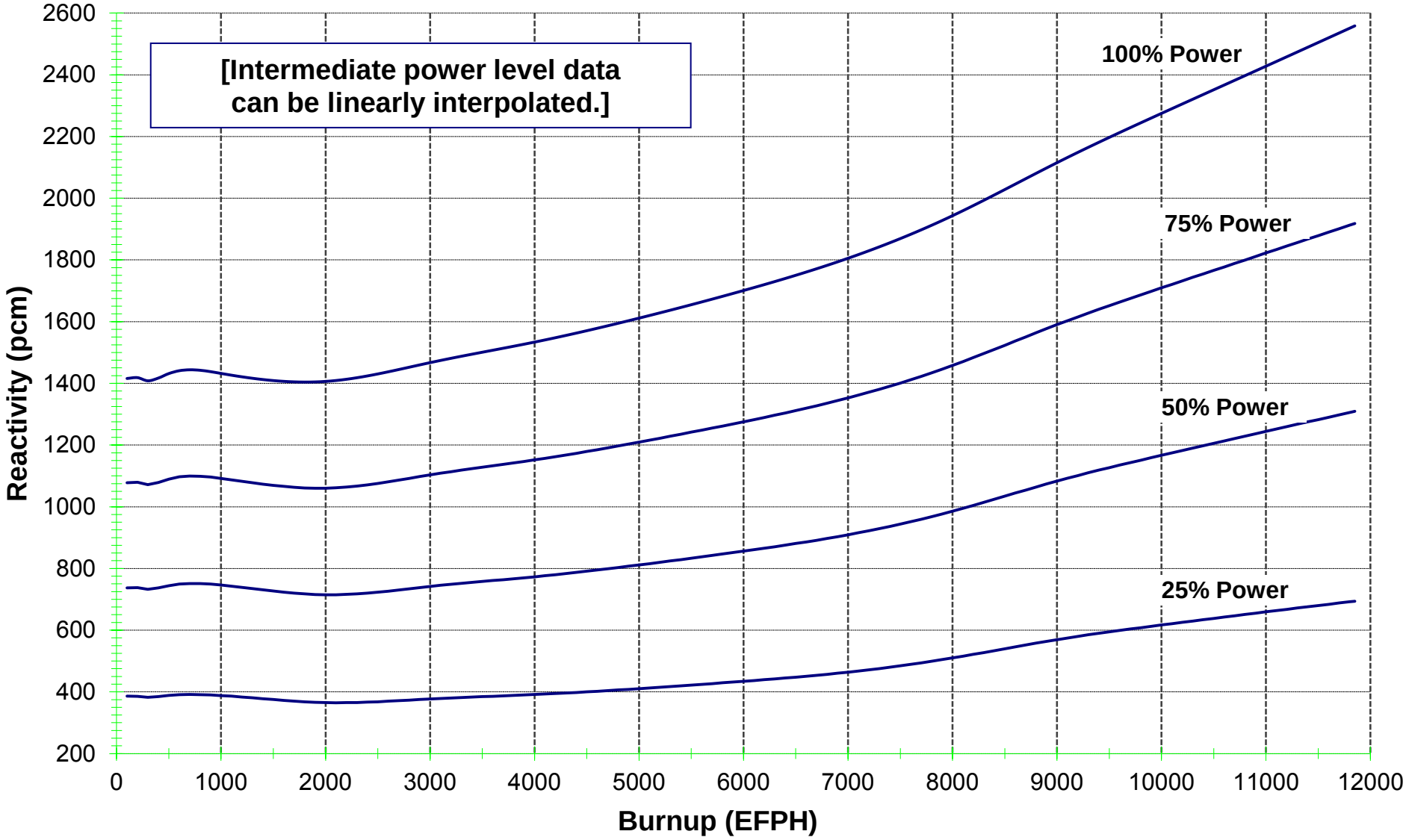
TABLE OF CONTENTS

Attachment 1 (continued)

Attachment 1

St. Lucie Unit 1 Cycle 28 Nuclear Design Report

Figure A.1 Rev. 1
St. Lucie Unit 1 Cycle 28
Power Defect vs Burnup



Date Of Update
____/____/____

Reference: PSL-1FJF-18-003 Rev. 0, Attachment 1 Page 2

Figure A.1 Rev. 1
Page 1 of 4

St. Lucie Unit 1 Cycle 28

Power Defect (pcm) vs Burnup (EFPH)

EFPH	100%	75%	50%	25%
100	1416	1078	737	386
200	1419	1079	738	385
300	1408	1072	733	383
400	1417	1079	737	385
500	1432	1090	744	388
600	1441	1097	749	391
700	1444	1100	751	392
800	1442	1099	751	391
900	1438	1096	749	390
1000	1432	1092	746	388
1100	1426	1087	743	386
1200	1421	1082	739	383
1300	1416	1078	735	381
1400	1412	1073	731	378
1500	1409	1069	727	375
1600	1406	1066	723	372
1700	1405	1063	720	370
1800	1404	1061	718	368
1900	1405	1060	716	366
2000	1406	1060	715	365
2100	1409	1061	715	365
2200	1413	1064	716	365
2300	1418	1067	718	366
2400	1424	1071	720	367
2500	1430	1076	723	368
2600	1437	1081	727	370
2700	1445	1086	730	371
2800	1452	1092	734	373
2900	1460	1098	738	375
3000	1467	1103	742	377
3100	1474	1109	745	379

[Intermediate power level data can be linearly interpolated.]

Reference: PSL-1FJF-18-003 Rev. 0, Attachment 1 Page 3

Figure A.1 Rev. 1
Page 2 of 4

St. Lucie Unit 1 Cycle 28

Power Defect (pcm) vs Burnup (EFPH)

EFPH	100%	75%	50%	25%
3200	1481	1114	749	380
3300	1488	1119	752	382
3400	1494	1123	755	383
3500	1501	1128	758	385
3600	1507	1133	761	386
3700	1514	1137	764	387
3800	1520	1142	767	389
3900	1527	1147	770	390
4000	1534	1152	773	391
4100	1541	1157	776	393
4200	1548	1162	780	395
4300	1555	1168	783	396
4400	1563	1173	787	398
4500	1571	1179	791	400
4600	1579	1185	795	402
4700	1587	1191	799	404
4800	1595	1197	803	406
4900	1603	1203	807	408
5000	1611	1210	811	411
5100	1620	1216	816	413
5200	1628	1222	820	415
5300	1637	1229	824	417
5400	1646	1235	829	420
5500	1655	1242	833	422
5600	1664	1248	838	424
5700	1673	1255	842	427
5800	1682	1262	847	429
5900	1691	1268	851	432
6000	1701	1275	856	434
6100	1710	1282	861	437
6200	1720	1289	866	439

[Intermediate power level data can be linearly interpolated.]

Reference: PSL-1FJF-18-003 Rev. 0, Attachment 1 Page 4

Figure A.1 Rev. 1

Page 3 of 4

St. Lucie Unit 1 Cycle 28

Power Defect (pcm) vs Burnup (EFPH)

EFPH	100%	75%	50%	25%
6300	1730	1297	871	442
6400	1740	1304	876	445
6500	1750	1312	881	448
6600	1761	1319	886	451
6700	1771	1327	892	454
6800	1782	1336	897	457
6900	1794	1344	903	460
7000	1805	1353	909	464
7100	1817	1362	916	468
7200	1830	1371	922	472
7300	1842	1381	929	476
7400	1856	1391	936	480
7500	1869	1401	944	484
7600	1883	1412	952	489
7700	1897	1423	960	494
7800	1912	1434	968	499
7900	1928	1446	977	504
8000	1943	1458	986	510
8100	1960	1470	995	516
8200	1976	1483	1005	522
8300	1993	1497	1014	528
8400	2011	1510	1024	534
8500	2028	1523	1034	540
8600	2046	1537	1044	546
8700	2063	1550	1054	552
8800	2081	1564	1064	558
8900	2098	1577	1074	564
9000	2115	1590	1083	569
9100	2132	1603	1092	575
9200	2149	1616	1101	580
9300	2165	1628	1110	585
9400	2181	1640	1119	590

[Intermediate power level data can be linearly interpolated.]

Reference: PSL-1FJF-18-003 Rev. 0, Attachment 1 Page 5

Figure A.1 Rev. 1

Page 4 of 4

St. Lucie Unit 1 Cycle 28

Power Defect (pcm) vs Burnup (EFPH)

EFPH	100%	75%	50%	25%
9500	2197	1652	1127	595
9600	2213	1664	1135	599
9700	2229	1675	1143	604
9800	2244	1687	1151	608
9900	2260	1698	1159	612
10000	2275	1710	1167	617
10100	2290	1721	1175	621
10200	2306	1732	1182	625
10300	2321	1744	1190	630
10400	2336	1755	1198	634
10500	2352	1766	1206	638
10600	2367	1777	1213	642
10700	2382	1789	1221	647
10800	2397	1800	1229	651
10900	2413	1811	1237	655
11000	2428	1823	1244	659
11100	2443	1834	1252	663
11200	2459	1845	1260	668
11300	2474	1856	1267	672
11400	2489	1868	1275	676
11500	2505	1879	1283	680
11600	2520	1890	1290	684
11700	2536	1901	1298	688
11800	2551	1913	1306	692
11850	2559	1918	1309	694

[Intermediate power level data can be linearly interpolated.]

Figure A.2 - 5000 EFPH Rev. 4
St. Lucie Unit 1 Cycle 28
Xenon Buildup to Equilibrium

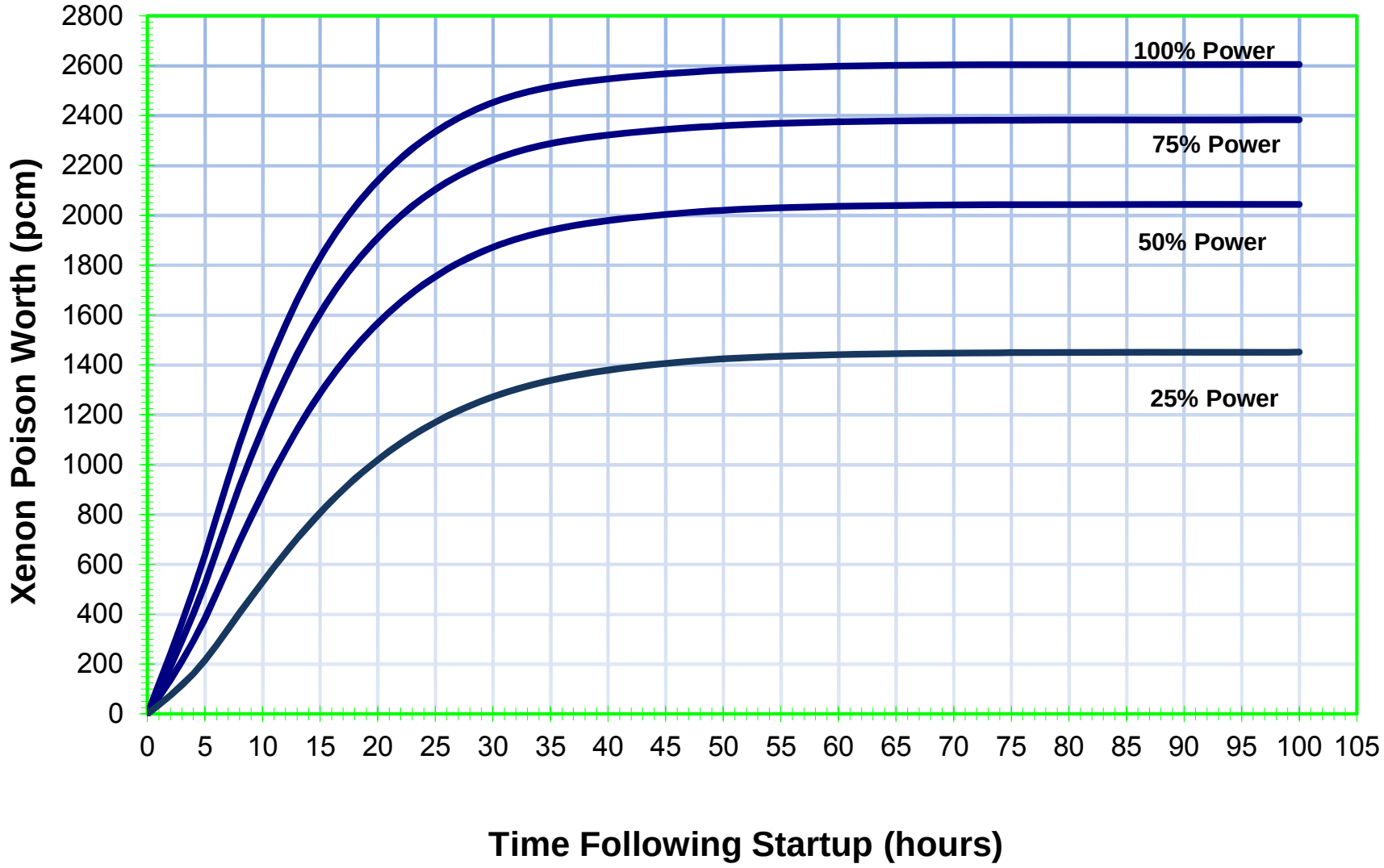


Figure A.2 Rev. 4

Page 1 of 3

St. Lucie Unit 1 Cycle 28

Xenon Buildup to Equilibrium (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
0	0	0	0	0
1	119	94	67	36
2	240	191	137	74
3	365	293	211	115
4	498	402	293	162
5	639	522	383	215
6	789	652	483	276
7	940	785	588	340
8	1082	912	690	404
9	1215	1031	789	467
10	1339	1144	884	529
11	1454	1250	974	589
12	1560	1349	1059	647
13	1658	1442	1140	703
14	1748	1528	1216	756
15	1830	1607	1287	807
16	1904	1679	1352	855
17	1972	1745	1413	900
18	2033	1804	1468	942
19	2088	1859	1520	982
20	2139	1909	1567	1019
21	2186	1955	1611	1054
22	2228	1997	1651	1086
23	2267	2036	1689	1116
24	2303	2071	1723	1144
25	2335	2104	1754	1170
26	2364	2133	1782	1194
27	2390	2159	1808	1216
28	2413	2182	1832	1236
29	2434	2204	1853	1255
30	2452	2222	1872	1272
31	2468	2239	1889	1288
32	2483	2254	1904	1302
33	2495	2267	1918	1315

Reference: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 14

Figure A.2 Rev. 4
Page 2 of 3

St. Lucie Unit 1 Cycle 28

Xenon Buildup to Equilibrium (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
34	2506	2278	1930	1327
35	2515	2288	1941	1338
36	2523	2296	1950	1348
37	2530	2304	1958	1357
38	2536	2311	1966	1365
39	2542	2317	1973	1372
40	2547	2322	1979	1379
41	2552	2327	1985	1385
42	2556	2332	1990	1391
43	2560	2336	1995	1397
44	2564	2340	2000	1402
45	2568	2344	2004	1406
46	2571	2348	2008	1411
47	2574	2351	2011	1414
48	2577	2354	2015	1418
49	2580	2357	2018	1421
50	2582	2359	2020	1424
51	2585	2362	2023	1427
52	2587	2364	2025	1429
53	2589	2366	2027	1431
54	2590	2367	2029	1433
55	2592	2369	2030	1435
56	2593	2370	2032	1436
57	2595	2372	2033	1438
58	2596	2373	2034	1439
59	2597	2374	2035	1440
60	2598	2375	2036	1441
61	2599	2376	2037	1442
62	2600	2377	2038	1443
63	2600	2377	2038	1444
64	2601	2378	2039	1444
65	2602	2379	2040	1445
66	2602	2379	2040	1446
67	2602	2380	2040	1446

Reference: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 15

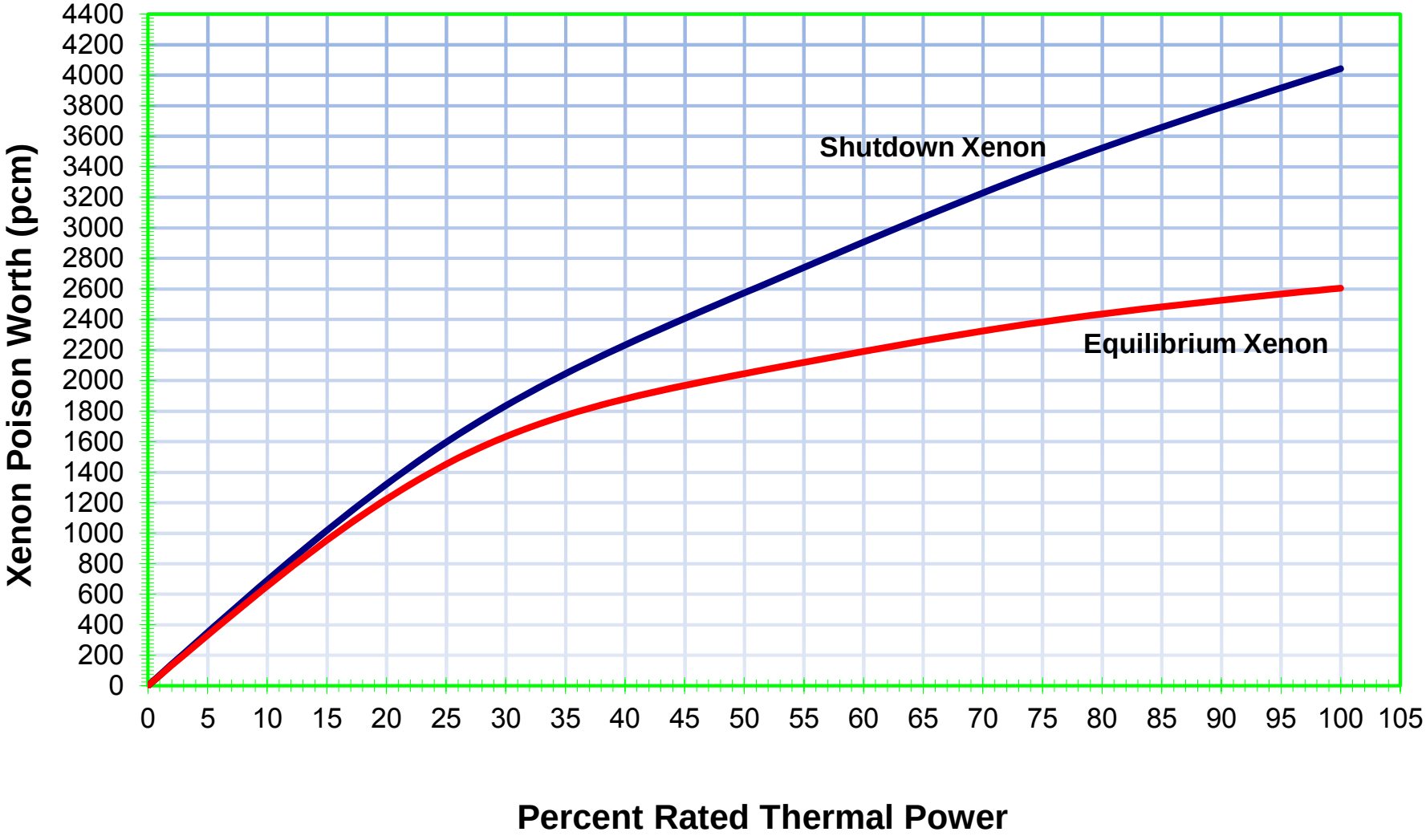
Figure A.2 Rev. 4
Page 3 of 3

St. Lucie Unit 1 Cycle 28

Xenon Buildup to Equilibrium (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
68	2603	2380	2041	1447
69	2603	2380	2041	1447
70	2603	2381	2042	1448
71	2603	2381	2042	1448
72	2604	2381	2042	1448
73	2604	2381	2042	1449
74	2604	2381	2042	1449
75	2604	2382	2043	1449
76	2604	2382	2043	1449
77	2604	2382	2043	1450
78	2604	2382	2043	1450
79	2604	2382	2043	1450
80	2604	2382	2043	1450
81	2604	2382	2043	1450
82	2604	2382	2043	1450
83	2604	2382	2043	1450
84	2604	2382	2043	1450
85	2604	2382	2043	1451
86	2604	2382	2043	1451
87	2604	2382	2043	1451
88	2604	2382	2043	1451
89	2604	2382	2044	1451
90	2604	2383	2044	1451
91	2604	2383	2044	1451
92	2604	2383	2044	1451
93	2605	2383	2044	1451
94	2605	2383	2044	1451
95	2605	2383	2044	1451
96	2605	2383	2044	1451
97	2605	2383	2044	1451
98	2605	2383	2044	1451
99	2605	2383	2044	1451
100	2605	2383	2044	1451

Figure A.3 - 5000 EFPH Rev. 4
St. Lucie Unit 1 Cycle 28
Xenon Worth vs. Reactor Power (SD and EQ)



Date Of Update
____/____/____

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 42

Figure A.3 Rev. 4

Page 1 of 2

St. Lucie Unit 1 Cycle 28

(5000 EFPH)

Xenon Worth vs. Reactor Power (Shutdown and Equilibrium)

(Units in pcm)

RX Power	S/D Xe	Equil Xe
0	0	0
1	70	67
2	140	133
3	210	199
4	279	265
5	349	331
6	418	397
7	487	461
8	555	526
9	623	589
10	690	652
11	757	714
12	823	775
13	888	836
14	953	895
15	1017	953
16	1080	1009
17	1141	1065
18	1202	1119
19	1262	1171
20	1321	1222
21	1378	1272
22	1434	1319
23	1489	1365
24	1543	1409
25	1595	1451
26	1646	1491
27	1695	1529
28	1743	1565
29	1789	1599

RX Power	S/D Xe	Equil Xe
30	1834	1632
31	1879	1663
32	1921	1692
33	1963	1720
34	2004	1746
35	2044	1771
36	2083	1795
37	2122	1818
38	2159	1839
39	2196	1860
40	2232	1880
41	2268	1899
42	2303	1917
43	2338	1934
44	2372	1951
45	2406	1967
46	2440	1983
47	2473	1999
48	2507	2014
49	2540	2029
50	2573	2044
51	2607	2059
52	2640	2074
53	2673	2089
54	2707	2103
55	2740	2118
56	2774	2133
57	2807	2147
58	2840	2162
59	2873	2176

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 43

Figure A.3 Rev. 4

Page 2 of 2

St. Lucie Unit 1 Cycle 28

(5000 EFPH)

Xenon Worth vs. Reactor Power (Shutdown and Equilibrium)

(Units in pcm)

RX Power	S/D Xe	Equil Xe
60	2907	2190
61	2939	2204
62	2972	2218
63	3005	2232
64	3038	2246
65	3070	2259
66	3102	2273
67	3134	2286
68	3166	2299
69	3197	2311
70	3228	2324
71	3259	2336
72	3290	2348
73	3320	2360
74	3350	2372
75	3380	2383
76	3409	2394
77	3438	2405
78	3467	2415
79	3495	2426
80	3523	2436
81	3551	2445
82	3578	2455
83	3606	2464
84	3632	2474
85	3659	2483
86	3686	2492
87	3712	2500
88	3738	2509
89	3764	2517

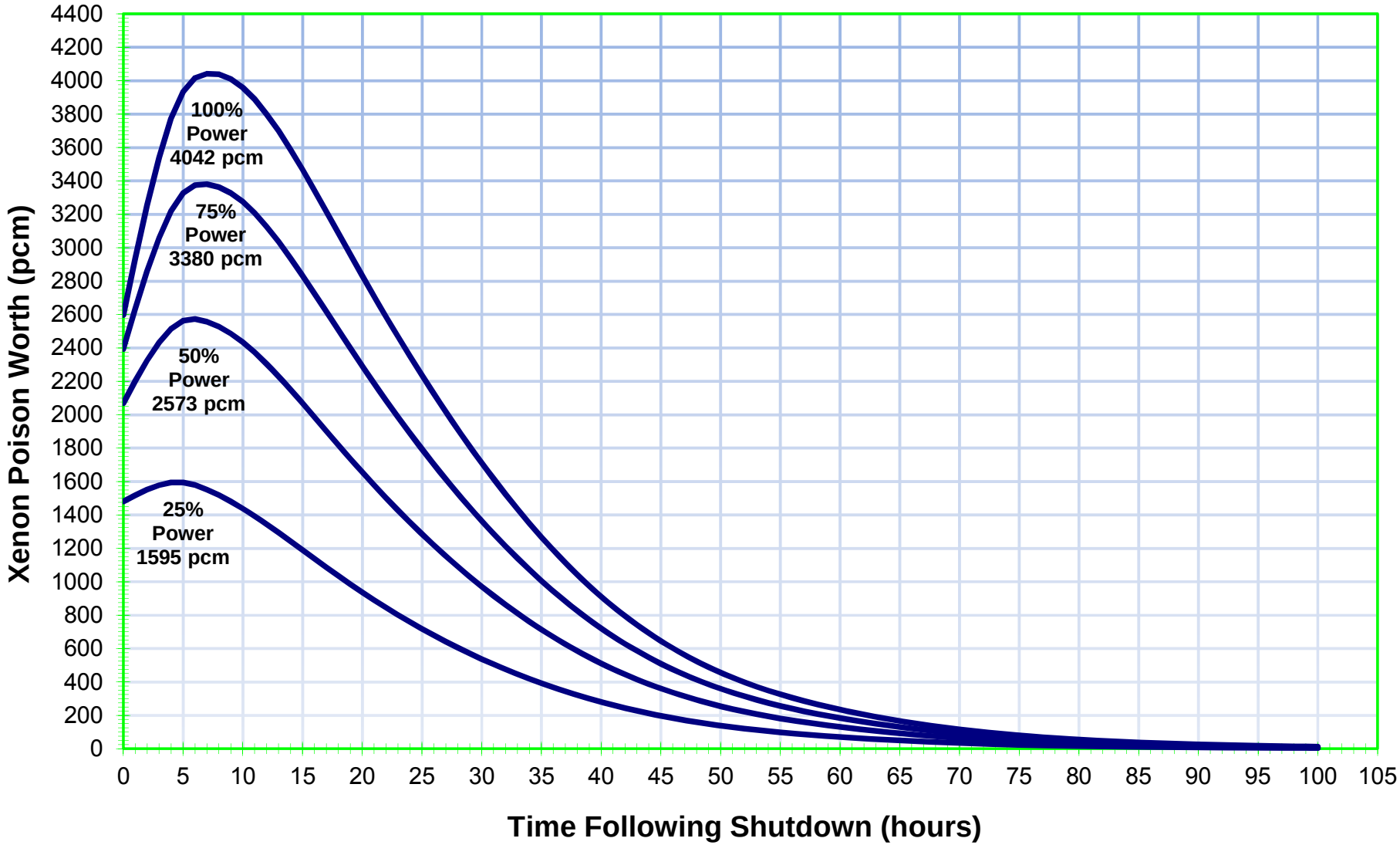
RX Power	S/D Xe	Equil Xe
90	3790	2526
91	3815	2534
92	3841	2542
93	3866	2550
94	3892	2558
95	3917	2566
96	3942	2574
97	3967	2582
98	3992	2590
99	4017	2597
100	4042	2605

Date Of Update

____/____/____

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 44

Figure A.4 5000 EFPH Rev. 4
St. Lucie Unit 1 Cycle 28
Xenon Worth Following Shutdown



Date Of Update
____/____/____

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 69

Figure A.4 Rev. 4

Page 1 of 3

St. Lucie Unit 1 Cycle 28

Xenon Worth Following Shutdown (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
0	2597	2393	2069	1480
1	2935	2633	2201	1518
2	3255	2859	2325	1552
3	3540	3059	2433	1578
4	3772	3219	2515	1594
5	3934	3327	2563	1595
6	4016	3375	2573	1579
7	4042	3380	2557	1552
8	4038	3363	2527	1518
9	4010	3328	2486	1480
10	3959	3275	2434	1438
11	3888	3208	2373	1392
12	3801	3127	2305	1344
13	3699	3036	2230	1294
14	3587	2937	2151	1242
15	3468	2833	2069	1190
16	3344	2726	1986	1138
17	3217	2617	1902	1086
18	3089	2508	1819	1035
19	2960	2399	1737	986
20	2833	2292	1656	937
21	2708	2187	1577	890
22	2586	2085	1501	845
23	2466	1985	1427	801
24	2350	1889	1355	759
25	2236	1794	1286	718
26	2125	1703	1219	679
27	2017	1614	1154	641
28	1912	1528	1091	605
29	1810	1445	1030	571
30	1712	1365	972	537
31	1616	1287	916	506
32	1524	1213	862	475
33	1435	1141	811	446

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 70

Figure A.4 Rev. 4
Page 2 of 3

St. Lucie Unit 1 Cycle 28

Xenon Worth Following Shutdown (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
34	1349	1072	761	419
35	1267	1006	714	392
36	1189	943	669	367
37	1114	883	626	344
38	1043	826	586	321
39	975	772	547	300
40	911	721	511	280
41	851	673	477	261
42	794	628	445	244
43	741	586	415	227
44	692	546	387	212
45	645	509	361	197
46	602	475	336	184
47	562	443	314	171
48	524	413	292	159
49	489	385	273	149
50	456	359	254	138
51	426	336	237	129
52	398	313	222	120
53	372	293	207	112
54	348	274	194	105
55	325	256	181	98
56	305	240	169	92
57	285	224	159	86
58	267	210	148	80
59	250	197	139	75
60	234	184	130	70
61	219	172	122	65
62	205	161	114	61
63	191	150	106	57
64	178	140	99	53
65	166	131	92	49
66	155	122	86	46
67	144	113	80	43

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 71

Figure A.4 Rev. 4
Page 3 of 3

St. Lucie Unit 1 Cycle 28

Xenon Worth Following Shutdown (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
68	134	105	74	40
69	125	98	69	37
70	116	91	64	34
71	108	85	59	32
72	100	78	55	29
73	93	73	51	27
74	86	68	47	25
75	80	63	44	23
76	74	58	41	22
77	69	54	38	20
78	64	50	35	19
79	59	46	32	17
80	55	43	30	16
81	51	40	28	15
82	47	37	26	14
83	44	34	24	13
84	41	32	22	12
85	38	29	20	11
86	35	27	19	10
87	32	25	18	9
88	30	24	16	9
89	28	22	15	8
90	26	20	14	8
91	24	19	13	7
92	22	18	12	7
93	21	17	12	6
94	19	16	11	6
95	18	14	10	6
96	17	14	9	5
97	16	13	9	5
98	14	12	8	5
99	13	11	8	4
100	12	10	7	4

Date Of Update

____/____/____

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 72

Figure A.5 - 5000 EFPH Rev. 4
St. Lucie Unit 1 Cycle 28
Shutdown Sm/Np/Transient Fission Product Worth

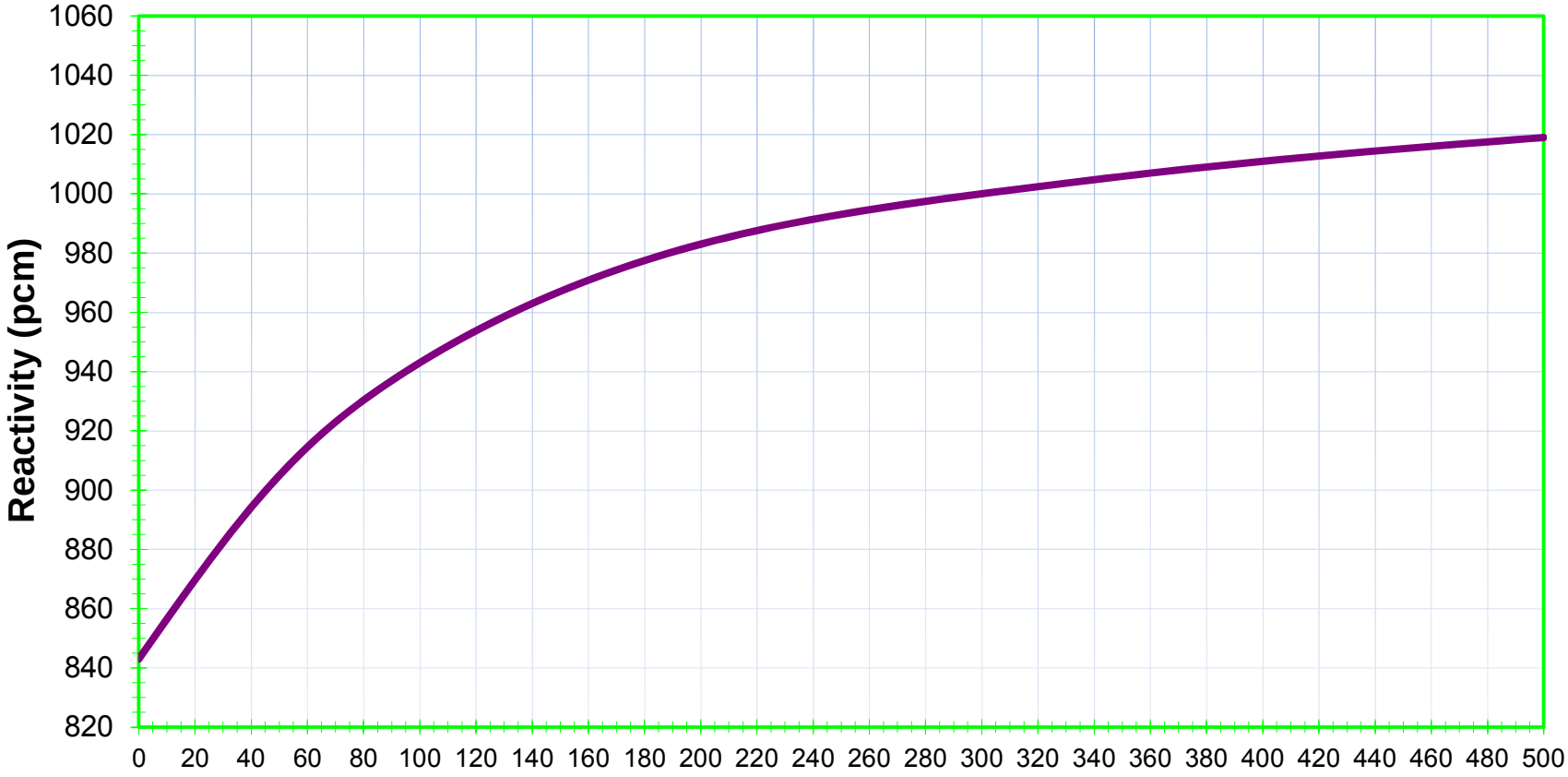


Figure A.5 Rev. 4

Page 1 of 1

St. Lucie Unit 1 Cycle 28

Sm/Np/Transient Fission Product Worth Contribution Following Shutdown

(5000 EFPH)

HOURS S/D	WORTH (PCM)
0	843
5	850
10	856
15	863
20	870
25	876
30	882
35	888
40	894
45	900
50	905
55	910
60	915
65	919
70	923
75	927
80	930
85	934
90	937
95	940
100	943
105	946
110	949
115	951
120	954
125	956
130	959
135	961
140	963
145	965
150	967
155	969
160	971
165	973
170	974

HOURS S/D	WORTH (PCM)
175	976
180	977
185	979
190	980
195	982
200	983
205	984
210	985
215	987
220	988
225	989
230	990
235	991
240	991
245	992
250	993
255	994
260	995
265	995
270	996
275	997
280	997
285	998
290	999
295	999
300	1000
305	1001
310	1001
315	1002
320	1002
325	1003
330	1004
335	1004
340	1005
345	1005

HOURS S/D	WORTH (PCM)
350	1006
355	1006
360	1007
365	1008
370	1008
375	1009
380	1009
385	1010
390	1010
395	1011
400	1011
405	1011
410	1012
415	1012
420	1013
425	1013
430	1014
435	1014
440	1014
445	1015
450	1015
455	1016
460	1016
465	1016
470	1017
475	1017
480	1018
485	1018
490	1018
495	1019
500	1019

Figure A.6 Rev. 4
St. Lucie Unit 1 Cycle 28
HZP Sequential Integral CEA Worth, 5000 EFPH

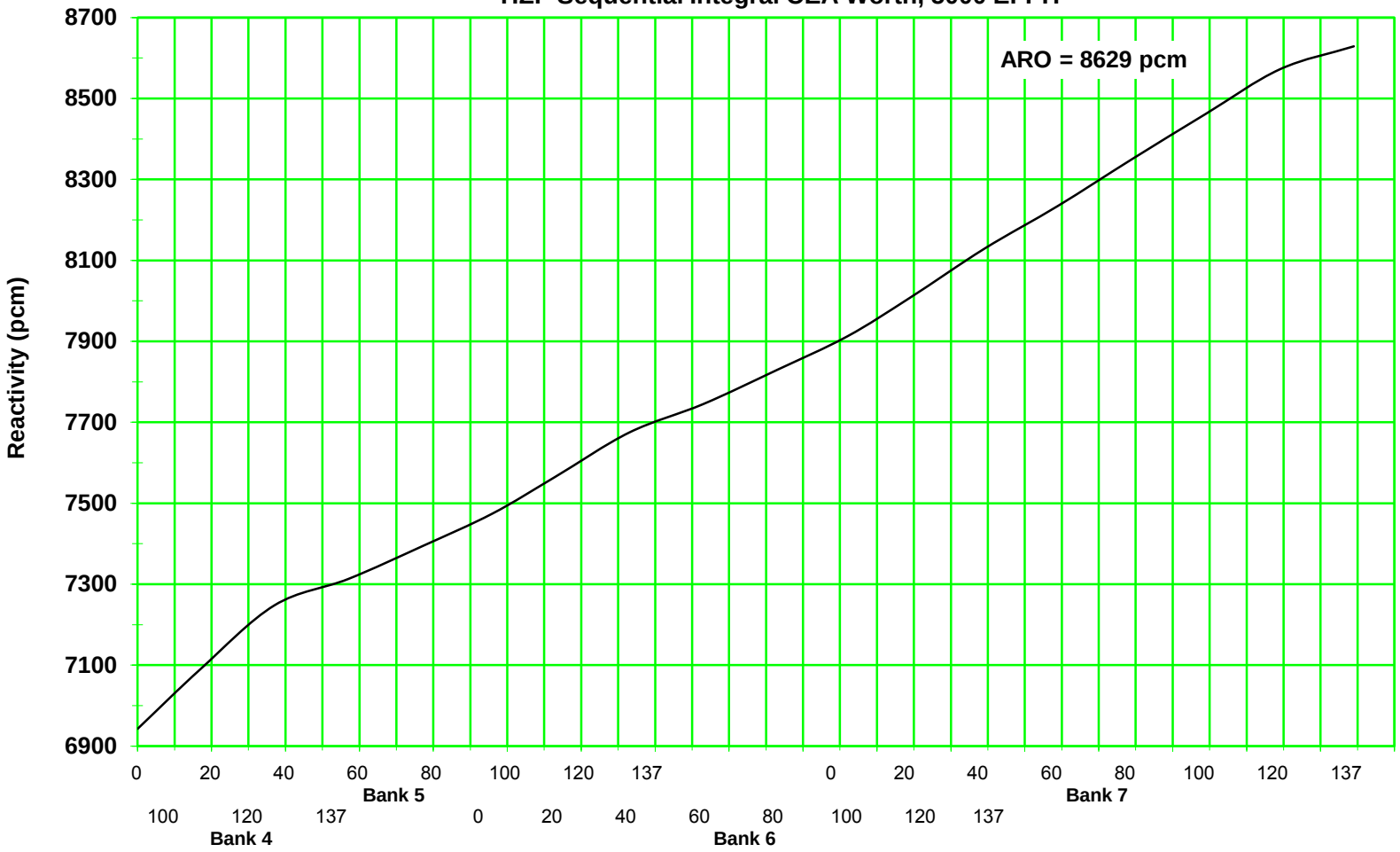
Group	Position (Inches Withdrawn)	Group	Position (Inches Withdrawn)	Integral Worth (pcm)
A	0			0
A	17			140
A	37			1261
A	57			1851
A	77			2147
A	97			2342
A	117			2540
A	137	B	0	2741
		B	17	2753
		B	37	2833
		B	57	3003
		B	77	3169
		B	97	3314
		B	117	3468
1	0	B	137	3603
1	17			3618
1	37			3683
1	57			3794
1	77			3915
1	96	2	0	4028
1	113	2	17	4224
1	133	2	37	4647
1	137	2	57	4983
		2	77	5200
3	0	2	96	5357
3	17	2	113	5514

Group	Position (Inches Withdrawn)	Group	Position (Inches Withdrawn)	Integral Worth (pcm)
3	37	2	133	5697
3	57	2	137	5754
3	77			5829
3	96	4	0	5907
3	113	4	17	6029
3	133	4	37	6304
3	137	4	57	6588
		4	77	6792
5	0	4	96	6943
5	17	4	113	7090
5	37	4	133	7248
5	57	4	137	7313
5	77			7394
5	96	6	0	7475
5	113	6	17	7565
5	133	6	37	7675
5	137	6	57	7745
		6	77	7830
7	0	6	96	7912
7	17	6	113	8008
7	37	6	133	8129
7	57	6	137	8235
7	77			8350
7	97			8462
7	117			8572
7	137			8629

Date of Update: ____ / ____ / ____

Reference: PSL-1FJF-18-007, Rev. 0, Attachment 1, Page 7

Figure A.6 Rev. 4
St. Lucie Unit 1 Cycle 28
HZP Sequential Integral CEA Worth, 5000 EFPH



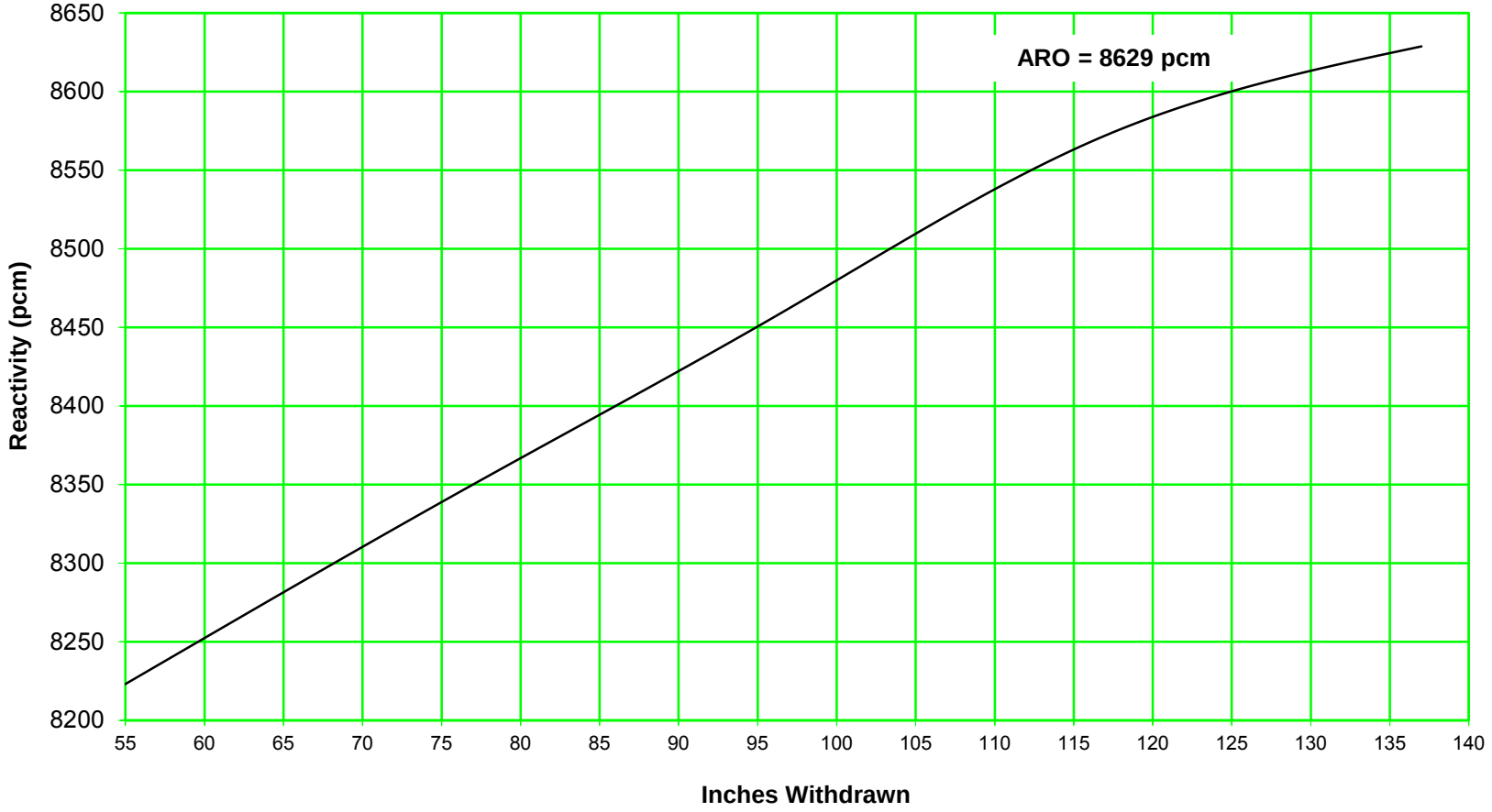
Date of Update: ____ /____ /____

Reference: PSL-1FJF-18-007, Rev. 0, Attachment 1, Page 8

Figure A.7 Rev. 4
St. Lucie Unit 1 Cycle 28
HZP Integral Worth of CEA Lead Group (55 in to ARO), 5000 EFPH

CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)
55	8223	76	8344	97	8462	118	8576
56	8229	77	8350	98	8468	119	8580
57	8235	78	8356	99	8474	120	8584
58	8241	79	8361	100	8480	121	8588
59	8246	80	8367	101	8486	122	8591
60	8252	81	8372	102	8492	123	8594
61	8258	82	8378	103	8498	124	8597
62	8264	83	8383	104	8504	125	8600
63	8270	84	8389	105	8510	126	8603
64	8276	85	8394	106	8515	127	8606
65	8281	86	8400	107	8521	128	8608
66	8287	87	8405	108	8527	129	8611
67	8293	88	8411	109	8532	130	8613
68	8299	89	8417	110	8538	131	8616
69	8305	90	8422	111	8543	132	8618
70	8310	91	8428	112	8548	133	8620
71	8316	92	8433	113	8554	134	8622
72	8322	93	8439	114	8558	135	8625
73	8328	94	8445	115	8563	136	8627
74	8333	95	8451	116	8568	137	8629
75	8339	96	8456	117	8572		

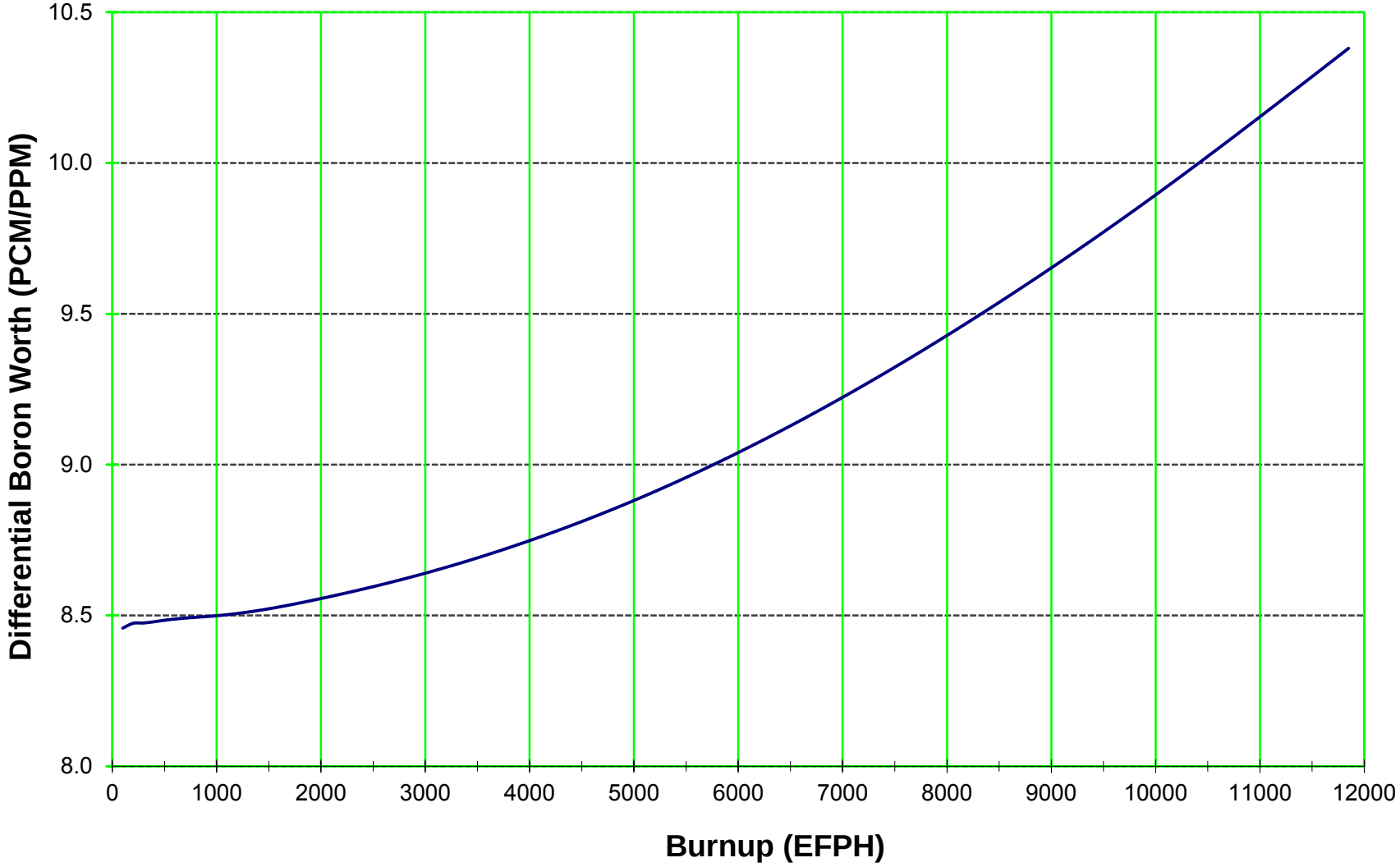
Figure A.7 Rev. 4
St. Lucie Unit 1 Cycle 28
HZP Integral Worth of CEA Lead Group (55 in to ARO), 5000 EFPH



Date of Update: _____/ _____ /_____

Reference: PSL-1FJF-18-007, Rev. 0, Attachment 1, Page 24

Figure A.8 Rev. 1
St. Lucie Unit 1 Cycle 28
HZP Differential Boron Worth vs Burnup



Date Of Update
____/____/____

Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1, Page 7

Figure A.8 Rev. 1
Page 1 of 1

St. Lucie Unit 1 Cycle 28

HZP Differential Boron Worth vs Burnup

Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)
100	8.46	3300	8.67	6500	9.13	9700	9.82
200	8.47	3400	8.68	6600	9.15	9800	9.84
300	8.47	3500	8.69	6700	9.17	9900	9.87
400	8.48	3600	8.70	6800	9.18	10000	9.89
500	8.48	3700	8.71	6900	9.20	10100	9.92
600	8.49	3800	8.72	7000	9.22	10200	9.94
700	8.49	3900	8.74	7100	9.24	10300	9.97
800	8.49	4000	8.75	7200	9.26	10400	10.00
900	8.50	4100	8.76	7300	9.28	10500	10.02
1000	8.50	4200	8.77	7400	9.30	10600	10.05
1100	8.50	4300	8.79	7500	9.32	10700	10.07
1200	8.51	4400	8.80	7600	9.34	10800	10.10
1300	8.51	4500	8.81	7700	9.36	10900	10.13
1400	8.52	4600	8.82	7800	9.39	11000	10.15
1500	8.52	4700	8.84	7900	9.41	11100	10.18
1600	8.53	4800	8.85	8000	9.43	11200	10.21
1700	8.53	4900	8.87	8100	9.45	11300	10.23
1800	8.54	5000	8.88	8200	9.47	11400	10.26
1900	8.55	5100	8.90	8300	9.49	11500	10.29
2000	8.56	5200	8.91	8400	9.52	11600	10.31
2100	8.56	5300	8.93	8500	9.54	11700	10.34
2200	8.57	5400	8.94	8600	9.56	11800	10.37
2300	8.58	5500	8.96	8700	9.58	11850	10.38
2400	8.59	5600	8.97	8800	9.61		
2500	8.60	5700	8.99	8900	9.63		
2600	8.60	5800	9.01	9000	9.65		
2700	8.61	5900	9.02	9100	9.68		
2800	8.62	6000	9.04	9200	9.70		
2900	8.63	6100	9.06	9300	9.72		
3000	8.64	6200	9.07	9400	9.75		
3100	8.65	6300	9.09	9500	9.77		
3200	8.66	6400	9.11	9600	9.79		

Date Of Update
___/___/___

Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1, Page 8

Figure A.9 Rev. 4

Page 1 of 2

St. Lucie Unit 1 Cycle 28

Inverse Count Rate Ratio Data Sheet

5000 EFPH

Date: ___/___/___ Time of Completion: _____ EFPH _____

Initial Power (%) or Count Rate (CPS):

Count	Count Time (sec)	Channel _____	Channel _____
1	120		
2	120		
3	120		
Total Counts --->			
Avg Counts (Total/3)-->			**(Base Counts)**

Estimated Critical CEA Position: Group _____ at _____ Inches W/D

Actual Critical CEA Position: Group _____ at _____ Inches W/D

(Filled in at time of use)

SUGGESTED CEA HEIGHT		**ACTUAL HEIGHT**		**% POWER or COUNT RATE**		**ICRR**	
Group	Inches	Group	Inches	CH ____	CH ____	CH ____	CH ____
1	**3**			Base Count	Base Count	1.0	1.0
1	**119**						
2	**68**						
3	**83**						
4	**59**						
5	**68**						
6	**71**						
7	**60**						
7	**ARO**						

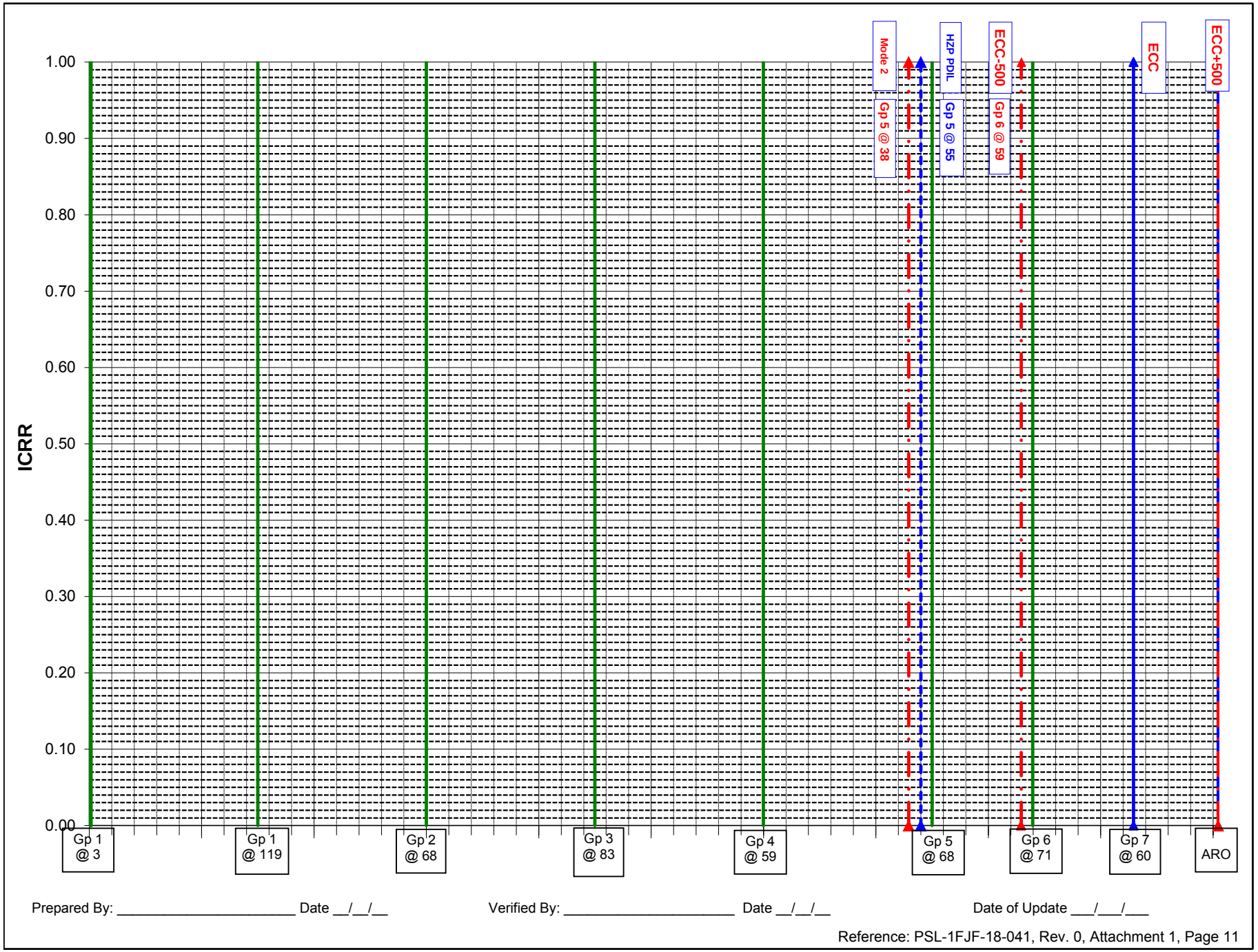
COMPLETED BY: _____ REVIEWED BY: _____

Date of Update: ___/___/___

Figure A.9 Rev. 4 (page 2 of 2)
St. Lucie Unit 1, Cycle 28, 5000 EFPH
Inverse Count Rate Ratio Plot Sheet

Startup # _____ **EFPH:** _____

CH.____ RED CH.____ BLK



Prepared By: _____ Date __/__/__

Verified By: _____ Date __/__/__

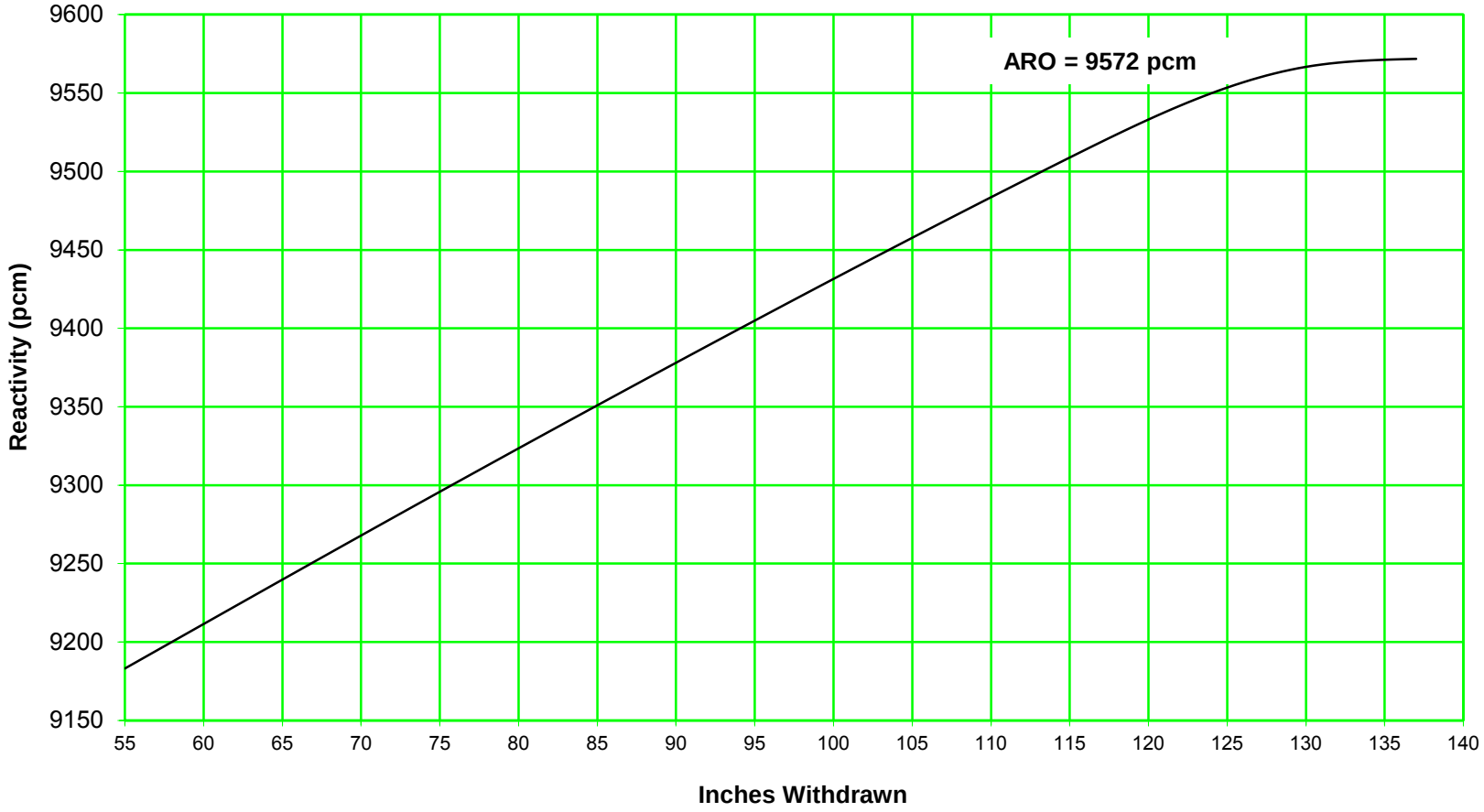
Date of Update ___/___/___

Reference: PSL-1FJF-18-041, Rev. 0, Attachment 1, Page 11

Figure A.10 Rev. 4
St. Lucie Unit 1 Cycle 28
HFP Integral Worth of CEA Lead Group (55 in to ARO), 5000 EFPH

CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)
55	9183	76	9301	97	9416	118	9524
56	9189	77	9307	98	9421	119	9528
57	9194	78	9312	99	9426	120	9533
58	9200	79	9318	100	9432	121	9538
59	9206	80	9323	101	9437	122	9542
60	9211	81	9329	102	9442	123	9546
61	9217	82	9334	103	9447	124	9550
62	9223	83	9340	104	9453	125	9553
63	9228	84	9345	105	9458	126	9557
64	9234	85	9351	106	9463	127	9560
65	9240	86	9356	107	9468	128	9562
66	9245	87	9362	108	9473	129	9565
67	9251	88	9367	109	9478	130	9567
68	9257	89	9373	110	9484	131	9568
69	9262	90	9378	111	9489	132	9569
70	9268	91	9383	112	9494	133	9570
71	9274	92	9389	113	9499	134	9571
72	9279	93	9394	114	9504	135	9571
73	9285	94	9400	115	9509	136	9572
74	9290	95	9405	116	9514	137	9572
75	9296	96	9410	117	9519		

Figure A.10 Rev. 4
St. Lucie Unit 1 Cycle 28
HFP Integral Worth of CEA Lead Group (55 in to ARO), 5000 EFPH



Date of Update: _____/ _____ /_____

Reference: PSL-1FJF-18-007, Rev. 0, Attachment 1, Page 40

Figure B.4

St. Lucie Unit 1 Cycle 28

CEA Total Worth
(5000 EFPH, Rev. 4)

CEA TOTAL WORTH

● HZP All Rods In to All Rods Out	=	8629 pcm

STUCK CEA INFORMATION

● Single Worst Stuck CEA Worth [Location: C5, D6 Dual (1)]	=	1192 pcm
● Combined First and Second Worst Stuck CEA Worth [Locations: C5, D6 Dual and D4 (1)]	=	2743 pcm
● Difference Between Worst and Second Worst Stuck CEA Worth (2)	=	1513 pcm

DROPPED CEA INFORMATION

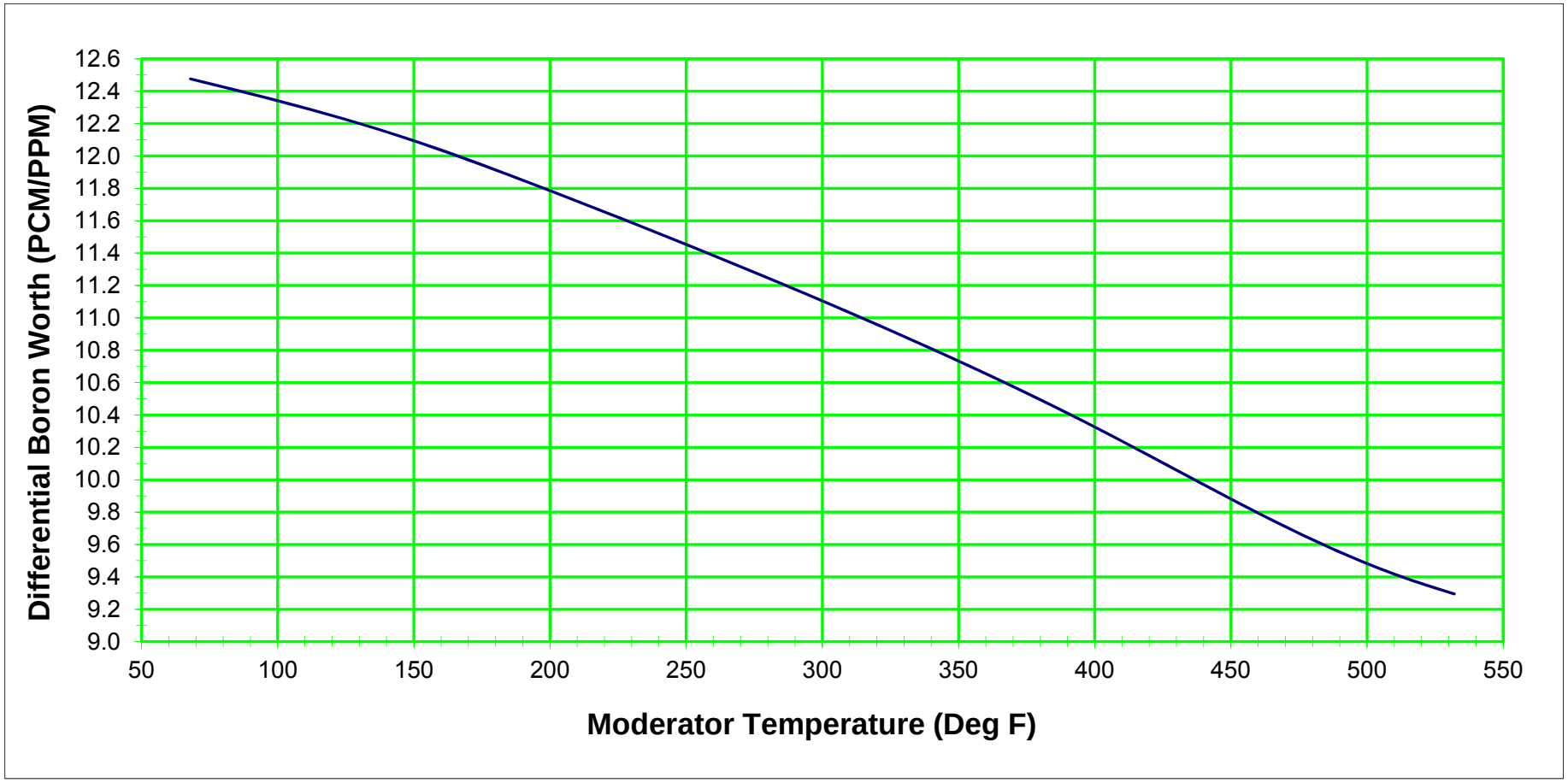
● Highest Single Dropped CEA Worth [Location: G7, J9 Dual (1)]	=	172 pcm

(1) Symmetric locations are also applicable. The CEA worth provided is the minimum of the worst stuck rods at the burnup for all temperatures to be used as a CEA credit if all rods are verified to be in. The maximum stuck rod worth may be higher.

(2) This is the maximum difference over all temperature conditions and may not be equivalent to the delta between the single and combined worths listed on this sheet.

Figure B.5 Rev. 4
St. Lucie Unit 1 Cycle 28

Differential Boron Worth vs RCS Temp.
(5000 EFPH, No Xenon, ARI Minus Worst Stuck CEA)



Date of Update
____/____/____

References: PSL-1FJF-18-004, Rev. 0, Attach. 1 Page 8

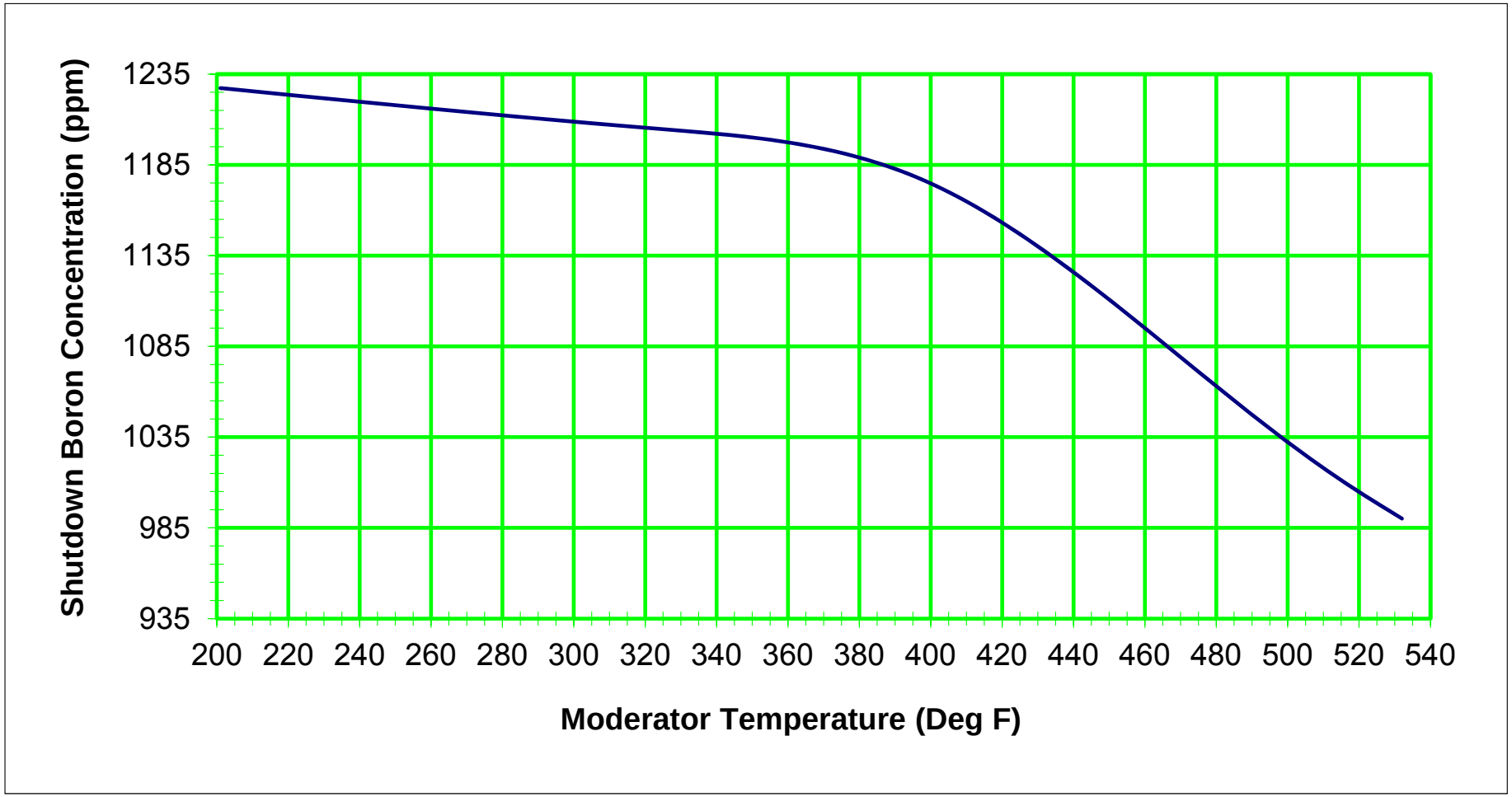
Figure B.5 Rev. 4
Page 1 of 1

St. Lucie Unit 1 Cycle 28
(5000 EFPH)
Differential Boron Worth vs Moderator Temperature
(No Xenon, ARI Minus Worst Stuck CEA)

RCS Temp. (^oF)	Boron Worth (pcm/ppm)	RCS Temp. (^oF)	Boron Worth (pcm/ppm)	RCS Temp. (^oF)	Boron Worth (pcm/ppm)	RCS Temp. (^oF)	Boron Worth (pcm/ppm)
68	12.48	188	11.86	308	11.05	428	10.08
72	12.46	192	11.84	312	11.02	432	10.04
76	12.44	196	11.81	316	10.99	436	10.01
80	12.43	200	11.79	320	10.96	440	9.97
84	12.41	204	11.76	324	10.93	444	9.93
88	12.39	208	11.73	328	10.90	448	9.90
92	12.38	212	11.71	332	10.87	452	9.86
96	12.36	216	11.68	336	10.84	456	9.83
100	12.34	220	11.65	340	10.81	460	9.79
104	12.32	224	11.63	344	10.78	464	9.76
108	12.31	228	11.60	348	10.75	468	9.73
112	12.29	232	11.57	352	10.72	472	9.69
116	12.27	236	11.55	356	10.69	476	9.66
120	12.25	240	11.52	360	10.66	480	9.63
124	12.23	244	11.49	364	10.62	484	9.60
128	12.21	248	11.47	368	10.59	488	9.57
132	12.19	252	11.44	372	10.56	492	9.54
136	12.17	256	11.41	376	10.53	496	9.51
140	12.15	260	11.39	380	10.49	500	9.48
144	12.13	264	11.36	384	10.46	504	9.46
148	12.11	268	11.33	388	10.43	508	9.43
152	12.08	272	11.30	392	10.39	512	9.40
156	12.06	276	11.27	396	10.36	516	9.38
160	12.04	280	11.25	400	10.33	520	9.36
164	12.01	284	11.22	404	10.29	524	9.34
168	11.99	288	11.19	408	10.26	528	9.32
172	11.96	292	11.16	412	10.22	532	9.30
176	11.94	296	11.13	416	10.19		
180	11.91	300	11.10	420	10.15		
184	11.89	304	11.08	424	10.11		

Figure B.6 Rev. 4
St. Lucie Unit 1 Cycle 28
Shutdown Boron Concentration vs RCS Temp.
Modes 2-4 , 5000 EFPH, No Xe, ARI Minus Worst Stuck CEA)

ARI-1 3600 pcm S/D Margin



Date Of Update
____/____/____

References: PSL-1FJF-18-004, Rev. 0, Attach. 1 Page 24

Figure B.6 Rev. 4

Page 1 of 1

St. Lucie Unit 1 Cycle 28

(5000 EFPH)

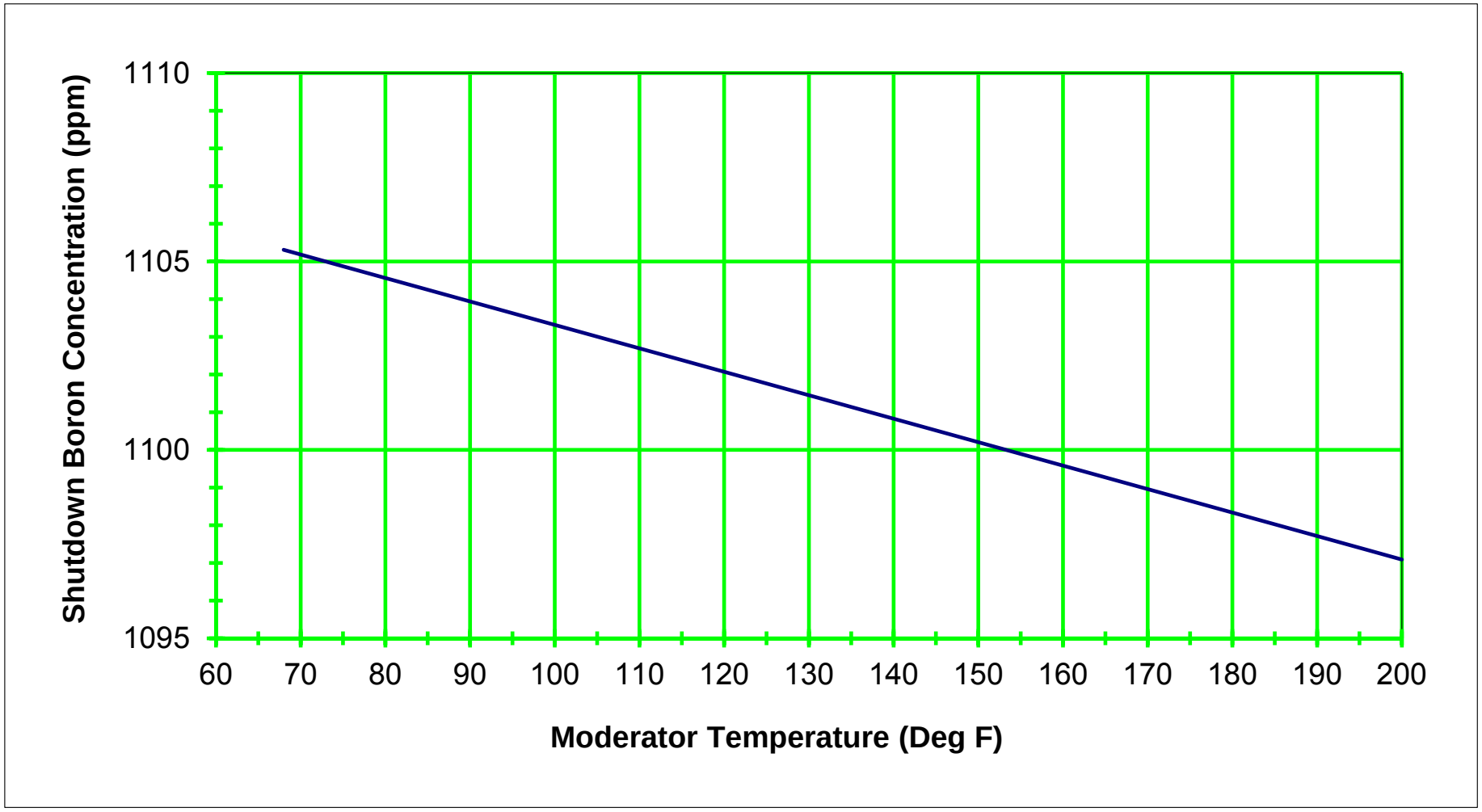
Shutdown Boron Concentration

Modes 2-4 (No Xenon, ARI Minus Worst Stuck CEA)

RCS Temp. (^oF)	Boron (ppm)	RCS Temp. (^oF)	Boron (ppm)	RCS Temp. (^oF)	Boron (ppm)
201	1227	312	1207	424	1148
204	1227	316	1206	428	1143
208	1226	320	1205	432	1137
212	1225	324	1205	436	1132
216	1224	328	1204	440	1126
220	1224	332	1204	444	1120
224	1223	336	1203	448	1114
228	1222	340	1202	452	1108
232	1221	344	1201	456	1101
236	1221	348	1201	460	1095
240	1220	352	1200	464	1089
244	1219	356	1199	468	1082
248	1218	360	1197	472	1076
252	1217	364	1196	476	1069
256	1217	368	1195	480	1063
260	1216	372	1193	484	1057
264	1215	376	1191	488	1050
268	1215	380	1189	492	1044
272	1214	384	1187	496	1038
276	1213	388	1184	500	1032
280	1212	392	1181	504	1026
284	1212	396	1178	508	1021
288	1211	400	1175	512	1015
292	1210	404	1171	516	1010
296	1209	408	1167	520	1005
300	1209	412	1163	524	1000
304	1208	416	1158	528	995
308	1207	420	1153	532	990

Figure B.8 Rev. 4
St. Lucie Unit 1 Cycle 28
Shutdown Boron Concentration vs RCS Temp.
Mode 5 , 5000 EFPH, No Xe, ARI Minus Worst Stuck CEA)

ARI-1 2000 pcm S/D Margin



Date Of Update
____/____/____

References: PSL-1FJF-18-004, Rev. 0, Attach. 1 Page 42

Figure B.8 Rev. 4
Page 1 of 1

St. Lucie Unit 1 Cycle 28
(5000 EFPH)
Shutdown Boron Concentration
Mode 5 (No Xenon, ARI Minus Worst Stuck CEA)

RCS Temp. (^oF)	Boron (ppm)
68	1105
72	1105
76	1105
80	1105
84	1104
88	1104
92	1104
96	1104
100	1103
104	1103
108	1103
112	1103
116	1102
120	1102
124	1102
128	1102
132	1101
136	1101
140	1101
144	1101
148	1100
152	1100
156	1100
160	1100
164	1099
168	1099
172	1099
176	1099
180	1098
184	1098
188	1098
192	1098
196	1097
200	1097

Figure C.1 Rev. 0
Page 1 of 1

St. Lucie Unit 1 Cycle 28

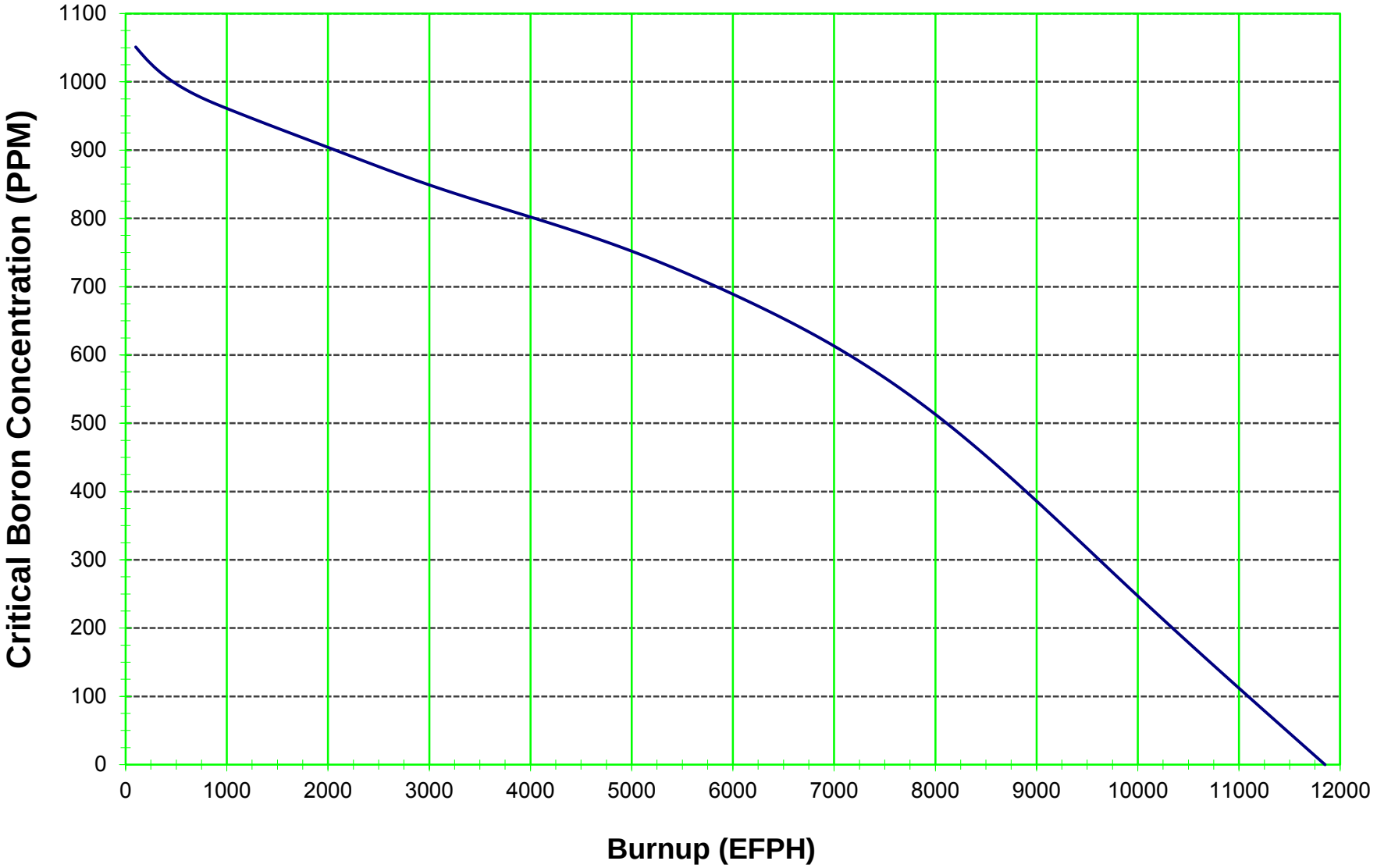
HFP Differential Boron Worth vs Burnup

Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)
100	7.98	3300	8.19	6500	8.63	9700	9.30
200	7.99	3400	8.20	6600	8.64	9800	9.32
300	8.00	3500	8.21	6700	8.66	9900	9.34
400	8.00	3600	8.22	6800	8.68	10000	9.37
500	8.00	3700	8.23	6900	8.70	10100	9.39
600	8.01	3800	8.24	7000	8.72	10200	9.42
700	8.01	3900	8.25	7100	8.73	10300	9.44
800	8.01	4000	8.26	7200	8.75	10400	9.47
900	8.01	4100	8.28	7300	8.77	10500	9.49
1000	8.02	4200	8.29	7400	8.79	10600	9.52
1100	8.02	4300	8.30	7500	8.81	10700	9.54
1200	8.03	4400	8.31	7600	8.83	10800	9.57
1300	8.03	4500	8.32	7700	8.85	10900	9.59
1400	8.04	4600	8.34	7800	8.87	11000	9.62
1500	8.04	4700	8.35	7900	8.89	11100	9.65
1600	8.05	4800	8.36	8000	8.91	11200	9.67
1700	8.05	4900	8.38	8100	8.93	11300	9.70
1800	8.06	5000	8.39	8200	8.96	11400	9.72
1900	8.07	5100	8.41	8300	8.98	11500	9.75
2000	8.07	5200	8.42	8400	9.00	11600	9.78
2100	8.08	5300	8.43	8500	9.02	11700	9.80
2200	8.09	5400	8.45	8600	9.04	11800	9.83
2300	8.10	5500	8.46	8700	9.06	11850	9.84
2400	8.10	5600	8.48	8800	9.09		
2500	8.11	5700	8.50	8900	9.11		
2600	8.12	5800	8.51	9000	9.13		
2700	8.13	5900	8.53	9100	9.15		
2800	8.14	6000	8.54	9200	9.18		
2900	8.15	6100	8.56	9300	9.20		
3000	8.16	6200	8.58	9400	9.22		
3100	8.17	6300	8.59	9500	9.25		
3200	8.18	6400	8.61	9600	9.27		

Date Of Update
___/___/___

Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1 Page 10

Figure C.2 Rev. 0
St. Lucie Unit 1 Cycle 28
HFP Critical Boron Concentration vs Burnup (Un-normalized)



Date Of Update
____/____/____

Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1, Page 11

Figure C.2 Rev. 0
Page 1 of 1

St. Lucie Unit 1 Cycle 28

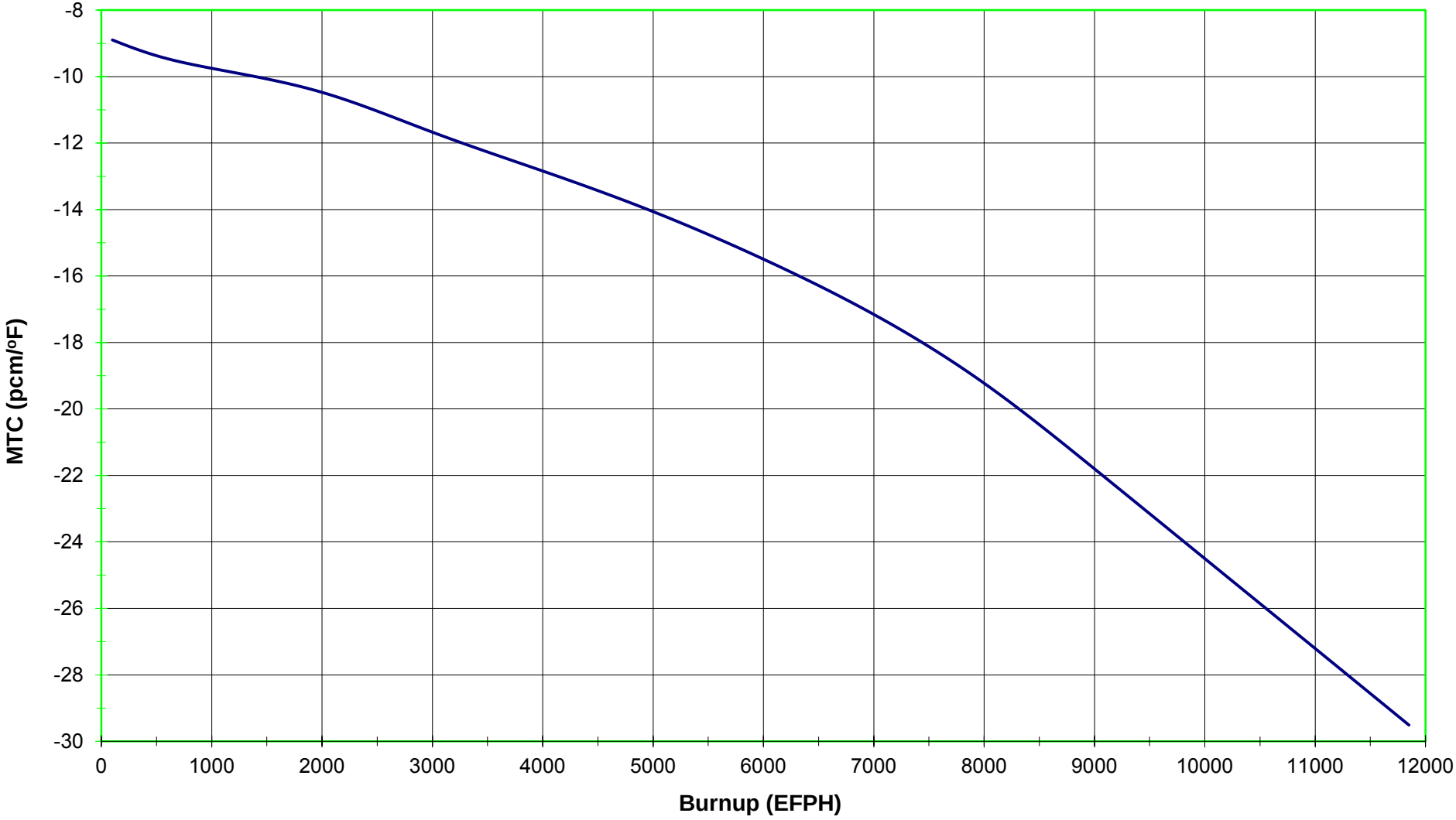
HFP Critical Boron Concentration vs Burnup (Un-normalized)

Burnup (EFPH)	Critical Boron (ppm)	Burnup (EFPH)	Critical Boron (ppm)	Burnup (EFPH)	Critical Boron (ppm)	Burnup (EFPH)	Critical Boron (ppm)
100	1051	3300	834	6500	653	9700	289
200	1034	3400	830	6600	646	9800	275
300	1019	3500	825	6700	638	9900	261
400	1007	3600	820	6800	630	10000	247
500	997	3700	816	6900	621	10100	233
600	988	3800	811	7000	613	10200	220
700	980	3900	807	7100	604	10300	206
800	973	4000	802	7200	595	10400	192
900	967	4100	797	7300	586	10500	179
1000	961	4200	793	7400	576	10600	165
1100	955	4300	788	7500	567	10700	152
1200	949	4400	783	7600	556	10800	139
1300	944	4500	778	7700	546	10900	125
1400	938	4600	773	7800	535	11000	112
1500	932	4700	768	7900	524	11100	99
1600	926	4800	763	8000	513	11200	86
1700	921	4900	758	8100	501	11300	72
1800	915	5000	752	8200	489	11400	59
1900	910	5100	746	8300	477	11500	46
2000	904	5200	740	8400	465	11600	33
2100	898	5300	734	8500	452	11700	20
2200	893	5400	728	8600	439	11800	7
2300	887	5500	722	8700	426	11850	0
2400	881	5600	716	8800	413		
2500	876	5700	709	8900	400		
2600	870	5800	703	9000	386		
2700	865	5900	696	9100	372		
2800	859	6000	689	9200	359		
2900	854	6100	682	9300	345		
3000	849	6200	675	9400	331		
3100	844	6300	668	9500	317		
3200	839	6400	661	9600	303		

Date Of Update
___/___/___

Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1, Page 12

Figure C.4 Rev. 0
St. Lucie Unit 1 Cycle 28
HFP Moderator Temperature Coefficient vs Burnup



Date of Update: ____ / ____ / ____

Reference: PSL-1FJF-18-002 Rev. 0, Attachment 1 Page 5

Figure C.4 Rev. 0
Page 1 of 1

St. Lucie Unit 1 Cycle 28

HFP Moderator Temperature Coefficient vs Burnup

Burnup (EFPH)	MTC (pcm/°F)
100	-8.90
200	-9.03
300	-9.15
400	-9.27
500	-9.37
600	-9.46
700	-9.54
800	-9.62
900	-9.69
1000	-9.75
1100	-9.81
1200	-9.88
1300	-9.94
1400	-10.00
1500	-10.07
1600	-10.14
1700	-10.21
1800	-10.29
1900	-10.38
2000	-10.47
2100	-10.58
2200	-10.68
2300	-10.80
2400	-10.92
2500	-11.04
2600	-11.16
2700	-11.29
2800	-11.42
2900	-11.55
3000	-11.67
3100	-11.80

Burnup (EFPH)	MTC (pcm/°F)
3200	-11.92
3300	-12.03
3400	-12.15
3500	-12.27
3600	-12.38
3700	-12.50
3800	-12.61
3900	-12.73
4000	-12.84
4100	-12.96
4200	-13.07
4300	-13.19
4400	-13.31
4500	-13.43
4600	-13.55
4700	-13.68
4800	-13.80
4900	-13.93
5000	-14.06
5100	-14.19
5200	-14.33
5300	-14.47
5400	-14.61
5500	-14.75
5600	-14.89
5700	-15.04
5800	-15.19
5900	-15.34
6000	-15.49
6100	-15.65
6200	-15.80
6300	-15.96

Burnup (EFPH)	MTC (pcm/°F)
6400	-16.12
6500	-16.29
6600	-16.45
6700	-16.62
6800	-16.80
6900	-16.97
7000	-17.16
7100	-17.34
7200	-17.53
7300	-17.72
7400	-17.92
7500	-18.12
7600	-18.33
7700	-18.55
7800	-18.77
7900	-18.99
8000	-19.23
8100	-19.46
8200	-19.71
8300	-19.96
8400	-20.21
8500	-20.47
8600	-20.73
8700	-21.00
8800	-21.26
8900	-21.53
9000	-21.80
9100	-22.07
9200	-22.34
9300	-22.61
9400	-22.88
9500	-23.15

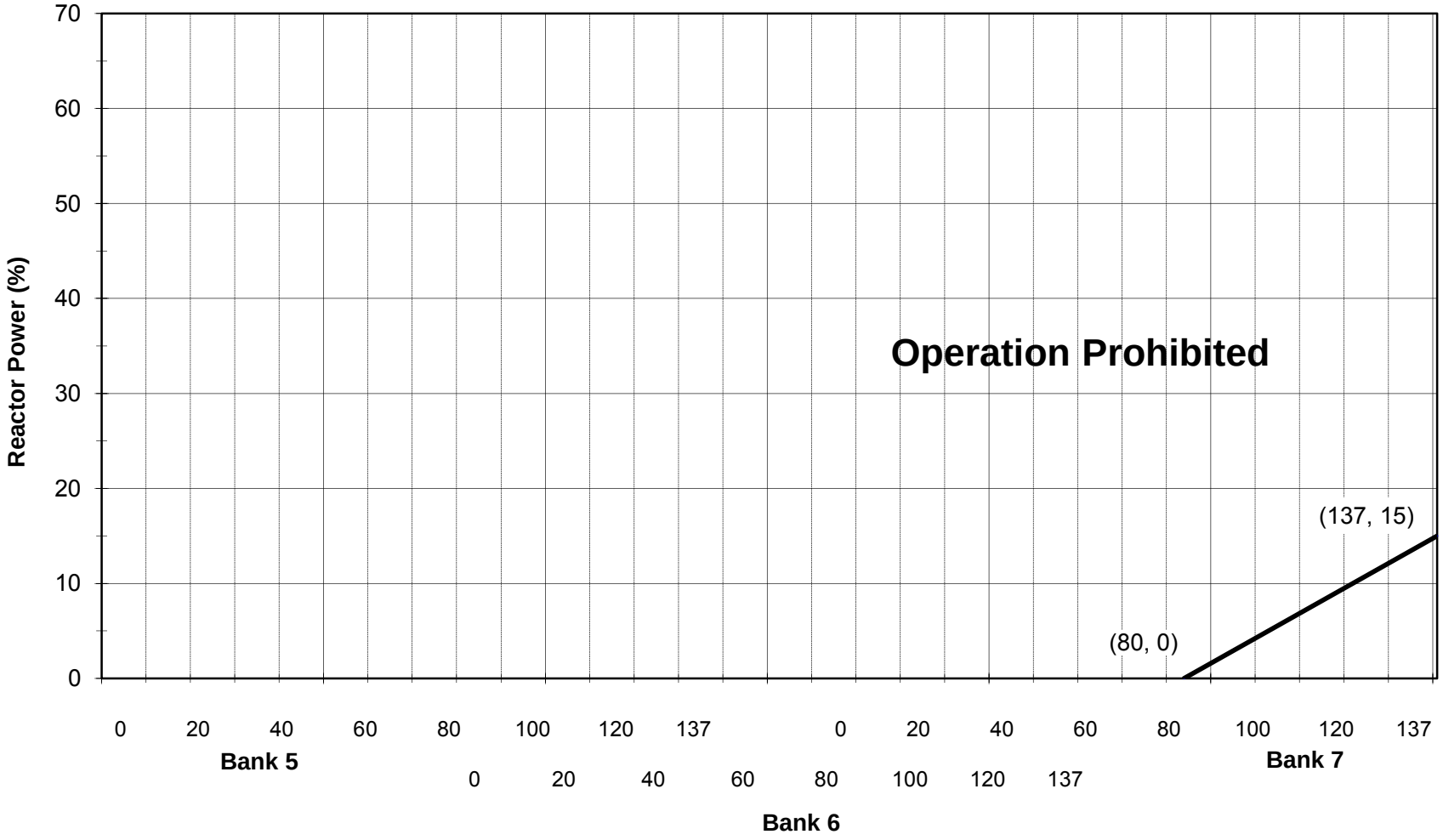
Burnup (EFPH)	MTC (pcm/°F)
9600	-23.42
9700	-23.69
9800	-23.96
9900	-24.23
10000	-24.50
10100	-24.77
10200	-25.04
10300	-25.31
10400	-25.58
10500	-25.85
10600	-26.12
10700	-26.40
10800	-26.67
10900	-26.94
11000	-27.21
11100	-27.48
11200	-27.75
11300	-28.02
11400	-28.29
11500	-28.56
11600	-28.83
11700	-29.10
11800	-29.38
11850	-29.51

Date Of Update
____/____/____

Reference: PSL-1FJF-18-002 Rev. 0, Attachment 1 Page 6

Figure C.5 Rev. 0

St. Lucie Unit 1 Cycle 28
Two Stuck CEA PDIL



Date Of Update: ____/____/____

Figure E.2 Rev. 4
Determination of Xenon Constants for DCS Input
St. Lucie Plant DCS Xenon Constant Calculation Sheet
UNIT 1 CYCLE 28

EXPOSURE 5000 EFPH

IODINE DECAY CONSTANT=λI	=	2.9239E-05	sec-1
XENON DECAY CONSTANT =λXe	=	2.1182E-05	sec-1
FISSION YIELD OF IODINE=γI	=	6.5096E-02	
FISSION YIELD OF XENON =γXe	=	5.6458E-03	
EQUILIBRIUM IODINE CONCENTRATION=I100	=	6.3305E+15	
EQUILIBRIUM XENON CONCENTRATION=Xe100	=	2.5532E+15	
EQUILIBRIUM XENON WORTH=Xew100	=	2.5970E+03	

Determination of Constants:

K1=λI*2 sec/calculation	=	5.8478E-05
K2=λI*2 sec/calculation	=	5.8478E-05
K3=(I100/Xe100) * K1	=	1.4499E-04
K4=(γXe/γI) * K2	=	5.0719E-06
K5= λXe * 2 sec/calculation	=	4.2364E-05
K6= (K3+K4-K5)/100	=	1.0770E-06
K7= -Xew100/100	=	-2.5970E+01

Date of Update: _____

References: PSL-1FJF-18-010, Rev. 0, Attach. 1, Page 5

Table 4.1.4.1
Page 1 of 1

St. Lucie Unit 1 Cycle 28

Integral Rod Worth of All CEA's
ARO to 129" Withdrawn
HFP, Equilibrium Xe

Exposure (EFPH)	Rod Worth (pcm)
100	92
200	92
1000	86
3000	76
5000	69
7000	73
9000	97
11000	124
11850	135

JPM TITLE: RO TIME TO BOIL CALCULATION

JPM NUMBER: L-19-1 NRC JPM A-2 RO **REV.** 0

TASK NUMBER(S) / TASK TITLE(S): 07003470 / Respond to a Loss of the SDC system

K/A NUMBERS / K/A VALUES: (RO SRO) 2.1.37 RCO (4.3) Knowledge of procedures, guidelines, or limitations associated with reactivity management.

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:
☒ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [ ] Perform: [X]

EVALUATION LOCATION: In-Plant: [ ] Control Room: [ ]
Simulator: [ ] Other: [X]
Lab: [ ]

Time for Completion: 15 Minutes Time Critical: NO

Alternate Path [NRC]: NO
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10.	Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11.	Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16.	If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☐	☐	☒

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:
- 1-AOP-03.02 Shutdown Cooling Abnormal Operations
- 1-ONP-01.04, Plant Condition 4, Shutdown Cooling in Operation-Reduced Inventory Operations.

General References:
- 1-AOP-03.02 Shutdown Cooling Abnormal Operations
- 1-ONP-01.04, Plant Condition 4, Shutdown Cooling in Operation-Reduced Inventory Operations.

Task Standards: This JPM is complete when the applicant determines the time to core boiling and time boiling will occur

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit 1 is in a Refueling outage.
- Core shuffle or reload has **NOT** been completed.
- A loss of shutdown cooling has just occurred.

INITIATING CUES:

You are the BRCO determine the time to core boiling and the time boiling will occur.

Given:

- RCS temperature is 114°F, Mode 6
- RCS level is 31 feet
- 1A Shutdown Cooling Train in Operation
- The Unit was tripped on May 20, at 0615

Subsequently:

- On May 24, 0715, the 1A LPSI pump tripped, and the 1B LPSI failed to start
- Current date / time is May 24, 0720

Time To Core Boiling_____.
Time Boiling Will Occur_____.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

ATTACHMENT 1	
Performance Step: 1 **Critical NO**	**Record the following information** • **Time SDC was lost**
Standard:	Examinee Records 0715
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 2 **Critical: NO**	**Record** the following information • RCS Temperature •
Standard:	Records 114ºF
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 3 **Critical: NO**	ATTACHMENT 1 step 1A Record the following information Vessel / Cavity Level
Standard:	Records 31 ft.
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 4 **Critical NO**	Record the following information Time since shutdown (hours)
Standard:	Examinee Records 96 hours
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 5 **Critical YES**	Record time to boil at mid-loop per Table 1
Standard:	Examinee 12.3 minutes
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	• Temperature between columns, select higher temperature • Time since shutdown between rows, select the lesser time

Performance Step: 6 **Critical YES**	Record additional time to boil for a $100ft^3$ volume per Table 2
Standard:	0.857 (minutes / $100ft^3$)
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE:**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	• Temperature between columns, select higher temperature • Time since shutdown between rows, select the lesser time

Performance Step: 7 **Critical: YES**	Record additional $100ft^3$ volumes above mid-loop per Table 3
Standard:	1.21 (100 ft^3)
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE:**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 8 **Critical YES**	Calculate Time to Boil as Follows:
Standard:	Calculate Time to Boil as Follows: (__12.3__) + [(_0.857_) x (__1.21__)] = 13.34 min Time to boil Additional Time to boil Additional 100 ft^3 volumes Time to Boil Step 1.B Step 1.C Step 1.D Time to Boil 13.34 minutes (13–13.34 minutes is acceptable)
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 9 **Critical YES**	IF core shuffle or reload has NOT been completed, THEN CALCULATE time boiling will occur as follows: (__0715__) + (_13.34_) = (0728.34) Time SDC lost Time to boil Time boiling will occur Step 1.A Step 1.E
Standard:	Time 0728:00 to 0729:00 is acceptable
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Terminating Cues:

This JPM is complete when the applicant determines the time to core boiling and time boiling will occur

The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

- Unit 1 is in a Refueling outage.
- Core shuffle or reload has **NOT** been completed.
- A loss of shutdown cooling has just occurred.

INITIATING CUES:

You are the BRCO determine the time to core boiling and the time boiling will occur.

Given:

- RCS temperature is 114°F, Mode 6
- RCS level is 31 feet
- 1A Shutdown Cooling Train in Operation
- The Unit was tripped on May 20, at 0615

Subsequently:

- On May 24, 0715, the 1A LPSI pump tripped, and the 1B LPSI failed to start
- Current date / time is May 24, 0720

Time To Core Boiling_____.
Time Boiling Will Occur_____.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 1 of 9)

NOTE

During Core Offload / Reload conditions, Time to Boil is only required to be calculated once per shift unless otherwise directed by the Shift Manager.

1. **DETERMINE** estimated time to core boiling as follows (Section 6.2, Commitment 2):

A. **RECORD** the following information at the time SDC was lost:

Time Shutdown Cooling Lost from Section 4.2, Step 2 _____

RCS Temperature from Section 4.2, Step 2 _____ ºF

Vessel / Cavity Level _____ ft

Time since shutdown (hours) _____

B. **RECORD** time to boil at mid-loop per Table 1:
_____ (minutes)

C. **RECORD** additional time to boil for a 100 ft^3 volume per Table 2:
_____ (minutes / 100 ft^3).

D. **RECORD** additional 100 ft^3 volumes above mid-loop per Table 3:
_____ (100 ft^3)

E. **CALCULATE** Time to Boil as follows:

$$\left(\frac{\text{Time to boil}}{\text{Step 1.B}}\right) + \left[\left(\frac{\text{Additional time to boil}}{\text{Step 1.C}}\right) \text{x} \left(\frac{\text{Additional 100 ft}^3\text{ volumes}}{\text{Step 1.D}}\right)\right] = \frac{\text{\_\_\_\_\_}}{\text{Time to Boil}} \text{ min}$$

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 2 of 9)

F. IF Full Core Offload is in progress, THEN **CALCULATE** Time to Boil as follows: (Section 6.1.3, Management Directive 1)

$$\left[\left(\frac{\text{\_\_\_\_\_}}{\begin{matrix}\text{Time to Boil}\\ \text{Step 1.E}\end{matrix}}\right)\times\left(\frac{\text{\_\_\_\_\_}}{\begin{matrix}\text{Time to Boil Multiplier}\\ \text{Table 4}\end{matrix}}\right)\right]=\frac{\text{\_\_\_\_\_}}{\text{Time to Boil}}\ \text{min}$$

G. If Reload is in progress OR complete, THEN **CALCULATE** Time to Boil as follows: (Section 6.1.3, Management Directive 1)

$$\left[\left(\frac{\text{\_\_\_\_\_}}{\begin{matrix}\text{Time to Boil}\\ \text{Step 1.E}\end{matrix}}\right)\times(1.35)\,\text{x}\left(\frac{\text{\_\_\_\_\_}}{\begin{matrix}\text{Time to Boil Multiplier}\\ \text{Table 5}\end{matrix}}\right)\right]=\frac{\text{\_\_\_\_\_}}{\text{Time to Boil}}\ \text{min}$$

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 3 of 9)

NOTE

- Temperatures between columns, select higher temperature.
- Time since shutdown between rows, select the lesser time.

Table 1
Time to Boil (minutes) at Mid-Loop

		RCS Temperature (°F)							
Shutdown Time (Hours)	60	80	90	100	110	120	130	140	200
24	13.1	11.4	10.5	9.64	8.77	7.90	7.03	6.17	1.08
48	16.0	13.9	12.8	11.8	10.7	9.66	8.60	7.54	1.32
60	17.3	15.0	13.9	12.7	11.6	10.4	9.30	8.16	1.43
72	18.6	16.1	14.9	13.7	12.4	11.2	9.98	8.76	1.54
90	20.4	17.7	16.4	15.0	13.7	12.3	11.0	9.62	1.69
102	21.6	18.7	17.3	15.9	14.4	13.0	11.6	10.2	1.78
120	23.2	20.1	18.6	17.0	15.5	14.0	12.4	10.9	1.91
132	24.2	21.0	19.4	17.8	16.2	14.6	13.0	11.4	2.00
144	25.1	21.8	20.1	18.5	16.8	15.1	13.5	11.8	2.07
240	31.0	26.9	24.8	22.8	20.7	18.7	16.6	14.6	2.56
300	33.8	29.3	27.0	24.8	22.6	20.3	18.1	15.9	2.79
360	36.3	31.5	29.0	26.6	24.2	21.8	19.4	17.1	2.99
480	40.9	35.5	32.8	30.1	27.3	24.6	21.9	19.3	3.38
600	45.4	39.4	36.4	33.3	30.4	27.3	24.3	21.4	3.75
840	54.2	47.0	43.4	39.8	36.2	32.6	29.0	25.5	4.47
1440	73.9	64.1	59.2	54.3	49.4	44.5	39.6	34.8	6.10

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 4 of 9)

NOTE

- Temperatures between columns, select higher temperature.
- Time since shutdown between rows, select the lesser time.

Table 2
Additional Time To Boil (minutes) for Each 100 cubic feet of RCS Volume
(Section 6.1.3, Management Directive 2)

	RCS Temperature (°F)								
Shutdown Time (Hours)	60	80	90	100	110	120	130	140	200
24	0.913	0.792	0.731	0.671	0.610	0.550	0.490	0.430	0.0754
48	1.12	0.968	0.893	0.819	0.746	0.672	0.598	0.525	0.0921
60	1.21	1.05	0.967	0.887	0.807	0.727	0.647	0.568	0.0996
72	1.30	1.12	1.04	0.952	0.866	0.781	0.695	0.610	0.107
90	1.42	1.23	1.14	1.04	0.951	0.857	0.763	0.669	0.117
102	1.50	1.30	1.20	1.10	1.00	0.905	0.805	0.707	0.124
120	1.61	1.40	1.29	1.19	1.08	0.972	0.865	0.760	0.133
132	1.68	1.46	1.35	1.24	1.13	1.01	0.902	0.792	0.139
144	1.75	1.52	1.40	1.28	1.17	1.05	0.937	0.823	0.144
240	2.16	1.87	1.73	1.58	1.44	1.30	1.16	1.01	0.178
300	2.35	2.04	1.88	1.73	1.57	1.42	1.26	1.11	0.194
360	2.52	2.19	2.02	1.85	1.69	1.52	1.35	1.19	0.208
480	2.85	2.47	2.28	2.09	1.90	1.71	1.53	1.34	0.235
600	3.16	2.74	2.53	2.32	2.11	1.90	1.69	1.49	0.261
840	3.77	3.27	3.02	2.77	2.52	2.27	2.02	1.77	0.311
1440	5.14	4.46	4.12	3.78	3.44	3.10	2.76	2.42	0.424

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 5 of 9)

NOTE

If elevation is between rows, select the lesser value.

Table 3
Additional Volume (100 cubic feet) Above Mid-Loop
(Section 6.1.3, Management Directive 2)

Vessel Head Installed or Not Installed			Vessel Head Not Installed			Vessel Head Not Installed	
Elevation	Additional Volume		Elevation	Additional Volume		Elevation	Additional Volume
Feet	100 ft3		Feet	100 ft3		Feet	100 ft3
29.5	0.00		36.5	14.20		48.5	229.00
30.0	0.40		37.0	23.15		49.0	237.95
30.5	0.81		37.5	32.10		49.5	246.90
31.0	1.21		38.0	41.05		50.0	255.85
31.5	1.61		38.5	50.00		50.5	264.80
32.0	2.02		39.0	58.95		51.0	273.75
32.5	2.42		39.5	67.90		51.5	282.70
33.0	2.82		40.0	76.85		52.0	291.65
33.5	3.23		40.5	85.80		52.5	300.60
34.0	3.63		41.0	94.75		53.0	309.55
34.5	4.04		41.5	103.70		53.5	318.50
35.0	4.44		42.0	112.65		54.0	327.45
35.5	4.84		42.5	121.60		54.5	336.40
36.0	5.25		43.0	130.55		55.0	345.35
			43.5	139.50		55.5	354.30
			44.0	148.45		56.0	363.25
			44.5	157.40		56.5	372.70
			45.0	166.35		57.0	381.15
			45.5	175.30		57.5	390.10
			46.0	184.25		58.0	399.05
			46.5	193.20		58.5	408.00
			47.0	202.15		59.0	416.95
			47.5	211.10		59.5	425.90
			48.0	220.05		60.0	434.85

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 6 of 9)

NOTE

If the number of assemblies OFFLOADED is between rows, then use the SMALLER number of assemblies OFFLOADED to get the most conservative (smaller) Time-to-Boil Multiplier.

Table 4
Time to Boil Multiplier during **OFFLOAD**

Number of Assemblies OFFLOADED	Number of Assemblies in CORE	Time-to-Boil Multiplier (1/Decay Heat Fraction)
0	217	1.00
5	212	1.02
10	207	1.04
15	202	1.06
20	197	1.09
25	192	1.11
30	187	1.14
35	182	1.16
40	177	1.19
45	172	1.22
50	167	1.26
55	162	1.29
60	157	1.33
65	152	1.36
70	147	1.40
75	142	1.45
80	137	1.49
85	132	1.54
90	127	1.59
95	122	1.65
100	117	1.70
105	112	1.77
110	107	1.84
115	102	1.93
120	97	2.03
125	92	2.14

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 7 of 9)

Number of Assemblies OFFLOADED	Number of Assemblies in CORE	Time-to-Boil Multiplier (1/Decay Heat Fraction)
130	87	2.26
135	82	2.40
140	77	2.56
145	72	2.73
150	67	2.94
155	62	3.18
160	57	3.46
165	52	3.79
170	47	4.19
175	42	4.69
180	37	5.33
190	27	7.30
200	17	11.60
210	7	21.70
216	1	21.70

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 8 of 9)

NOTE

If the number of assemblies RELOADED is between rows, then use the LARGER number of assemblies RELOADED to get the most conservative (smaller) Time-to-Boil Multiplier.

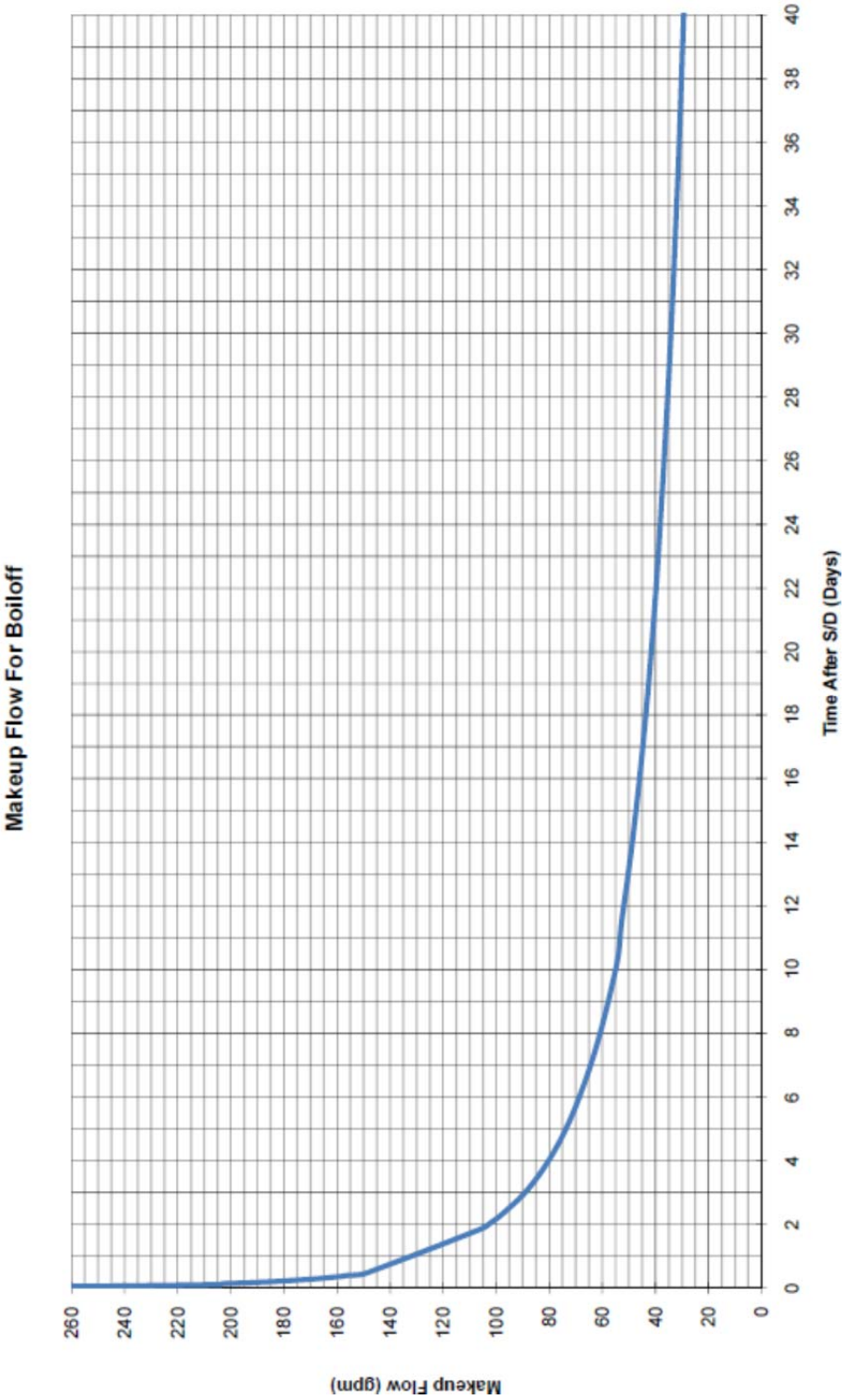
Table 5
Time to Boil Multiplier during **RELOAD**

Number of Assemblies RELOADED	Time-to-Boil Multiplier (1/Decay Heat Fraction)
1	21.70
5	21.70
10	21.70
15	14.46
20	10.85
25	8.68
30	7.23
35	6.20
40	5.42
45	4.82
50	4.34
55	3.94
60	3.61
65	3.33
70	3.10
75	2.89
80	2.71
85	2.55
90	2.41
95	2.28
100	2.17
105	2.06
110	1.97
115	1.88
120	1.80
125	1.73
130	1.66

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 9 of 9)

Number of Assemblies RELOADED	Time-to-Boil Multiplier (1/Decay Heat Fraction)
135	1.60
140	1.55
145	1.49
150	1.44
155	1.40
160	1.35
165	1.31
170	1.27
175	1.24
180	1.20
190	1.14
200	1.08
210	1.03
217	1.00

FIGURE 2
FLOW TO MAKE UP FOR BOIL-OFF
(Page 1 of 1)



JPM TITLE: RO Perform 2C Intake Cooling Water Pump Code Run Unit 2

JPM NUMBER: L-19-1 NRC JPM A-3 RO **REV.** 0

TASK NUMBER(S) / TASK TITLE(S): 07203250 / Implement Surveillance procedures

K/A NUMBERS / K/A VALUES: (RO SRO) 2.2.12 Knowledge of surveillance procedures RO (3.7)

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:
☒ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [ ] Perform: [X]

EVALUATION LOCATION: In-Plant: [ ] Control Room: [ ]
Simulator: [ ] Other: [X]
Lab: [ ]

Time for Completion: 15 Minutes Time Critical: NO

Alternate Path [NRC]: NO
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
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12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
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All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:

- 2-OSP-21.01C, 2C INTAKE COOLING WATER PUMP CODE RUN, Steps 4.2.19, 4.2.20 and Attachment 2.
- Calculator

General References:

- 2-OSP-21.01C, 2C INTAKE COOLING WATER PUMP CODE RUN, Steps 4.2.19, 4.2.20 and Attachment 2.

Calculator

Task Standards:

The applicant will:

- Enter pump data into the surveillance procedure steps.
- Evaluate the results to determine if pump status.

This JPM is complete when the applicant returns the cue sheet, filled out surveillance procedure, and calculation to the examiner.

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit 2 is at 100% power.
- 2-OSP-21.01C, 2C INTAKE COOLING WATER PUMP CODE RUN is in progress.

INITIATING CUES:

- You are the Reactor Operator performing a code run on the 2C ICW pump; you are to record and evaluate the test data with respect to acceptance criteria and determine the status of the 2C ICW Pump in accordance with Steps 4.2.19, 4.2.20 and Attachment 2.
- **INDICATE** status: 2C ICW pump.
- No computers are available to perform this calculation.
- The ANPO has Transmitted the pump data from Attachment 2 as follows:
  - **Intake Level**
    - -3.44 ft.
  - **Pump Disc Press. (PI-21-5C)**
    - 43 psig
  - **Vibration (Peak Velocity)**
    - UMN .06208 in/sec
    - UME .05777 in/sec
    - UMA .06126 in/sec
  - **Vibration Instr. No.**
    - PSL-2592

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

2-OSP-21.01C, 2C INTAKE COOLING WATER PUMP CODE RUN

Performance Step: 1 **Critical YES**

Record and evaluate the test data

Standard:

REVISION NO.: 26	PROCEDURE TITLE: 2C INTAKE COOLING WATER PUMP CODE RUN	PAGE: 22 of 53
PROCEDURE NO.: 2-OSP-21.01C	ST. LUCIE UNIT 2	INITIAL

4.2 2C ICW Pump Code Run on B Header (continued)

19. Perform the following:

A. **CALCULATE** pump head. _____

Actual pump head = 41 + (a x 2.307) – (b +18)

where: a = PI-21-5C, 2C ICW Pump Disch Press
b = Intake level

Actual pump head = 41 + (43 psig x 2.307) – (-3.44 ft +18)

Actual pump head = 125.6 ft

CRITICAL STEP

B. **RECORD** calculated pump head in Table 1 of Attachment 2, 2C ICW Quarterly Pump Code Run. _____

C. **VERIFY** calculated pump head Acceptance Criteria. _____

Acceptance Criteria	Results (✓)
Calculated pump head is 126.3 to 140.8 ft.	☐ SAT ☑ UNSAT

CRITCAL STEP

20. **PERFORM** the following:

A. **VERIFY** vibration Acceptance Criteria. _____

Location	Acceptance Criteria	Results (✓)
UMN	Vibration is < 0.195 in/sec	☑ SAT ☐ UNSAT
UME	Vibration is < 0.119 in/sec	☑ SAT ☐ UNSAT
UMA	Vibration is < 0.167 in/sec	☑ SAT ☐ UNSAT

Evaluator Cue: **NONE**

Performance: **SATISFACTORY** _____ **UNSATISFACTORY** _____

Comments:

Performance Step: 2 **Critical: YES**	**Determine the status of the 2C ICW Pump**
Standard:	

REVISION NO.: 26 | PROCEDURE TITLE: 2C INTAKE COOLING WATER PUMP CODE RUN | PAGE: 53 of 53

PROCEDURE NO.: 2-OSP-21.01C | ST. LUCIE UNIT 2

ATTACHMENT 2
2C ICW Quarterly Pump Code Run
(Page 1 of 1)

Date: _____ / _____ / _____ Vibration Instr. No. _____

Table 1
2C ICW Pump Flow and Vibration Data

Parameter		Reading	Acceptance Criteria: Allowable Range	Alert Range	Required Action
Intake Level		-3.44 ft.	N/A	N/A	N/A
Pump Disch. Press. (PI-21-5C)		43 psig	N/A	N/A	N/A
Calculated Pump Head *		125.6 ft.	126.3 to 140.8	123.6 to < 126.3	< 123.6 or > 140.8
Peak Velocity **	UMN	.06208 in./sec.	< 0.195	0.195 to 0.468	> 0.468
	UME	.05777 in./sec.	<0.119	0.119 to 0.286	> 0.286
	UMA	.06126 in./sec.	< 0.167	0.167 to 0.401	> 0.401

* Calculated Pump Head = 41 ft. + (Disch. Press. x 2.307) - (Intake Level + 18 ft.).
** See Attachment 1, 2C ICW Pump Vibration Reading Locations, for measurement points.

1. **INDICATE** purpose of test:
   - ☑ Code Run
   - ☐ Post Maintenance (explain) _____
   - ☐ Other (explain) _____

2. CRITCAL STEP **EVALUATE** the test data with respect to acceptance criteria and **INDICATE** status:
   - ☐ ACCEPTABLE
   - ☑ ALERT RANGE
   - ☐ REQUIRED ACTION RANGE

Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

	The applicant will:
Terminating Cues:	**• Enter pump data into the surveillance procedure steps.** **• Evaluate the results to determine if pump status.**
The JPM is complete.	**This JPM is complete when the applicant returns the cue sheet, filled out surveillance procedure, and calculation to the examiner.**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

- Unit 2 is at 100% power.
- 2-OSP-21.01, 2C INTAKE COOLING WATER PUMP CODE RUN is in progress.

INITIATING CUES:

- You are the Reactor Operator performing a code run on the 2C ICW pump; you are to record and evaluate the test data with respect to acceptance criteria and determine the status of the 2C ICW Pump in accordance with Steps 4.2.19, 4.2.20 and Attachment 2.
- **INDICATE** status: 2C ICW pump.
- No computers are available to perform this calculation.
- The ANPO has Transmitted the pump data from Attachment 2 as follows:
  - **Intake Level**
    - -3.44 ft.
  - **Pump Disc Press. (PI-21-5C)**
    - 43 psig
  - **Vibration (Peak Velocity)**
    - UMN .06208 in/sec
    - UME .05777 in/sec
    - UMA .06126 in/sec
  - **Vibration Instr. No.**
    - PSL-2592

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

REVISION NO.: 26	PROCEDURE TITLE: 2C INTAKE COOLING WATER PUMP CODE RUN	PAGE: 22 of 53
PROCEDURE NO.: 2-OSP-21.01C	ST. LUCIE UNIT 2	INITIAL

4.2 2C ICW Pump Code Run on B Header (continued)

19. Perform the following:

A. **CALCULATE** pump head. _____

$$\text{Actual pump head} = 41 + (\underline{\ a\ } \times 2.307) - (\underline{\ b\ } + 18)$$

where: a = PI-21-5C, 2C ICW Pump Disch Press
b = Intake level

$$\text{Actual pump head} = 41 + (\_\_\_\_\_ \times 2.307) - (\_\_\_\_\_ + 18)$$

$$\text{Actual pump head} = \_\_\_\_\_$$

B. **RECORD** calculated pump head in Table 1 of Attachment 2, 2C ICW Quarterly Pump Code Run. _____

C. **VERIFY** calculated pump head Acceptance Criteria. _____

Acceptance Criteria	Results (✓)
Calculated pump head is 126.3 to 140.8 ft.	☐ SAT ☐ UNSAT

20. **PERFORM** the following:

A. **VERIFY** vibration Acceptance Criteria. _____

Location	Acceptance Criteria	Results (✓)
UMN	Vibration is < 0.195 in/sec	☐ SAT ☐ UNSAT
UME	Vibration is < 0.119 in/sec	☐ SAT ☐ UNSAT
UMA	Vibration is < 0.167 in/sec	☐ SAT ☐ UNSAT

REVISION NO.: 26	PROCEDURE TITLE: 2C INTAKE COOLING WATER PUMP CODE RUN	PAGE: 53 of 53
PROCEDURE NO.: 2-OSP-21.01C	ST. LUCIE UNIT 2	

ATTACHMENT 2
2C ICW Quarterly Pump Code Run
(Page 1 of 1)

Date: _____ / _____ / _____ Vibration Instr. No. _____

Table 1
2C ICW Pump Flow and Vibration Data

Parameter		Reading	Acceptance Criteria		
			Allowable Range	Alert Range	Required Action
Intake Level		ft.	N/A	N/A	N/A
Pump Disch. Press. (PI-21-5C)		psig	N/A	N/A	N/A
Calculated Pump Head *		ft.	126.3 to 140.8	123.6 to < 126.3	< 123.6 or > 140.8
Peak Velocity **	UMN	in./sec.	< 0.195	0.195 to 0.468	> 0.468
	UME	in./sec.	<0.119	0.119 to 0.286	> 0.286
	UMA	in./sec.	< 0.167	0.167 to 0.401	> 0.401

* Calculated Pump Head = 41 ft. + (Disch. Press. x 2.307) - (Intake Level + 18 ft.).
** See Attachment 1, 2C ICW Pump Vibration Reading Locations, for measurement points.

1. **INDICATE** purpose of test:

   ☐ Code Run

   ☐ Post Maintenance (explain) _____

   ☐ Other (explain) _____

2. **EVALUATE** the test data with respect to acceptance criteria and **INDICATE** status:

   ☐ ACCEPTABLE

   ☐ ALERT RANGE

   ☐ REQUIRED ACTION RANGE

NOTE

Either Section 4.1 or Section 4.2 may be performed to complete the 2C ICW Code Run testing.

4.2 2C ICW Pump Code Run on B Header

1. IF ICW inlet temperature is greater than 88ºF, THEN **PERFORM** one of the following: (Section 8.1.3, Management Directive 1)

   - **OBTAIN** an evaluation to demonstrate operability prior to performing this procedure. N/A <88 ˚F

   - **DECLARE** ICW train B inoperable when strainer upstream isolation valve SB21232, SS-21-1B UPSTRM ISOL, is unlocked and throttled. LFG N/A <88 ˚F

2. **CIRCLE** type of test performance. LFG

   - Code Run
   - Post Maintenance
   - Other: (_____)

3. **RECORD** vibration instrument number in Section 5.2, Step 1 AND on Attachment 2, 2C ICW Quarterly Pump Code Run. LFG

4. **ENSURE** SB21165, 2C ICW PUMP X-TIE DISCH TO “A” TRAIN ISOL, is LOCKED CLOSED. (INTK/9/N-4/W-C) BFG ANPO

5. IF SB21165, 2C ICW PUMP X-TIE DISCH TO “A” TRAIN ISOL, is LOCKED CLOSED AND the "V" notch on indicator plate and valve indicator arrow are **NOT** aligned, THEN **NOTIFY** Site Programs Engineering. (INTK/9/N-4/W-C) LFG

6. **ENSURE** the 2C ICW Pump is operating on the 2B Header per 2-NOP-21.03C, 2C Intake Cooling Water System Operation. LFG

4.2 2C ICW Pump Code Run on B Header (continued)

NOTE

Section 4.2, Step 7 and Section 4.2, Step 8 may be performed concurrently.

7. **PERFORM** the following:

A. **CHECK** ICW Pump 2C and associated valves and piping for the following: BFG / ANPO

- Leakage
- Abnormal Conditions

B. IF any leakage or abnormal conditions are identified, THEN **DOCUMENT** in Section 5.2, Documentation. BFG / ANPO

NOTE

The Auto/Manual status of TCVs in the turbine building should be evaluated for the impact of changing ICW flow prior to cross-tying heat exchangers (TCW, Blowdown, Seal Oil, H2, Exciter, Lube Oil, and EH).

8. **ENSURE** the following valves OPEN:

- SB212001, ICW CROSS-TIE TO 2A/2B OBHX ISOL (TGB/32/N-21/E-G) GF / NPO
- SB21215, 2A/2B TCW HX ICW INLET CROSS-TIE BYPASS (TGB/27/S-20/E-G) GF / NPO

4.2 2C ICW Pump Code Run on B Header (continued)

9. **PERFORM** the following:

A. **VERIFY** SS-21-1B, 2B CCW HX ICW INLET STRNR, is **NOT** in Auto Backwash cycle. (CCW/26/N-E/W-4) BUG / SNPO

B. **ENSURE** SS-21-1B, 2B CCW HX ICW INLET STRNR, Auto/Man selector switch is in MAN. BUG / SNPO

C. **ENSURE** HCV-21-7B, SS-21-1B DEBRIS DISCH ISOL, is CLOSED. (CCW/19/N-E/E-3) BUG / SNPO

10. **CLOSE** MV-21-2, 'B' ICW TRAIN TO TCW HXS. (RTGB 202) LEG

11. **OPEN** TCV-14-4B, 2B CCW HX OUTLET, by performing one of the following:

A. IF Stroke Timing of TCV-14-4B, 2B CCW HX OUTLET, is required, THEN **OPEN** TCV-14-4B, 2B CCW HX OUTLET, per 2-OSP-99.08B, B Train Quarterly Non Check Valve Cycle Test. (CCW/15/N-D/W-4) BUG / SNPO

B. IF Stroke Timing of TCV-14-4B, 2B CCW HX OUTLET, is **NOT** performed, THEN **OPEN** TCV-14-4B, 2B CCW HX OUTLET, by performing the following: (CCW/15/N-D/W-4)

(1) **PLACE** TIC-14-4B, 2B CCW HX TEMP (Controller), in MANUAL. BUG / SNPO

(2) At TCV-14-4B, 2B CCW HX OUTLET, **PERFORM** the following:

a. **REMOVE** the 3-way valve quick disconnect end cap. BUG / SNPO

b. **ISOLATE** the air supply to the valve positioner. BUG / SNPO

c. **ADJUST** the 3-way valve to the vent position. BUG / SNPO

4.2 2C ICW Pump Code Run on B Header (continued)

11. B. (2) (continued)

d. **VERIFY** TCV-14-4B, 2B CCW HX OUTLET, is OPEN.

BUG
SNPO

NOTE

ICW flow has a significant effect on calculated pump head during the ICW pump surveillance. Accurately establishing 14,000 gpm flow is essential for determining pump operability. Fluctuations in flow on FIS-21-9B,2B CCW HX ICW OUTLET FLOW, should NOT exceed +/-200 gpm.

12. **THROTTLE** SB21232, SS-21-1B UPSTRM ISOL, to obtain ICW flow of 14,000 gpm as indicated on FIS-21-9B, 2B CCW HX ICW OUTLET FLOW. (CCW/26/N-3/E-3)

BUG
SNPO

13. IF ICW inlet temperature is greater than 88ºF AND an evaluation is **NOT** obtained to demonstrate operability, THEN **DECLARE** ICW train B inoperable. (Section 8.1.3, Management Directive 1)

N/A <88 ˚F

14. **RECORD** ICW flow as indicated on FIS-21-9B, 2B CCW HX ICW FLOW.

BUG
SNPO

FIS-21-9B 14,000 gpm Time NOW

15. IF any of the following conditions exist on FIS-21-9B, 2B CCW HX OUTLET ICW FLOW:

- Fluctuations in flow exceed +/- 200 gpm from 14,000 gpm
- Gauge accuracy is suspect

THEN **REQUEST** I&C perform the following:

- **VENT** FIS-21-9B, 2B CCW HX ICW OUTLET FLOW, and its associated lines.

LSG
I&C

- IF I&C determines calibration is necessary, THEN **CALIBRATE** transmitter FIS-21-9B, 2B CCW HX ICW OUTLET FLOW.

LSG
I&C

4.2 2C ICW Pump Code Run on B Header (continued)

NOTE

- When the ICW pump temporary gauge isolation valve is opened, the affected pump and header the pump is aligned to shall be declared inoperable but available.
- Field operator shall remain locally and in radio communication with the Control Room while temporary gauge is in service to restore valve closure in case of an emergency header demand.

16. WHEN two minutes has elapsed, THEN **PERFORM** the following:

A. **OPEN** SH21204, ROOT VALVE FOR PI-21-5C. (INTK/23/N-3/W-C)

BFG
ANPO

B. **RECORD** the following in Table 1 of Attachment 2, 2C ICW Quarterly Pump Code Run

- Pressure from temporary gauge located at PI-21-5C, 2C ICW PUMP DISCH PRESS
- Intake level from LT-21-9A or LT-21-9B on PDR-21-1 (RTGB 202) or Intake Level Gauge at Unit 1 intake.

C. **CLOSE** SH21204, ROOT VALVE FOR PI-21-5C. (INTK/23/N-3/W-C)

BFG
ANPO

17. Referring to Attachment 1, 2C ICW Pump Vibration Reading Locations, **TAKE** vibration readings AND **RECORD** in Table 1 of Attachment 2, 2C ICW Quarterly Pump Code Run.

BFG
ANPO

18. **TRANSMIT** recorded data from Attachment 2, Table 1 to Control Room.

BFG
ANPO

4.2 2C ICW Pump Code Run on B Header (continued)

19. Perform the following:

A. **CALCULATE** pump head. _____

$$\text{Actual pump head} = 41 + (\underline{\ a\ } \times 2.307) - (\underline{\ b\ } + 18)$$

where: a = PI-21-5C, 2C ICW Pump Disch Press
b = Intake level

$$\text{Actual pump head} = 41 + (\underline{43\ \text{psig}} \times 2.307) - (\underline{-3.44\ \text{ft}} + 18)$$

$$\text{Actual pump head} = \underline{125.6\ \text{ft}}$$

CRITICAL STEP

B. **RECORD** calculated pump head in Table 1 of Attachment 2, 2C ICW Quarterly Pump Code Run. _____

C. **VERIFY** calculated pump head Acceptance Criteria. _____

Acceptance Criteria	Results (✓)
Calculated pump head is 126.3 to 140.8 ft.	☐ SAT ☑ UNSAT

CRITCAL STEP

20. **PERFORM** the following:

A. **VERIFY** vibration Acceptance Criteria. _____

Location	Acceptance Criteria	Results (✓)
UMN	Vibration is < 0.195 in/sec	☑ SAT ☐ UNSAT
UME	Vibration is < 0.119 in/sec	☑ SAT ☐ UNSAT
UMA	Vibration is < 0.167 in/sec	☑ SAT ☐ UNSAT

ATTACHMENT 2
2C ICW Quarterly Pump Code Run
(Page 1 of 1)

Date: _____ / _____/ _____ Vibration Instr. No. _____

Table 1
2C ICW Pump Flow and Vibration Data

Parameter		Reading	Acceptance Criteria		
			Allowable Range	Alert Range	Required Action
Intake Level		-3.44 ft.	N/A	N/A	N/A
Pump Disch. Press. (PI-21-5C)		43 psig	N/A	N/A	N/A
Calculated Pump Head *		**125.6** ft.	126.3 to 140.8	123.6 to < 126.3	< 123.6 or > 140.8
Peak Velocity **	UMN	.06208 in./sec.	< 0.195	0.195 to 0.468	> 0.468
	UME	**.05777** in./sec.	<0.119	0.119 to 0.286	> 0.286
	UMA	.06126 in./sec.	< 0.167	0.167 to 0.401	> 0.401

* Calculated Pump Head = 41 ft. + (Disch. Press. x 2.307) - (Intake Level + 18 ft.).
** See Attachment 1, 2C ICW Pump Vibration Reading Locations, for measurement points.

1. **INDICATE** purpose of test:

☑ Code Run

☐ Post Maintenance (explain) _____

☐ Other (explain) _____

2. **EVALUATE** the test data with respect to acceptance criteria and **INDICATE** status:

CRITCAL STEP

☐ ACCEPTABLE

☑ ALERT RANGE

☐ REQUIRED ACTION RANGE

JPM TITLE: RO EXPOSURE LIMITS NORMAL OPS

JPM NUMBER: L-19-1 NRC JPM A-4 RO **REV.** 0

TASK NUMBER(S) / TASK TITLE(S):

K/A NUMBERS / K/A VALUES: (RO SRO) 2.3.7 RCO (3.5) Ability to comply with radiation work permit requirements during normal or abnormal conditions.

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:
☒ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [ ] Perform: [X]

EVALUATION LOCATION: In-Plant: [ ] Control Room: [ ]
Simulator: [ ] Other: [ ]
Lab: [X]

Time for Completion: 15 Minutes Time Critical: NO

Alternate Path [NRC]: NO
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10.	Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11.	Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16.	If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☐	☐	☒

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:

- **HPP-30, Personnel Monitoring**

General References:

- **HPP-30, Personnel Monitoring**

Task Standards: This JPM is complete when the applicant determines what dose would be received for each person and which employee(s) are allowed to rebuild the Hoist Box without the Vice President Nuclear

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

Unit 2 is in a refueling outage and refueling equipment preparations are under way. The Refueling Machine Hoist Box will need to be rebuilt.

The Hoist Box rebuild will take 45 minutes in a 2700 mR/hr field.

Below are the employee's dose records:

Employee	Age	Lifetime Dose (TEDE)	Current Year DLR (Dosimetry of Legal Record) total (TEDE)	TOTAL DOSE	Employee CAN / CANNOT Rebuild the Hoist Box without the Vice President Nuclear approval
1	40	27 R	2050 mR		
2	38	33 R	1970 mR		
3	35	30 R	2000 mR		
4	27	19 R	1450 mR		

INITIATING CUES:

You are the Desk RCO, what dose would be received for each person and which employee(s) are allowed to rebuild the Hoist Box **without** the **Vice President Nuclear** approval IAW HPP-30, Personnel Monitoring?

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

Performance Step: 1 **Critical NO**	**Calculates the dose the employee will receive performing the rebuild.**
Standard:	**CALCULATES** 2700 mR/hr x 45 min x 1 hr/60 min = 2025 mR.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

HPP-30, Personnel Monitoring	
Performance Step: 2 **Critical: YES**	**Determines employee #1's Total dose.**
Standard:	**DETERMINES** that employee #1 will exceed 4000 mR/year and will need the Vice President Nuclear approval. Employee #1 **CANNOT** be used.
Evaluator Cue:	**NONE** **EXAMINERS NOTE:** Per HPP-30 Step 7.4.4, Vice President Nuclear shall approve all dose extensions above the annual limit of 4000 mrem TEDE. Employee #1 would receive 4075 mR
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 3 **Critical: YES**	**Determines employee #2's Total dose.**
Standard:	**DETERMINES** that employee #2 will not exceed dose limits. Employee #2 **CAN** be used.
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE,** employee #2 would receive 3995 mR
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 4 **Critical YES**	**Determines employee #3's Total dose.**
Standard:	**DETERMINES** that employee #3 will exceed 4000 mR/year and will need the Vice President Nuclear approval. Therefore employee #3 **CANNOT** be used.
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE,** employee #3 would receive 4025mR
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 5 **Critical YES**	**Determines employee #4's Total dose.**
Standard:	**DETERMINES** that employee #4 will not exceed dose limits. Therefore employee #2 **CAN** be used.
Evaluator Cue:	**NONE** **EXAMINERS NOTE:** employee #4 would receive 3475 mR
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 6 **Critical NO**	**Candidate informs the Examiner that the task is complete.**
Standard:	I**NFORMS** the Examiner that the task is complete.
Evaluator Cue:	**TASK IS COMPLETE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Terminating Cues: **This JPM is complete when the applicant determines what dose would be received for each person and which employee(s) are allowed to rebuild the Hoist Box without the Vice President Nuclear**

The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

Unit 2 is in a refueling outage and refueling equipment preparations are under way. The Refueling Machine Hoist Box will need to be rebuilt.

The Hoist Box rebuild will take 45 minutes in a 2700 mR/hr field.

Below are the employee's dose records:

Employee	Age	Lifetime Dose (TEDE)	Current Year DLR (Dosimetry of Legal Record) total (TEDE)	TOTAL DOSE	Employee CAN / CANNOT Rebuild the Hoist Box without the Vice President Nuclear approval
1	40	27 R	2050 mR		
2	38	33 R	1970 mR		
3	35	30 R	2000 mR		
4	27	19 R	1450 mR		

INITIATING CUES:

You are the Desk RCO, what dose would be received for each person and which employee(s) are allowed to rebuild the Hoist Box **without** the **Vice President Nuclear** approval IAW HPP-30, Personnel Monitoring?

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APPENDIX 6
AUTHORIZATION TO EXCEED ADMINISTRATIVE LIMITS
(Page 1 of 4)

7.0 Instructions: General

This appendix contains the instructions necessary to authorize persons to exceed administrative exposure limits.

7.1 When an individual is expected to exceed his exposure limits, a Radiation Exposure Extension Request (HPP-30.12) shall be completed.

NOTE
A request for this extension should be made at least 8 hours prior to expecting the individual to exceed the administrative exposure limits.

7.2 Before an extension is authorized, an investigation into the individual's radiation exposure history shall be conducted.

7.3 §2 Authorization may be granted as long as the exposure limits in 10 CFR 20 are not exceeded.

7.4 §2 Administrative Exposure Limits

1. Any individual with non-documented current year exposure shall have their annual exposure limits set to the following doses with RP Supervision approval:

A.	TEDE	0.25 rem
B.	Lens of eye	1.35 rem
C.	Skin	4.5 rem
D.	Extremity	4.5 rem
E.	CDE	4.5 rem

REVISION NO.:	PROCEDURE TITLE:	PAGE:
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APPENDIX 6
AUTHORIZATION TO EXCEED ADMINISTRATIVE LIMITS
(Page 2 of 4)

7.4 (continued)

2. §2 An individual with a complete Form 4 for the current year may have their site annual dose limit extended to greater than 2000 mrem by the Radiation Protection Manager, and the Site Director.

3. An individual with a complete Form 4 for the current year may have their annual dose limit extended to greater than 3000 mrem / year, by the Radiation Protection Manager and Site Director.

NOTE
Record DLR dose (from all sources) should be used for dose extension exceeding 4000 mrem TEDE.

4. §2 The Site Director, Radiation Protection Manager and Vice President Nuclear shall approve and the Site Vice President shall authorize all dose extensions above the annual limit of 4000 mrem TEDE not to exceed 4500 mrem TEDE.

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APPENDIX 6
AUTHORIZATION TO EXCEED ADMINISTRATIVE LIMITS
(Page 3 of 4)

NOTE
Circumstances requiring extending an annual limit should be documented. The documentation should include justification for the limit extension.

7.5 HPP-30.12 Request for Exposure Extension Form

1. When an exposure extension is needed, the requesting supervisor completes the following items on the HPP-30.12:

- **A.** RWP #
- **B.** Job description
- **C.** PID #
- **D.** Name
- **E.** Signature
- **F.** Date
- **G.** Requested limit
- **H.** Obtains worker's initials to ensure the worker is aware a request for extension is being submitted.

Then,

- **I.** Submits the completed form to the dosimetry office.

2. Dosimetry office personnel:

- **A.** Review the current annual exposure. Note the date and time this exposure information is obtained from Health Physics computer system.
- **B.** A "Complete" current annual exposure history for extensions is defined as a signed Form 5 or equivalent provided by all licensees or the individual's employer signed records for the current year.
- **C.** Signed individual dose estimates by the worker are defined as "Incomplete" records for dose extensions.
- **D.** Review the personnel exposure history files to verify the status of the records. Enter a "C" for complete or "I" for incomplete in the status box on the form HPP-30.12.
- **E.** Sign and enter the date/time in the "Records Checked By" box.
- **F.** Advise the requesting supervisor that Form HPP-30.12 is ready for the approval process.

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APPENDIX 6
AUTHORIZATION TO EXCEED ADMINISTRATIVE GUIDELINES
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7.5 (continued)

3. The requesting supervisor retrieves the HPP-30.12 from the dosimetry office and routes it for the required approval signatures.

A. Requests approval signatures

1. RP Manager

2. Site Director

3. VP Nuclear (when applicable)

B. Form HPP-30.12 must be returned to the Dosimetry Office.

NOTE
The requesting supervisor should review a copy of the HPP-30.12 form to ensure there are sufficient qualified workers available since some workers may not have received an extension.

4. Upon receipt of the approved HPP-30.12, Dosimetry personnel:

A. Enter the extensions into the RP computer system for those individuals with a "Complete" status (not to exceed the limits specified in HPP-30, Personnel Monitoring).

B. Do not extend individuals with "Incomplete" records status.

C. Retain the original copy of the HPP-30.12 form.

7.6 The administrative limits below should be followed when monitoring shallow (skin and extremity) dose:

1. Re-evaluate shallow does equivalent (SDE) results when a person's SDE whole body or SDE max extremity reaches 20 rem.

2. §2 When a person's annual shallow dose equivalent (SDE) for SDE whole body or SDE max extremity reaches 40 rem all sites, the person shall be restricted from further entry into the RCA for the remainder of the year.

END OF APPENDIX 6

JPM TITLE: SRO CALC BORON FOR WITHDRAWAL OF DROPPED CEA and T.S.

JPM NUMBER: L-19-1 NRC JPM A-1S **REV.** 0

TASK NUMBER(S) / TASK TITLE(S): 07002440/ Calculate Boron Concentration Change
07066120/ Perform a Dropped CEA Recovery

K/A NUMBERS / K/A VALUES: (RO SRO) Task 2.1.25 RCO (4.2) Ability to interpret reference materials, such as graphs, curves, tables, etc

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:
☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: ☐ Perform: X

EVALUATION LOCATION: In-Plant: ☐ Control Room: ☐
Simulator: ☐ Other: X
Lab: ☐

Time for Completion: 15 Minutes Time Critical: NO

Alternate Path [NRC]: NO
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10.	Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11.	Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16.	If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☐	☐	☒

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:
- Ops-520 Briefing, Data and Check Sheets, Briefing Sheet 1, Reactivity Management
- Physics Curves
- 1-AOP-66.01 Dropped or Misaligned CEA Abnormal Operations
- Unit-1 Daily Chemistry Sheet
- 1-NOP-02.24 Boron Concentration Control

General References:
- 1-AOP-66.01 Dropped or Misaligned CEA Abnormal Operations
- Unit-1 Daily Chemistry Sheet
- 1-NOP-02.24 Boron Concentration Control

Task Standards: This JPM is complete when the applicant has calculated the boration rate necessary to recover the worst case dropped CEA.

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

At 0100, Unit-1 is 100% power when CEA #7 in "B" shutdown group dropped, with its associated rod bottom light lit, all remaining "B" shutdown group are at 136", EFPH is 5000.
1-AOP-66.01 Dropped or Misaligned CEA Abnormal Operations has been entered. Attachment 5, CEA Functional Test and Operability Determination has been completed, CEA #7 is OPERABLE.

At 0110, Unit-1 is 92% power and stable Step 6.A. of Attachment 1, Dropped CEA Recovery with Reactor Critical, is being implemented for Shutdown Bank "B" CEA #7.

INITIATING CUES:

You are the Unit Supervisor. You are to calculate the boric acid rate required to recover the worst case dropped rod over a 10 minute period, using the 1A BAMT, per Ops-520, Briefing Sheet 1, Reactivity Management. Additionally, identify all required applicable Tech Spec actions statements required.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

Briefing Sheet 1, Reactivity Management	
Performance Step: 1 **Critical YES**	**CALCULATE the RCS Boron concentration increase required.** Applicant determines Worst Case Dropped Rod Worth (Physics Curve Book B.4)
Standard:	Applicant determines value to be **172 pcm** from Figure B.4, St. Lucie Unit 1 Cycle 28
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	Highest Single Dropped CEA Worth = 172 pcm

Performance Step: 2 **Critical: YES**	**CALCULATE the RCS Boron concentration increase required.** Applicant determines HFP Boron Worth (Physics Curve Book C.1)
Standard:	Applicant determines value to be **8.39 pcm/ppm** from Figure C.1, St. Lucie Unit 1 Cycle 28
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	Hot Full Power Differential Boron Worth at 5000 EFPH is 8.39 pcm/ppm

Performance Step: 3 **Critical: YES**	**CALCULATE the RCS Boron concentration increase required.** Applicant calculates the RCS Boron centration increase required is **20.5 ppm**. (172pcm/8.39pcm/ppm)
Standard:	Applicant calculates the RCS Boron centration increase required is 20.5 ppm. Worst Case Dropped Rod Worth divided by HFP Boron Worth.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	Applicant calculates the RCS Boron centration increase required is 20.5 ppm. Worst Case Dropped Rod Worth divided by HFP Boron Worth.

Performance Step: 4 **Critical YES**	**CALCULATE the amount of boric acid needed from the selected BAMT:** $V_{BAMT} = V_{RCS} * \ln(Cb_{BAMT}-Cb_{RCSi} / Cb_{BAMT}-Cb_{RCSf})$
Standard:	Applicant calculates the required volume of boric acid to be added is $V_{BAMT} = V_{RCS} * \ln(Cb_{BAMT}-Cb_{RCSi} / Cb_{BAMT}-Cb_{RCSf})$ $V_{BAMT} = 62,500 * \ln((5,870-843) / (5,870 – 863.5))$ 255.4 gallons of boric acid
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	Applicant calculates the required volume of boric acid is 255.4 gallons

Performance Step: 5 **Critical YES**	**CALCULATE the initial Boration Rate necessary to recover the dropped rod:** Applicant determines the boration rate.
Standard:	Applicant determines that the boration rate is 25.54 gpm (**25-26.2 gpm)**
Evaluator Cue:	**NOTE** **The acceptable range takes into consideration the rounding of the calculation results**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	62500x ℓn $\frac{\text{BAM TK – Initial RCS Boron Conc}}{\text{BAM TK – Final RCS Boron Conc}}$ ⇨ 62500x ℓn $\frac{5870ppm – 843ppm}{5870ppm – 863.5ppm}$ 62500x ℓn 1.00409 ⇨ 62500x .004086 ⇨ 255.39 gal boric acid ⇨ **255.39/10 min = 25.5 gpm**

Performance Step: 6 **Critical YES**	**Determine Tech Spec applicability for the dropped CEA** Applicant determines the Tech Spec applicability for Shutdown Bank CEA #7 being out of alignment with the rest of it group.
Standard:	Applicant determines that the following Tech Spec actions apply at 0110: Tech Spec 3.1.3.1 action (e)
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Terminating Cues:

The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

At 0100, Unit-1 is 100% power when CEA #7 in "B" shutdown group dropped, with its associated rod bottom light lit, all remaining "B" shutdown group are at 136", EFPH is 5000.
1-AOP-66.01 Dropped or Misaligned CEA Abnormal Operations has been entered. Attachment 5, CEA Functional Test and Operability Determination has been completed, CEA #7 is OPERABLE.

At 0110, Unit-1 is 92% power and stable Step 6.A. of Attachment 1, Dropped CEA Recovery with Reactor Critical, is being implemented for Shutdown Bank "B" CEA #7.

INITIATING CUES:

You are the Unit Supervisor. You are to calculate the boric acid rate required to recover the worst case dropped rod over a 10 minute period, using the 1A BAMT, per Ops-520, Briefing Sheet 1, Reactivity Management. Additionally, identify all required applicable Tech Spec actions statements required.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

REVISION NO.: 8	PROCEDURE TITLE: DROPPED OR MISALIGNED CEA ABNORMAL OPERATIONS	PAGE: 17 of 34
PROCEDURE NO.: 1-AOP-66.01	ST. LUCIE UNIT 1	

ATTACHMENT 1
Dropped CEA Recovery With Reactor Critical
(Page 3 of 4)

NOTE

- If it can be done within the allowable time, it is desirable to pace the recovery to take at least 10 minutes.
- If Attachment 1, Step 6 can **NOT** be performed successfully, then Attachment 1, Step 5 shall be performed.

6. **WITHDRAW** dropped CEA as follows:

A. **RECORD** and **MAINTAIN** ΔT power less than or equal to power level recorded in Section 4.2, Step 4 or 70%, whichever limit is in effect, by borating. (Section 6.1.3, Management Directive 2)

Power level to maintain: **92** %

NOTE

Topics for Dropped CEA Recovery on Briefing Sheet 1, Reactivity Management, of OPS-520, Briefing, Data And Check Sheets, contains the amount and rate of boration while withdrawing the CEA.

B. **COMMENCE** borating per Operator Aid - RCS Boration Guide, posted at RTGB-105.

C. **SELECT** CEAPDS POSITION BACKUP DISPLAY to monitor affected CEA.

D. On CEA POSITION DISPLAYS panel, **SELECT** affected group using desired scale (FULL or +/-15 INCHES).

E. On MODE SELECTION panel, **SELECT** MANUAL INDIVIDUAL (MI).

F. On INDIVIDUAL CEA SELECTION panel, **SELECT** affected CEA.

G. On GROUP SELECTION panel, **SELECT** affected group.

Briefing Sheet 1
Reactivity Management
(Page 1 of 2)

Beginning of Shift Reactivity Review (Control Room Personnel Only - **Shiftly**)

- ☐ Water / Acid / CEA / Turbine changes during past shift
- ☐ EFPH _____ Boron _____ ppm Xenon trend _____ pcm ASI trend/stability _____
- ☐ Water / Acid / CEA / Turbine changes expected this shift
- ☐ Water / Acid to change temperature 0.1°F Water _____ gal. Acid _____ gal
- ☐ Blend ratio _____/1
- ☐ Operations reactivity evolutions planned this shift
- ☐ Maintenance activities potentially challenging reactivity
- ☐ Operator Work Arounds impacting reactivity
- ☐ Reactor Power Band _____ RCS Temperature Band _____

Topics Specific to Boron Concentration Control (**Shiftly**)

- ☐ Flow Path (VCT or charging pump suction)
- ☐ Amount to be added
- ☐ Volume Control Tank inventory management (as required)
- ☐ Ion Exchanger vs RCS boron concentration differences (delithiations)
- ☐ Expected Annunciators (M-26 for dilutions, N-40 for borations, M-2 for diverting)

Topics for Dropped CEA Recovery (Calculation on page 2, **1st day of shift rotation**)

- ☐ RCS Boron increase required for worst case dropped CEA _____ ppm
- ☐ Amount of Boric Acid required _____ gal
- ☐ Required Boration Flowrate required for CEA recovery _____ gpm
- ☐ Contingencies for dropped/misaligned CEA

Topics for Power Maneuvers (Profile for 100-92% at 10 mw shall be reviewed shiftly)

- ☐ Reactor Engineering predictions for borations/dilutions during power maneuver
- ☐ Turbine Ramp Rate
- ☐ ASI change anticipation
- ☐ Expected dilution/boration to support stabilization

Topics Specific to CEA Control (required for planned CEA movement)

- ☐ Group height vs reactivity effect
- ☐ CEA positioning vs ASI control/effect

Topics Specific to Turbine Control (required for planned maneuvers)

- ☐ Ovation Controls setup (Target, Rate)
- ☐ Tavg / Tref bands

Brief Closure (**Shiftly**)

- ☐ Review Roles and Responsibilities
- ☐ Critical Steps
- ☐ Contingencies
- ☐ Any Questions

Briefing Sheet 1
Reactivity Management
(Page 2 of 2)

Determine the initial Boration Rate necessary to recover a dropped rod (taking at least 10 minutes per 1/2-AOP-66.01 as follows:

1. Calculate the RCS Boron concentration increase required (equivalent to the worth of the dropped rod):

   $$\frac{\text{Worst Case Dropped Rod Worth (Physics Curve Book B.4)}}{\text{HFP Boron Worth (Physics Curve Book C.1)}} = \frac{\_\_\_\_\_\ \text{pcm}}{\text{pcm/ppm}}$$

   RCS Boron concentration increase required = _____ ppm

2. Calculate the amount of boric acid needed from the selected BAMT:

   $$\text{Amount of boric acid needed} = V_{BAMT} = V_{RCS} \times \ln\left(\frac{Cb_{BAMT} - Cb_{RCSi}}{Cb_{BAMT} - Cb_{RCSf}}\right)$$

   Unit 1 V_{RCS} = 62,500 gallons @ NOP NOT

   Unit 2 V_{RCS} = 66,891 gallons @ NOP NOT

   Amount of boric acid needed = _____ gallons

3. Calculate the initial Boration Rate necessary to recover the dropped rod:

   $$\text{Boration Rate} = \frac{\text{Amount of boric acid needed}}{\text{(at least) 10 minutes}} = \_\_\_\_\_\ \text{gpm}$$

DAILY CHEMISTRY REPORT

ST. LUCIE UNIT # 1

PRIMARY CHEMISTRY

DATE: 10/1/2018

	REACTOR COOLANT SYSTEM									
Parameter	**Boron**	**Lithium**	**Chloride**	**Fluoride**	**Oxygen**	**Gross Act.**	**DEQ I-131**	**DEQ Xe-133**	**Hydrogen**	**Surge Boron**
Units	*ppm*	*ppm*	*ppb*	*ppb*	*ppb*	*uci/ml*	*uci/ml*	*uCi/ml*	*cc/kg*	*ppm*
Limits	See COP-05.04 for limits									
Result	**843**	**3.37**	**3.26**	**0.82**	**< 5**	**1.59E-01**	**2.09E-04**	**0.22**	**44.45**	**848**
Date	**9/30/2018**	**9/30/2018**	**9/30/2018**	**9/30/2018**	**9/30/2018**	**9/30/2018**	**9/30/2018**	**9/26/2018**	**9/30/2018**	**9/26/2018**

RCS Boron Sample Time: 19:40 I-131 = 7.32E-05 I-134 = 1.87E-03 Iodine Sample Date: 9/30/2018
Zinc Pump Stroke: 3.00 Iodine Ratio = **1.24E-01** Xe Ratio = **0.70** Chg. Pmp. 1
* Xe Ratio >1.0 should be investigated for potential fuel defect

	RWST		SFP		BAMT'S		SIT'S			
Parameter	**Boron**	**Silica**	**Boron**	**Silica**	**A Boron**	**B Boron**	**1A1**	**1A2**	**1B1**	**1B2**
Units	*ppm*	*ppb*	*ppm*	*ppb*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*
Limits	See COP-05.04 for limits									
Result	**2177**	**No Data**	**2206**	**No Data**	**5870**	**5776**	**2101**	**2102**	**2099**	**2097**
Date	**9/24/2018**	**No Data**	**9/27/2018**	**No Data**	**9/30/2018**	**9/30/2018**	**9/7/2018**	**9/7/2018**	**9/7/2018**	**9/7/2018**
Time	9:00 AM						9:00 AM	9:00 AM	9:00 AM	9:00 AM

SECONDARY CHEMISTRY

	STEAM GENERATORS						
Parameter	Chloride	Fluoride	Sulfate	Cation Conductivity	Sodium	Gross Act	B/D Rate
Units	*ppb*	*ppb*	*ppb*	*umhos/cm*	*ppb*	*uci/ml*	*GPM*
Limits	See COP-05.04 for limits						
1A Result	**0.84**	**0.21**	**0.90**	**0.39**	**0.39**	**< 9.770E-07**	**40**
Date	9/30/2018	9/30/2018	9/30/2018	9/30/2018	9/30/2018	10/1/2018	10/1/2018
1B Result	**0.75**	**0.28**	**0.99**	**0.44**	**0.44**	**< 9.77E-07**	**40**
Date	9/30/2018	9/30/2018	9/30/2018	9/30/2018	9/30/2018	10/1/2018	10/1/2018

	CONDENSATE		FEED			
Parameter	Cation Conductivity	Diss. O2	pH	Ammonia	Iron	Copper
Units	*umhos/cm*	*ppb*		*ppm*	*ppb*	*ppb*
Limits	See COP-05.04 for limits					
Result	**0.20**	**15.00**	**10.04**	**17.35**	**0.50**	**0.010**
Date	9/30/2018	9/30/2018	9/30/2018	9/30/2018	9/26/2018	9/26/2018

Unit 1 Projected Steam Generator Leak Rate Calculations(Info Only)

Using the Air Ejector Monitor

Leakrate	**Projected Reading**	
5 gpd =	**68**	*cpm*
30 gpd =	**309**	*cpm*
75 gpd =	**742**	*cpm*
100 gpd =	**982**	*cpm*
150 gpd =	**1464**	*cpm*
1 GPM =	**13881**	*cpm*
Current =	**<1**	*gpd*

Air Ejector Set Point Basis:
Alert: 2X Average Background
High: 3X Average Background

Using the Blow Down Monitors

Leakrate	**Projected Reading**		
	A S/G	**B S/G**	
5 gpd =	**205**	**256**	*cpm*
30 gpd =	**428**	**753**	*cpm*
75 gpd =	**831**	**1647**	*cpm*
100 gpd =	**1054**	**2144**	*cpm*
150 gpd =	**1501**	**3137**	*cpm*
1 GPM =	**13034**	**28767**	*cpm*
Current =	**<1**	**<1**	*gpd*

Blow Down Set Point Basis:
Alert: 2X Average Background

FLORIDA POWER & LIGHT CO.

Nuclear Fuel
Nuclear Engineering Department

St. Lucie Unit 1 Cycle 28 Operation Data for the Nuclear Design Report

Engineering Evaluation

PSL-ENG-SEFJ-18-001
Revision 0

Quality Related

REVIEW AND APPROVAL RECORD

PLANT: PSL **UNIT:** 1

TITLE: St. Lucie Unit 1 Cycle 28 Operation Data for the Nuclear Design Report

SAFETY CLASSIFICATION: Quality Related

LEAD DISCIPLINE: Nuclear Fuel

ENGINEERING ORGANIZATION: Nuclear Engineering

REVIEW/APPROVAL:
NOTE: NAMS EC Milestones 101 through 199 may be used instead of signing below.

GROUP	INTERFACE TYPE			PREPARED	VERIFIED	APPROVED	FPL/NextEra APPROVED*
	INPUT	REVIEW	N/A				
MECH			X				
ELECT			X				
I&C			X				
CIVIL			X				
CSI			X				
NUC FUEL	X			See EC Milestones	See EC Milestones	See EC Milestones	N/A

* For Contractor Evals As Determined By Engineering Manager

FPL/NextEra ENGINEERING MANAGER APPROVAL: See EC Milestones **DATE:** See EC Milestones

OTHER INTERFACES

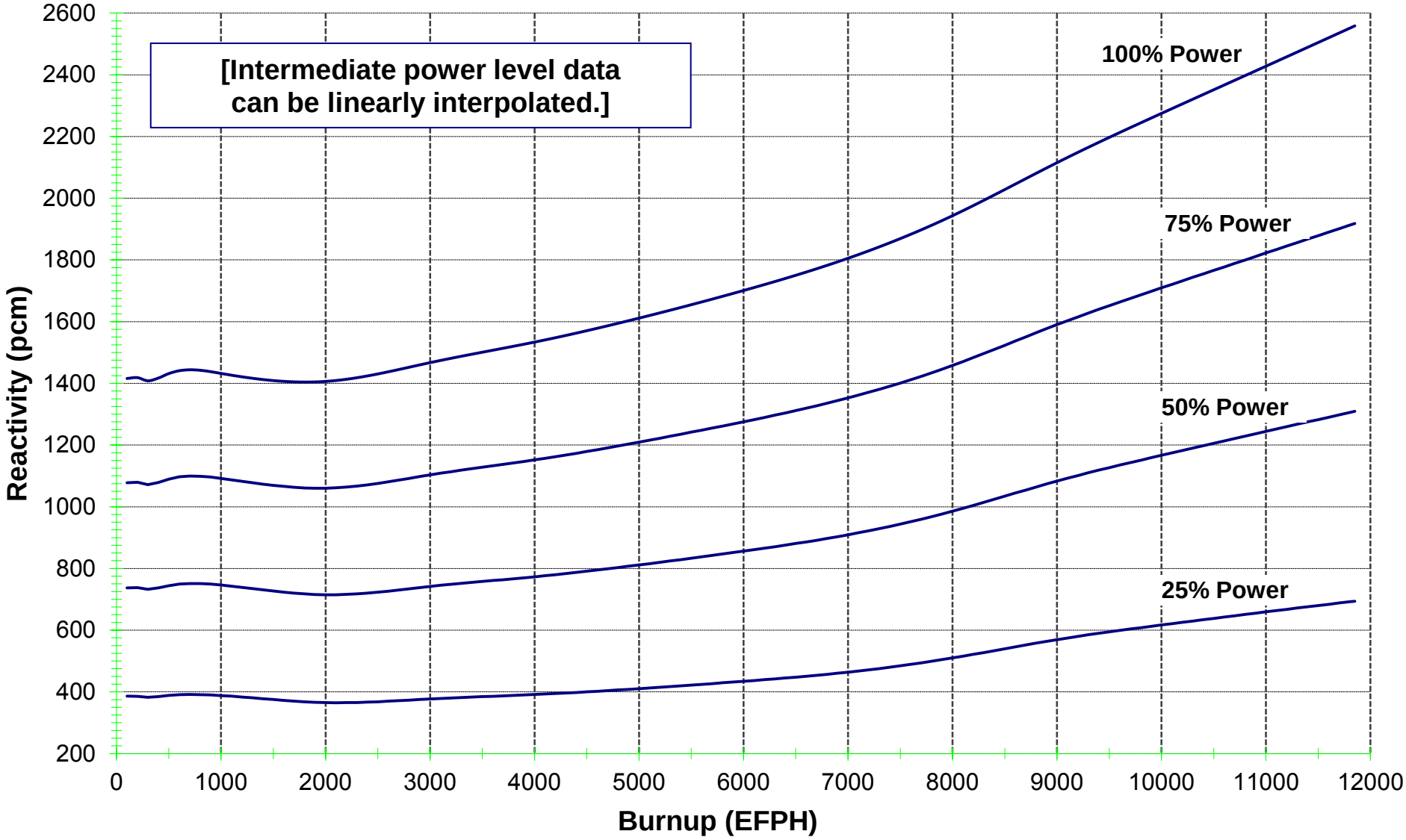
TABLE OF CONTENTS

Attachment 1 (continued)

Attachment 1

St. Lucie Unit 1 Cycle 28 Nuclear Design Report

Figure A.1 Rev. 1
St. Lucie Unit 1 Cycle 28
Power Defect vs Burnup



Date Of Update
____/____/____

Reference: PSL-1FJF-18-003 Rev. 0, Attachment 1 Page 2

Figure A.1 Rev. 1
Page 1 of 4

St. Lucie Unit 1 Cycle 28

Power Defect (pcm) vs Burnup (EFPH)

EFPH	100%	75%	50%	25%
100	1416	1078	737	386
200	1419	1079	738	385
300	1408	1072	733	383
400	1417	1079	737	385
500	1432	1090	744	388
600	1441	1097	749	391
700	1444	1100	751	392
800	1442	1099	751	391
900	1438	1096	749	390
1000	1432	1092	746	388
1100	1426	1087	743	386
1200	1421	1082	739	383
1300	1416	1078	735	381
1400	1412	1073	731	378
1500	1409	1069	727	375
1600	1406	1066	723	372
1700	1405	1063	720	370
1800	1404	1061	718	368
1900	1405	1060	716	366
2000	1406	1060	715	365
2100	1409	1061	715	365
2200	1413	1064	716	365
2300	1418	1067	718	366
2400	1424	1071	720	367
2500	1430	1076	723	368
2600	1437	1081	727	370
2700	1445	1086	730	371
2800	1452	1092	734	373
2900	1460	1098	738	375
3000	1467	1103	742	377
3100	1474	1109	745	379

[Intermediate power level data can be linearly interpolated.]

Reference: PSL-1FJF-18-003 Rev. 0, Attachment 1 Page 3

Figure A.1 Rev. 1
Page 2 of 4

St. Lucie Unit 1 Cycle 28

Power Defect (pcm) vs Burnup (EFPH)

EFPH	100%	75%	50%	25%
3200	1481	1114	749	380
3300	1488	1119	752	382
3400	1494	1123	755	383
3500	1501	1128	758	385
3600	1507	1133	761	386
3700	1514	1137	764	387
3800	1520	1142	767	389
3900	1527	1147	770	390
4000	1534	1152	773	391
4100	1541	1157	776	393
4200	1548	1162	780	395
4300	1555	1168	783	396
4400	1563	1173	787	398
4500	1571	1179	791	400
4600	1579	1185	795	402
4700	1587	1191	799	404
4800	1595	1197	803	406
4900	1603	1203	807	408
5000	1611	1210	811	411
5100	1620	1216	816	413
5200	1628	1222	820	415
5300	1637	1229	824	417
5400	1646	1235	829	420
5500	1655	1242	833	422
5600	1664	1248	838	424
5700	1673	1255	842	427
5800	1682	1262	847	429
5900	1691	1268	851	432
6000	1701	1275	856	434
6100	1710	1282	861	437
6200	1720	1289	866	439

[Intermediate power level data can be linearly interpolated.]

Reference: PSL-1FJF-18-003 Rev. 0, Attachment 1 Page 4

Figure A.1 Rev. 1

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St. Lucie Unit 1 Cycle 28

Power Defect (pcm) vs Burnup (EFPH)

EFPH	100%	75%	50%	25%
6300	1730	1297	871	442
6400	1740	1304	876	445
6500	1750	1312	881	448
6600	1761	1319	886	451
6700	1771	1327	892	454
6800	1782	1336	897	457
6900	1794	1344	903	460
7000	1805	1353	909	464
7100	1817	1362	916	468
7200	1830	1371	922	472
7300	1842	1381	929	476
7400	1856	1391	936	480
7500	1869	1401	944	484
7600	1883	1412	952	489
7700	1897	1423	960	494
7800	1912	1434	968	499
7900	1928	1446	977	504
8000	1943	1458	986	510
8100	1960	1470	995	516
8200	1976	1483	1005	522
8300	1993	1497	1014	528
8400	2011	1510	1024	534
8500	2028	1523	1034	540
8600	2046	1537	1044	546
8700	2063	1550	1054	552
8800	2081	1564	1064	558
8900	2098	1577	1074	564
9000	2115	1590	1083	569
9100	2132	1603	1092	575
9200	2149	1616	1101	580
9300	2165	1628	1110	585
9400	2181	1640	1119	590

[Intermediate power level data can be linearly interpolated.]

Reference: PSL-1FJF-18-003 Rev. 0, Attachment 1 Page 5

Figure A.1 Rev. 1

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St. Lucie Unit 1 Cycle 28

Power Defect (pcm) vs Burnup (EFPH)

EFPH	100%	75%	50%	25%
9500	2197	1652	1127	595
9600	2213	1664	1135	599
9700	2229	1675	1143	604
9800	2244	1687	1151	608
9900	2260	1698	1159	612
10000	2275	1710	1167	617
10100	2290	1721	1175	621
10200	2306	1732	1182	625
10300	2321	1744	1190	630
10400	2336	1755	1198	634
10500	2352	1766	1206	638
10600	2367	1777	1213	642
10700	2382	1789	1221	647
10800	2397	1800	1229	651
10900	2413	1811	1237	655
11000	2428	1823	1244	659
11100	2443	1834	1252	663
11200	2459	1845	1260	668
11300	2474	1856	1267	672
11400	2489	1868	1275	676
11500	2505	1879	1283	680
11600	2520	1890	1290	684
11700	2536	1901	1298	688
11800	2551	1913	1306	692
11850	2559	1918	1309	694

[Intermediate power level data can be linearly interpolated.]

Figure A.2 - 5000 EFPH Rev. 4
St. Lucie Unit 1 Cycle 28
Xenon Buildup to Equilibrium

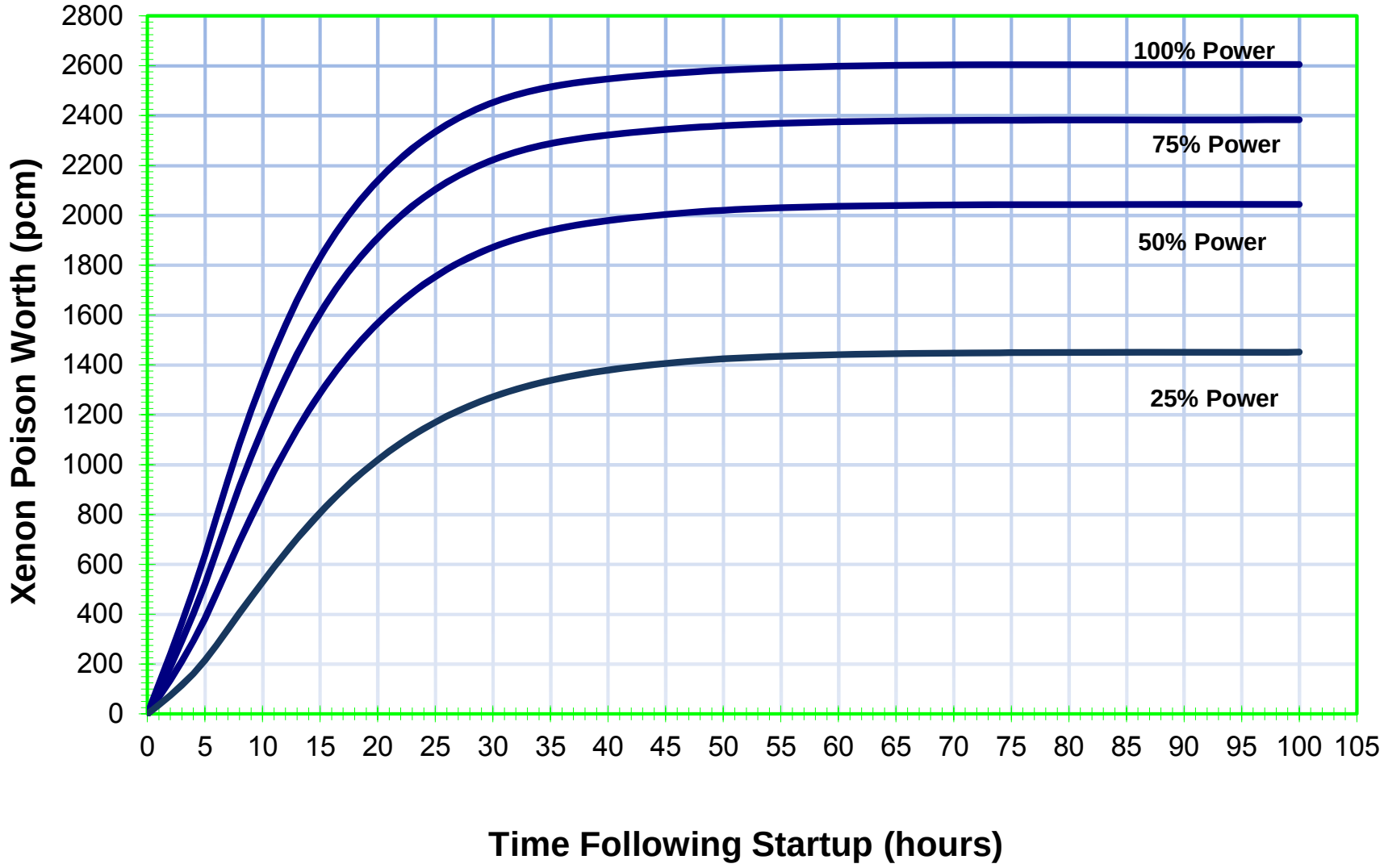

Figure A.2 Rev. 4

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St. Lucie Unit 1 Cycle 28

Xenon Buildup to Equilibrium (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
0	0	0	0	0
1	119	94	67	36
2	240	191	137	74
3	365	293	211	115
4	498	402	293	162
5	639	522	383	215
6	789	652	483	276
7	940	785	588	340
8	1082	912	690	404
9	1215	1031	789	467
10	1339	1144	884	529
11	1454	1250	974	589
12	1560	1349	1059	647
13	1658	1442	1140	703
14	1748	1528	1216	756
15	1830	1607	1287	807
16	1904	1679	1352	855
17	1972	1745	1413	900
18	2033	1804	1468	942
19	2088	1859	1520	982
20	2139	1909	1567	1019
21	2186	1955	1611	1054
22	2228	1997	1651	1086
23	2267	2036	1689	1116
24	2303	2071	1723	1144
25	2335	2104	1754	1170
26	2364	2133	1782	1194
27	2390	2159	1808	1216
28	2413	2182	1832	1236
29	2434	2204	1853	1255
30	2452	2222	1872	1272
31	2468	2239	1889	1288
32	2483	2254	1904	1302
33	2495	2267	1918	1315

Reference: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 14

Figure A.2 Rev. 4
Page 2 of 3

St. Lucie Unit 1 Cycle 28

Xenon Buildup to Equilibrium (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
34	2506	2278	1930	1327
35	2515	2288	1941	1338
36	2523	2296	1950	1348
37	2530	2304	1958	1357
38	2536	2311	1966	1365
39	2542	2317	1973	1372
40	2547	2322	1979	1379
41	2552	2327	1985	1385
42	2556	2332	1990	1391
43	2560	2336	1995	1397
44	2564	2340	2000	1402
45	2568	2344	2004	1406
46	2571	2348	2008	1411
47	2574	2351	2011	1414
48	2577	2354	2015	1418
49	2580	2357	2018	1421
50	2582	2359	2020	1424
51	2585	2362	2023	1427
52	2587	2364	2025	1429
53	2589	2366	2027	1431
54	2590	2367	2029	1433
55	2592	2369	2030	1435
56	2593	2370	2032	1436
57	2595	2372	2033	1438
58	2596	2373	2034	1439
59	2597	2374	2035	1440
60	2598	2375	2036	1441
61	2599	2376	2037	1442
62	2600	2377	2038	1443
63	2600	2377	2038	1444
64	2601	2378	2039	1444
65	2602	2379	2040	1445
66	2602	2379	2040	1446
67	2602	2380	2040	1446

Reference: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 15

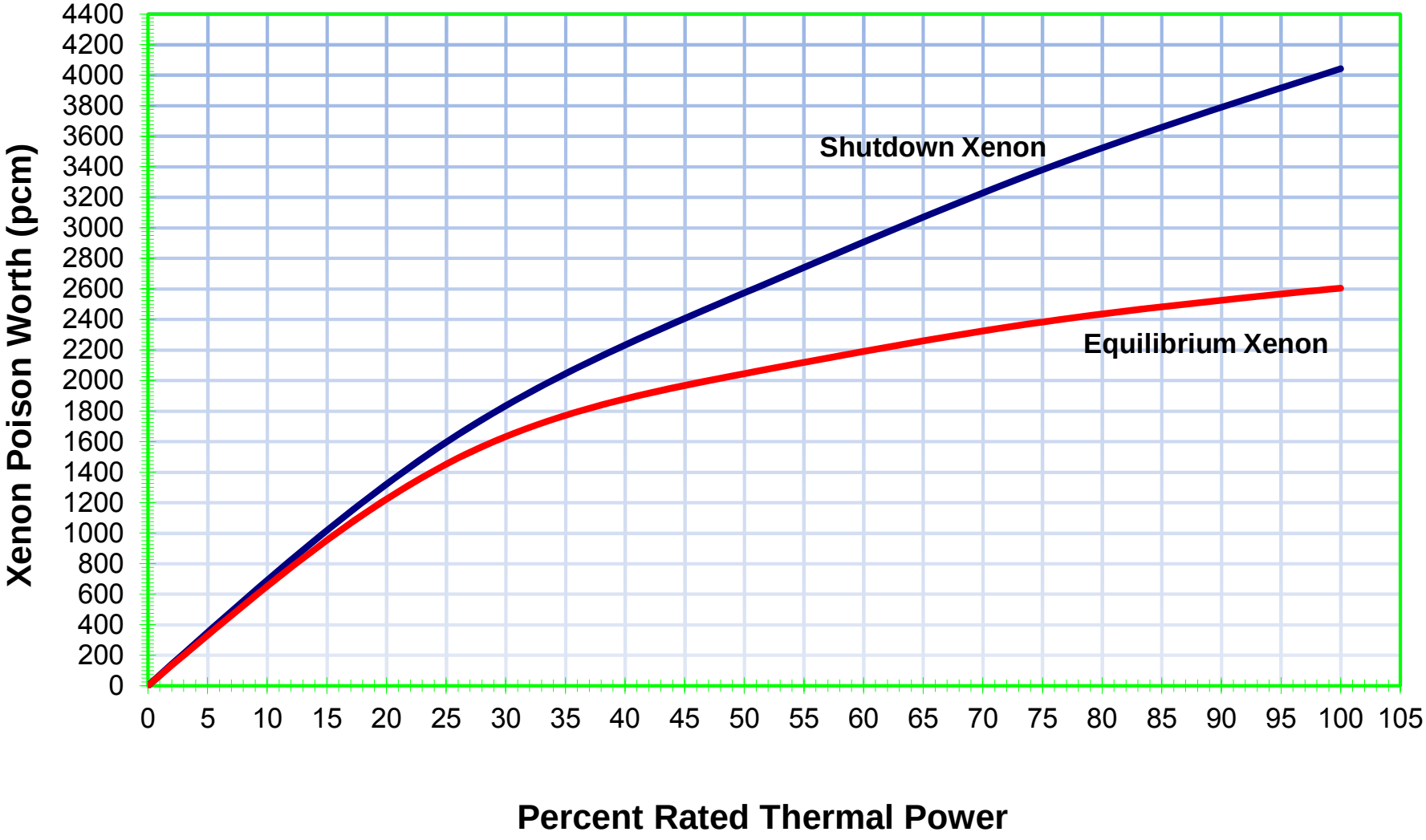
Figure A.2 Rev. 4
Page 3 of 3

St. Lucie Unit 1 Cycle 28

Xenon Buildup to Equilibrium (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
68	2603	2380	2041	1447
69	2603	2380	2041	1447
70	2603	2381	2042	1448
71	2603	2381	2042	1448
72	2604	2381	2042	1448
73	2604	2381	2042	1449
74	2604	2381	2042	1449
75	2604	2382	2043	1449
76	2604	2382	2043	1449
77	2604	2382	2043	1450
78	2604	2382	2043	1450
79	2604	2382	2043	1450
80	2604	2382	2043	1450
81	2604	2382	2043	1450
82	2604	2382	2043	1450
83	2604	2382	2043	1450
84	2604	2382	2043	1450
85	2604	2382	2043	1451
86	2604	2382	2043	1451
87	2604	2382	2043	1451
88	2604	2382	2043	1451
89	2604	2382	2044	1451
90	2604	2383	2044	1451
91	2604	2383	2044	1451
92	2604	2383	2044	1451
93	2605	2383	2044	1451
94	2605	2383	2044	1451
95	2605	2383	2044	1451
96	2605	2383	2044	1451
97	2605	2383	2044	1451
98	2605	2383	2044	1451
99	2605	2383	2044	1451
100	2605	2383	2044	1451

Figure A.3 - 5000 EFPH Rev. 4
St. Lucie Unit 1 Cycle 28
Xenon Worth vs. Reactor Power (SD and EQ)



Date Of Update
____/____/____

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 42

Figure A.3 Rev. 4

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St. Lucie Unit 1 Cycle 28

(5000 EFPH)

Xenon Worth vs. Reactor Power (Shutdown and Equilibrium)

(Units in pcm)

RX Power	S/D Xe	Equil Xe
0	0	0
1	70	67
2	140	133
3	210	199
4	279	265
5	349	331
6	418	397
7	487	461
8	555	526
9	623	589
10	690	652
11	757	714
12	823	775
13	888	836
14	953	895
15	1017	953
16	1080	1009
17	1141	1065
18	1202	1119
19	1262	1171
20	1321	1222
21	1378	1272
22	1434	1319
23	1489	1365
24	1543	1409
25	1595	1451
26	1646	1491
27	1695	1529
28	1743	1565
29	1789	1599

RX Power	S/D Xe	Equil Xe
30	1834	1632
31	1879	1663
32	1921	1692
33	1963	1720
34	2004	1746
35	2044	1771
36	2083	1795
37	2122	1818
38	2159	1839
39	2196	1860
40	2232	1880
41	2268	1899
42	2303	1917
43	2338	1934
44	2372	1951
45	2406	1967
46	2440	1983
47	2473	1999
48	2507	2014
49	2540	2029
50	2573	2044
51	2607	2059
52	2640	2074
53	2673	2089
54	2707	2103
55	2740	2118
56	2774	2133
57	2807	2147
58	2840	2162
59	2873	2176

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 43

Figure A.3 Rev. 4

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St. Lucie Unit 1 Cycle 28

(5000 EFPH)

Xenon Worth vs. Reactor Power (Shutdown and Equilibrium)

(Units in pcm)

RX Power	S/D Xe	Equil Xe
60	2907	2190
61	2939	2204
62	2972	2218
63	3005	2232
64	3038	2246
65	3070	2259
66	3102	2273
67	3134	2286
68	3166	2299
69	3197	2311
70	3228	2324
71	3259	2336
72	3290	2348
73	3320	2360
74	3350	2372
75	3380	2383
76	3409	2394
77	3438	2405
78	3467	2415
79	3495	2426
80	3523	2436
81	3551	2445
82	3578	2455
83	3606	2464
84	3632	2474
85	3659	2483
86	3686	2492
87	3712	2500
88	3738	2509
89	3764	2517

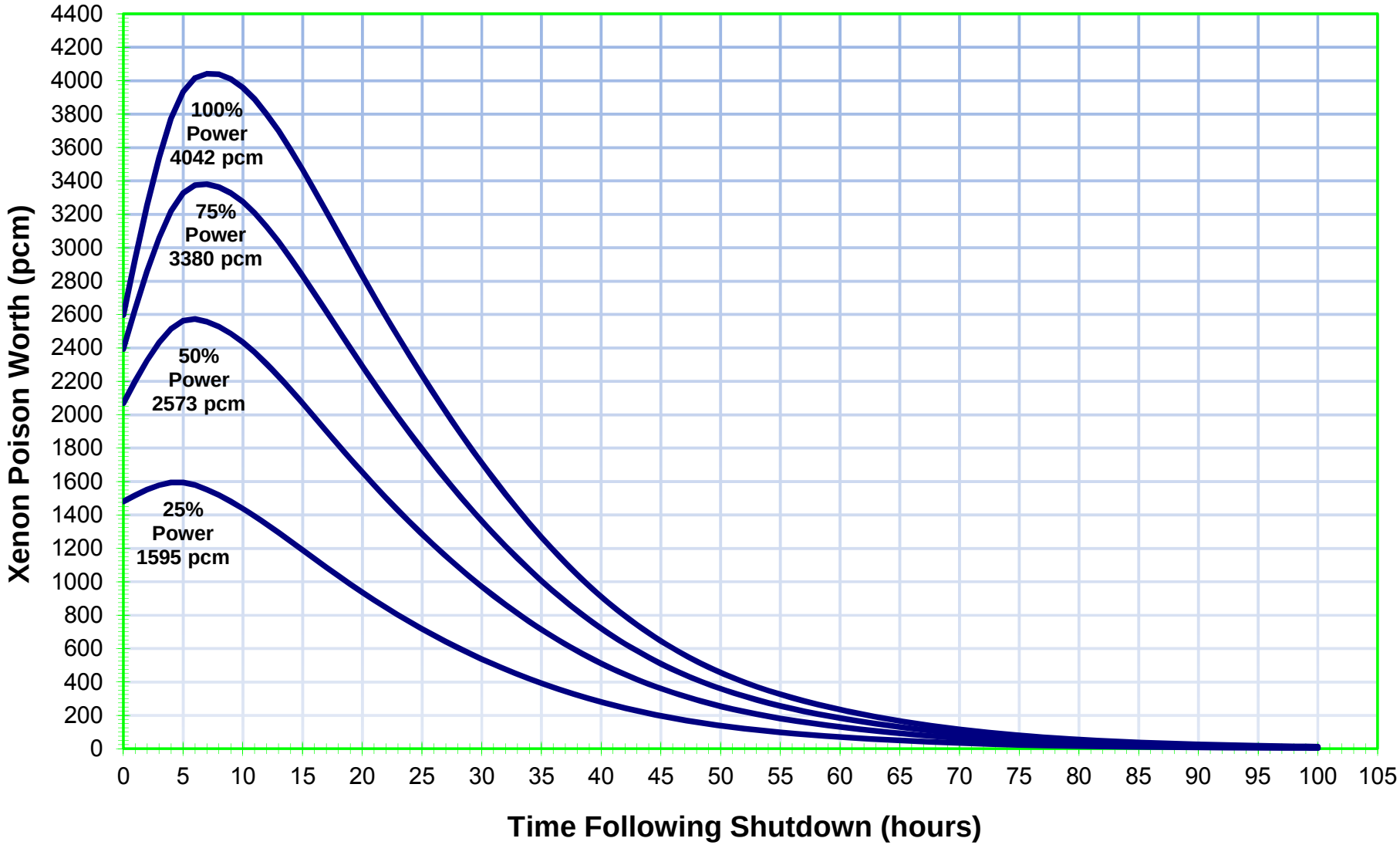
RX Power	S/D Xe	Equil Xe
90	3790	2526
91	3815	2534
92	3841	2542
93	3866	2550
94	3892	2558
95	3917	2566
96	3942	2574
97	3967	2582
98	3992	2590
99	4017	2597
100	4042	2605

Date Of Update

____/____/____

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 44

Figure A.4 5000 EFPH Rev. 4
St. Lucie Unit 1 Cycle 28
Xenon Worth Following Shutdown



Date Of Update
____/____/____

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 69

Figure A.4 Rev. 4

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St. Lucie Unit 1 Cycle 28

Xenon Worth Following Shutdown (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
0	2597	2393	2069	1480
1	2935	2633	2201	1518
2	3255	2859	2325	1552
3	3540	3059	2433	1578
4	3772	3219	2515	1594
5	3934	3327	2563	1595
6	4016	3375	2573	1579
7	4042	3380	2557	1552
8	4038	3363	2527	1518
9	4010	3328	2486	1480
10	3959	3275	2434	1438
11	3888	3208	2373	1392
12	3801	3127	2305	1344
13	3699	3036	2230	1294
14	3587	2937	2151	1242
15	3468	2833	2069	1190
16	3344	2726	1986	1138
17	3217	2617	1902	1086
18	3089	2508	1819	1035
19	2960	2399	1737	986
20	2833	2292	1656	937
21	2708	2187	1577	890
22	2586	2085	1501	845
23	2466	1985	1427	801
24	2350	1889	1355	759
25	2236	1794	1286	718
26	2125	1703	1219	679
27	2017	1614	1154	641
28	1912	1528	1091	605
29	1810	1445	1030	571
30	1712	1365	972	537
31	1616	1287	916	506
32	1524	1213	862	475
33	1435	1141	811	446

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 70

Figure A.4 Rev. 4
Page 2 of 3

St. Lucie Unit 1 Cycle 28

Xenon Worth Following Shutdown (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
34	1349	1072	761	419
35	1267	1006	714	392
36	1189	943	669	367
37	1114	883	626	344
38	1043	826	586	321
39	975	772	547	300
40	911	721	511	280
41	851	673	477	261
42	794	628	445	244
43	741	586	415	227
44	692	546	387	212
45	645	509	361	197
46	602	475	336	184
47	562	443	314	171
48	524	413	292	159
49	489	385	273	149
50	456	359	254	138
51	426	336	237	129
52	398	313	222	120
53	372	293	207	112
54	348	274	194	105
55	325	256	181	98
56	305	240	169	92
57	285	224	159	86
58	267	210	148	80
59	250	197	139	75
60	234	184	130	70
61	219	172	122	65
62	205	161	114	61
63	191	150	106	57
64	178	140	99	53
65	166	131	92	49
66	155	122	86	46
67	144	113	80	43

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 71

Figure A.4 Rev. 4
Page 3 of 3

St. Lucie Unit 1 Cycle 28

Xenon Worth Following Shutdown (units in pcm)
(5000 EFPH)

HOURS	100%	75%	50%	25%
68	134	105	74	40
69	125	98	69	37
70	116	91	64	34
71	108	85	59	32
72	100	78	55	29
73	93	73	51	27
74	86	68	47	25
75	80	63	44	23
76	74	58	41	22
77	69	54	38	20
78	64	50	35	19
79	59	46	32	17
80	55	43	30	16
81	51	40	28	15
82	47	37	26	14
83	44	34	24	13
84	41	32	22	12
85	38	29	20	11
86	35	27	19	10
87	32	25	18	9
88	30	24	16	9
89	28	22	15	8
90	26	20	14	8
91	24	19	13	7
92	22	18	12	7
93	21	17	12	6
94	19	16	11	6
95	18	14	10	6
96	17	14	9	5
97	16	13	9	5
98	14	12	8	5
99	13	11	8	4
100	12	10	7	4

Date Of Update

____/____/____

References: PSL-1FJF-18-008, Rev. 0, Attachment 1 Page 72

Figure A.5 - 5000 EFPH Rev. 4
St. Lucie Unit 1 Cycle 28
Shutdown Sm/Np/Transient Fission Product Worth

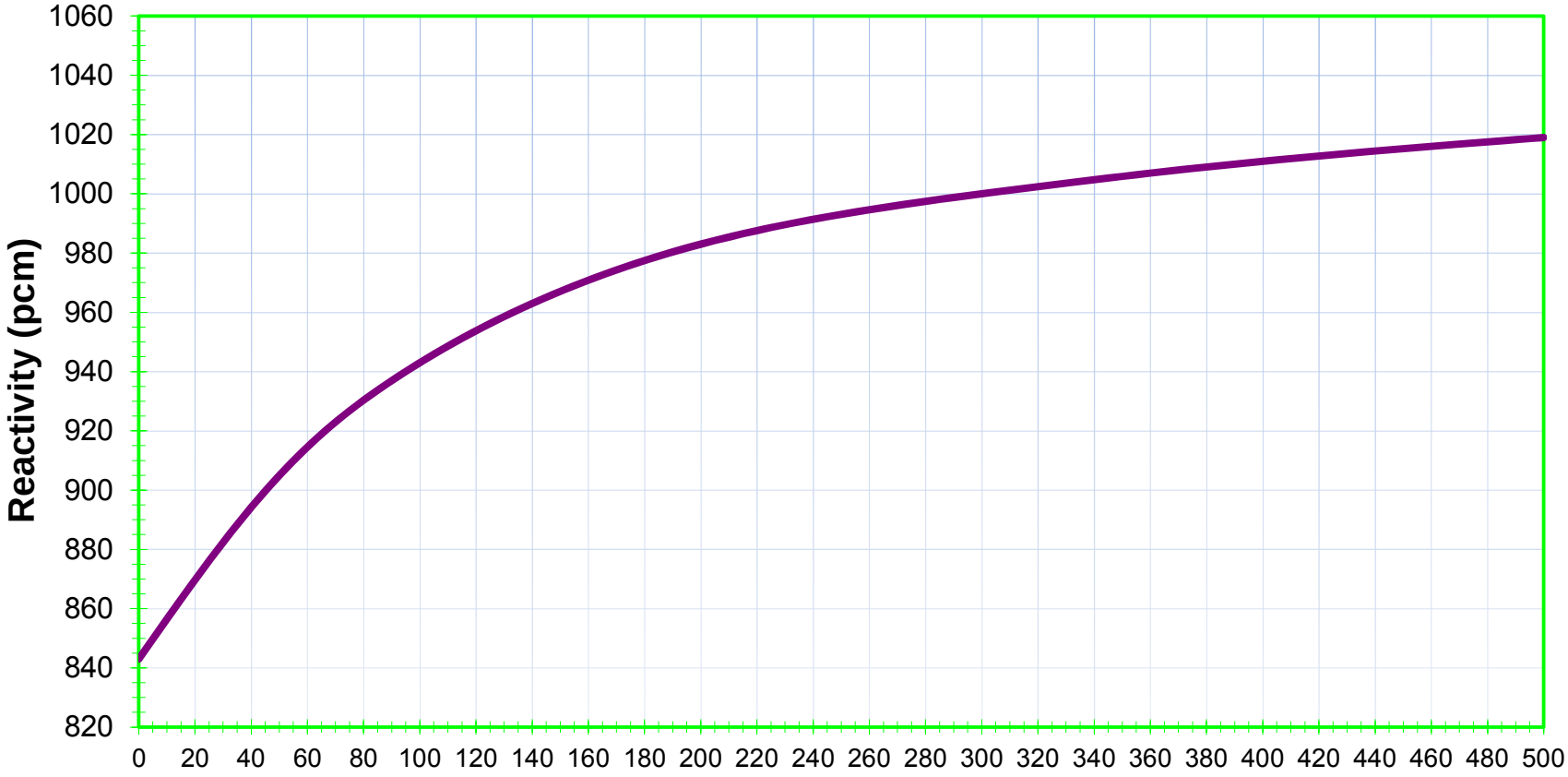


Figure A.5 Rev. 4

Page 1 of 1

St. Lucie Unit 1 Cycle 28

Sm/Np/Transient Fission Product Worth Contribution Following Shutdown

(5000 EFPH)

HOURS S/D	WORTH (PCM)
0	843
5	850
10	856
15	863
20	870
25	876
30	882
35	888
40	894
45	900
50	905
55	910
60	915
65	919
70	923
75	927
80	930
85	934
90	937
95	940
100	943
105	946
110	949
115	951
120	954
125	956
130	959
135	961
140	963
145	965
150	967
155	969
160	971
165	973
170	974

HOURS S/D	WORTH (PCM)
175	976
180	977
185	979
190	980
195	982
200	983
205	984
210	985
215	987
220	988
225	989
230	990
235	991
240	991
245	992
250	993
255	994
260	995
265	995
270	996
275	997
280	997
285	998
290	999
295	999
300	1000
305	1001
310	1001
315	1002
320	1002
325	1003
330	1004
335	1004
340	1005
345	1005

HOURS S/D	WORTH (PCM)
350	1006
355	1006
360	1007
365	1008
370	1008
375	1009
380	1009
385	1010
390	1010
395	1011
400	1011
405	1011
410	1012
415	1012
420	1013
425	1013
430	1014
435	1014
440	1014
445	1015
450	1015
455	1016
460	1016
465	1016
470	1017
475	1017
480	1018
485	1018
490	1018
495	1019
500	1019

Figure A.6 Rev. 4
St. Lucie Unit 1 Cycle 28
HZP Sequential Integral CEA Worth, 5000 EFPH

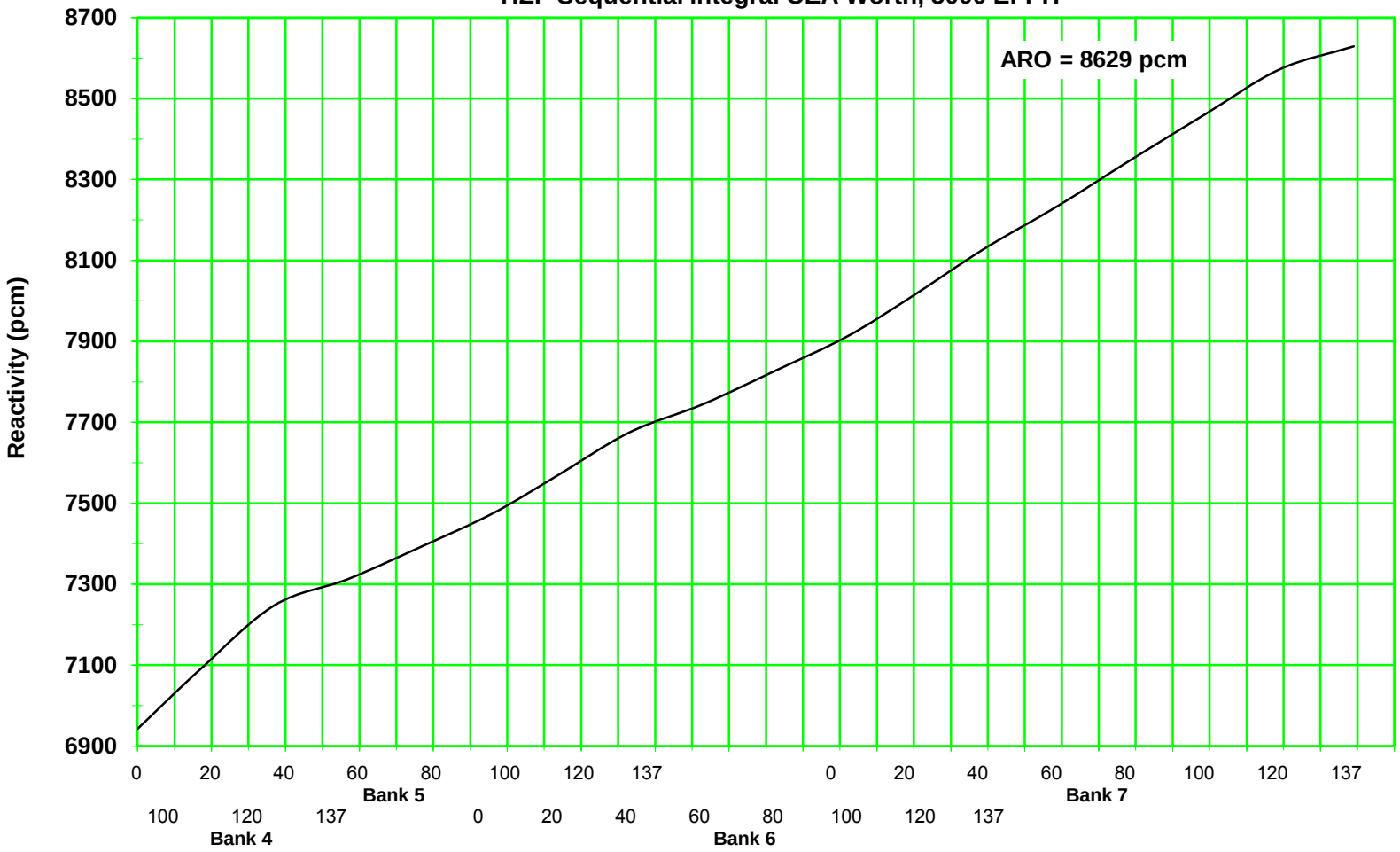
Group	Position (Inches Withdrawn)	Group	Position (Inches Withdrawn)	Integral Worth (pcm)
A	0			0
A	17			140
A	37			1261
A	57			1851
A	77			2147
A	97			2342
A	117			2540
A	137	B	0	2741
		B	17	2753
		B	37	2833
		B	57	3003
		B	77	3169
		B	97	3314
		B	117	3468
1	0	B	137	3603
1	17			3618
1	37			3683
1	57			3794
1	77			3915
1	96	2	0	4028
1	113	2	17	4224
1	133	2	37	4647
1	137	2	57	4983
		2	77	5200
3	0	2	96	5357
3	17	2	113	5514

Group	Position (Inches Withdrawn)	Group	Position (Inches Withdrawn)	Integral Worth (pcm)
3	37	2	133	5697
3	57	2	137	5754
3	77			5829
3	96	4	0	5907
3	113	4	17	6029
3	133	4	37	6304
3	137	4	57	6588
		4	77	6792
5	0	4	96	6943
5	17	4	113	7090
5	37	4	133	7248
5	57	4	137	7313
5	77			7394
5	96	6	0	7475
5	113	6	17	7565
5	133	6	37	7675
5	137	6	57	7745
		6	77	7830
7	0	6	96	7912
7	17	6	113	8008
7	37	6	133	8129
7	57	6	137	8235
7	77			8350
7	97			8462
7	117			8572
7	137			8629

Date of Update: ____ / ____ / ____

Reference: PSL-1FJF-18-007, Rev. 0, Attachment 1, Page 7

Figure A.6 Rev. 4
St. Lucie Unit 1 Cycle 28
HZP Sequential Integral CEA Worth, 5000 EFPH



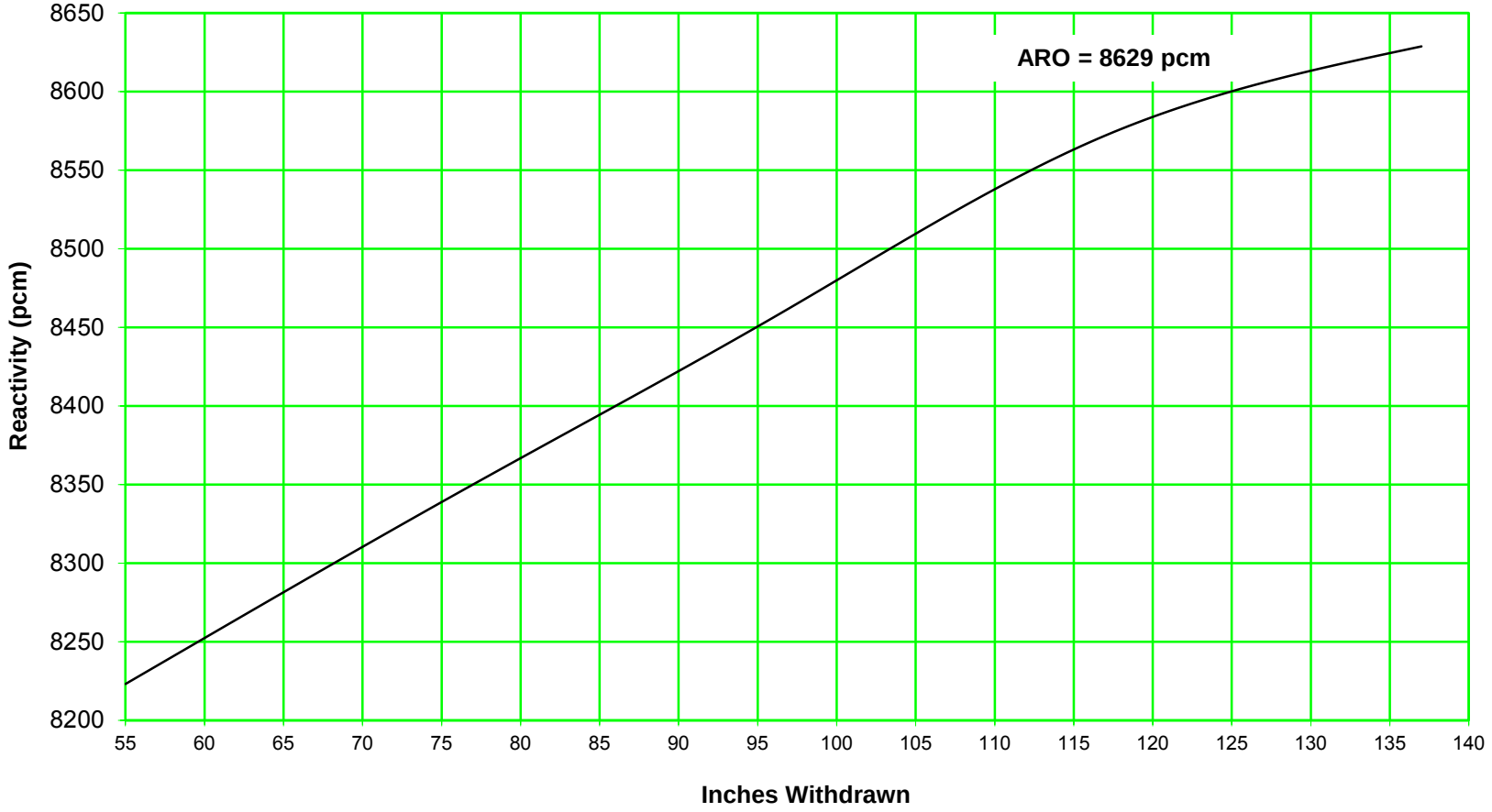
Date of Update: ____ /____ /____

Reference: PSL-1FJF-18-007, Rev. 0, Attachment 1, Page 8

Figure A.7 Rev. 4
St. Lucie Unit 1 Cycle 28
HZP Integral Worth of CEA Lead Group (55 in to ARO), 5000 EFPH

CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)
55	8223	76	8344	97	8462	118	8576
56	8229	77	8350	98	8468	119	8580
57	8235	78	8356	99	8474	120	8584
58	8241	79	8361	100	8480	121	8588
59	8246	80	8367	101	8486	122	8591
60	8252	81	8372	102	8492	123	8594
61	8258	82	8378	103	8498	124	8597
62	8264	83	8383	104	8504	125	8600
63	8270	84	8389	105	8510	126	8603
64	8276	85	8394	106	8515	127	8606
65	8281	86	8400	107	8521	128	8608
66	8287	87	8405	108	8527	129	8611
67	8293	88	8411	109	8532	130	8613
68	8299	89	8417	110	8538	131	8616
69	8305	90	8422	111	8543	132	8618
70	8310	91	8428	112	8548	133	8620
71	8316	92	8433	113	8554	134	8622
72	8322	93	8439	114	8558	135	8625
73	8328	94	8445	115	8563	136	8627
74	8333	95	8451	116	8568	137	8629
75	8339	96	8456	117	8572		

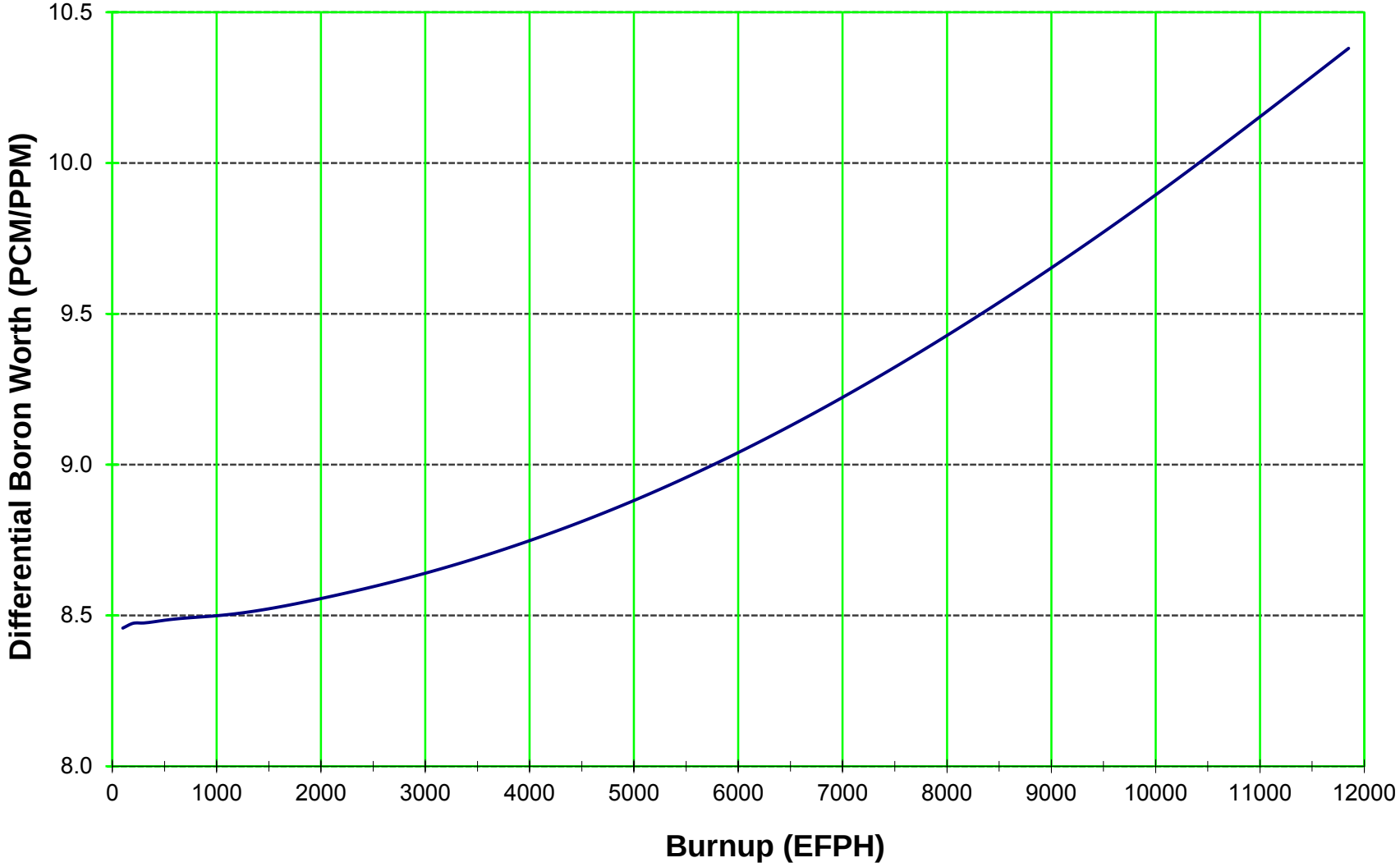
Figure A.7 Rev. 4
St. Lucie Unit 1 Cycle 28
HZP Integral Worth of CEA Lead Group (55 in to ARO), 5000 EFPH



Date of Update: _____/ _____ /_____

Reference: PSL-1FJF-18-007, Rev. 0, Attachment 1, Page 24

Figure A.8 Rev. 1
St. Lucie Unit 1 Cycle 28
HZP Differential Boron Worth vs Burnup



Date Of Update
____/____/____

Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1, Page 7

Figure A.8 Rev. 1
Page 1 of 1

St. Lucie Unit 1 Cycle 28

HZP Differential Boron Worth vs Burnup

Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)
100	8.46	3300	8.67	6500	9.13	9700	9.82
200	8.47	3400	8.68	6600	9.15	9800	9.84
300	8.47	3500	8.69	6700	9.17	9900	9.87
400	8.48	3600	8.70	6800	9.18	10000	9.89
500	8.48	3700	8.71	6900	9.20	10100	9.92
600	8.49	3800	8.72	7000	9.22	10200	9.94
700	8.49	3900	8.74	7100	9.24	10300	9.97
800	8.49	4000	8.75	7200	9.26	10400	10.00
900	8.50	4100	8.76	7300	9.28	10500	10.02
1000	8.50	4200	8.77	7400	9.30	10600	10.05
1100	8.50	4300	8.79	7500	9.32	10700	10.07
1200	8.51	4400	8.80	7600	9.34	10800	10.10
1300	8.51	4500	8.81	7700	9.36	10900	10.13
1400	8.52	4600	8.82	7800	9.39	11000	10.15
1500	8.52	4700	8.84	7900	9.41	11100	10.18
1600	8.53	4800	8.85	8000	9.43	11200	10.21
1700	8.53	4900	8.87	8100	9.45	11300	10.23
1800	8.54	5000	8.88	8200	9.47	11400	10.26
1900	8.55	5100	8.90	8300	9.49	11500	10.29
2000	8.56	5200	8.91	8400	9.52	11600	10.31
2100	8.56	5300	8.93	8500	9.54	11700	10.34
2200	8.57	5400	8.94	8600	9.56	11800	10.37
2300	8.58	5500	8.96	8700	9.58	11850	10.38
2400	8.59	5600	8.97	8800	9.61		
2500	8.60	5700	8.99	8900	9.63		
2600	8.60	5800	9.01	9000	9.65		
2700	8.61	5900	9.02	9100	9.68		
2800	8.62	6000	9.04	9200	9.70		
2900	8.63	6100	9.06	9300	9.72		
3000	8.64	6200	9.07	9400	9.75		
3100	8.65	6300	9.09	9500	9.77		
3200	8.66	6400	9.11	9600	9.79		

Date Of Update
___/___/___

Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1, Page 8

Figure A.9 Rev. 4

Page 1 of 2

St. Lucie Unit 1 Cycle 28

Inverse Count Rate Ratio Data Sheet

5000 EFPH

Date: ___/___/___ Time of Completion: _____ EFPH _____

Initial Power (%) or Count Rate (CPS):

Count	Count Time (sec)	Channel _____	Channel _____
1	120		
2	120		
3	120		
Total Counts --->			
Avg Counts (Total/3)-->			**(Base Counts)**

Estimated Critical CEA Position: Group _____ at _____ Inches W/D

Actual Critical CEA Position: Group _____ at _____ Inches W/D

(Filled in at time of use)

SUGGESTED CEA HEIGHT		**ACTUAL HEIGHT**		**% POWER or COUNT RATE**		**ICRR**	
Group	Inches	Group	Inches	CH ____	CH ____	CH ____	CH ____
1	**3**			Base Count	Base Count	1.0	1.0
1	**119**						
2	**68**						
3	**83**						
4	**59**						
5	**68**						
6	**71**						
7	**60**						
7	**ARO**						

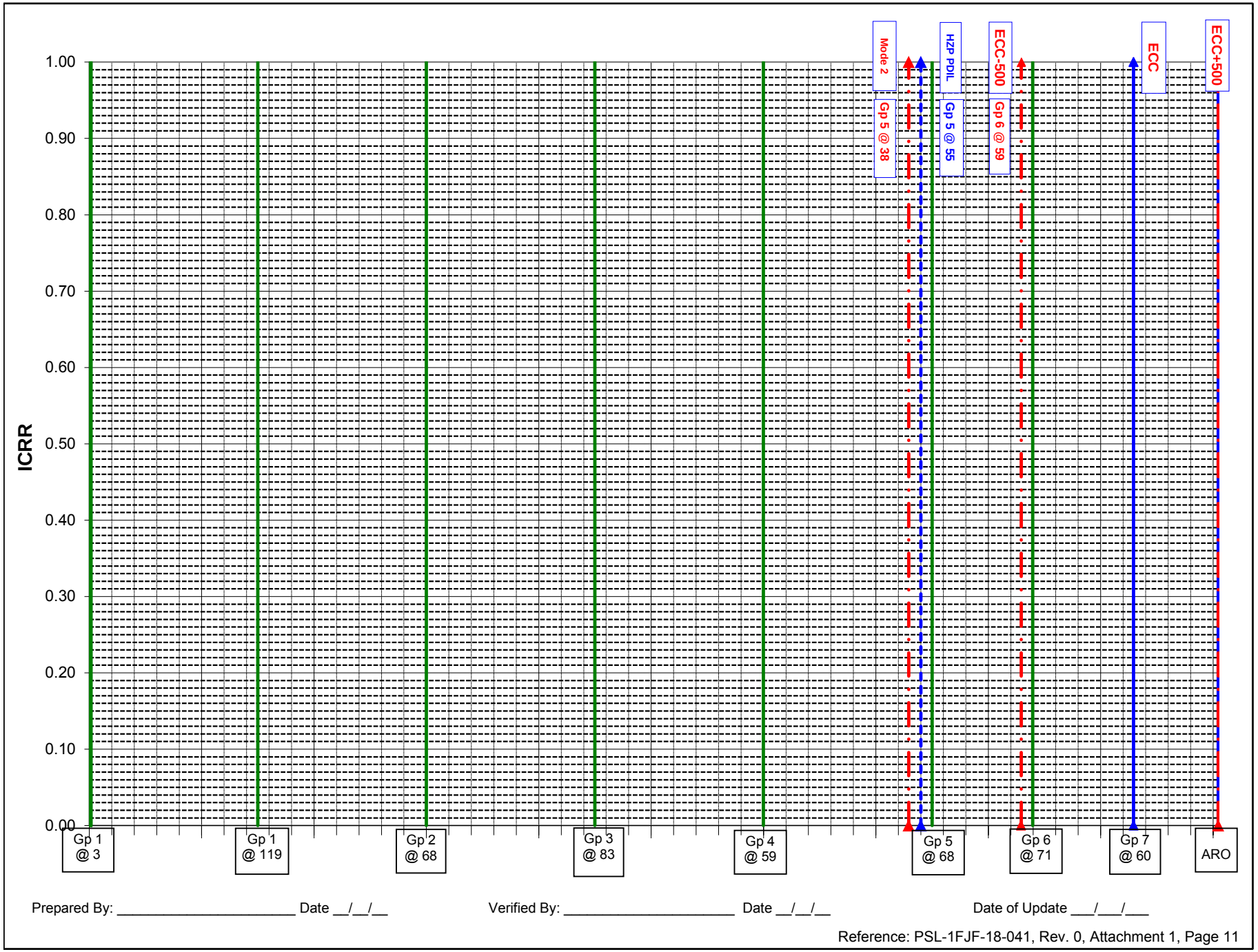
COMPLETED BY: _____ REVIEWED BY: _____

Date of Update: ___/___/___

Figure A.9 Rev. 4 (page 2 of 2)
St. Lucie Unit 1, Cycle 28, 5000 EFPH
Inverse Count Rate Ratio Plot Sheet

Startup # _____ **EFPH:** _____

CH.____ RED CH.____ BLK



Prepared By: _____ Date __/__/__

Verified By: _____ Date __/__/__

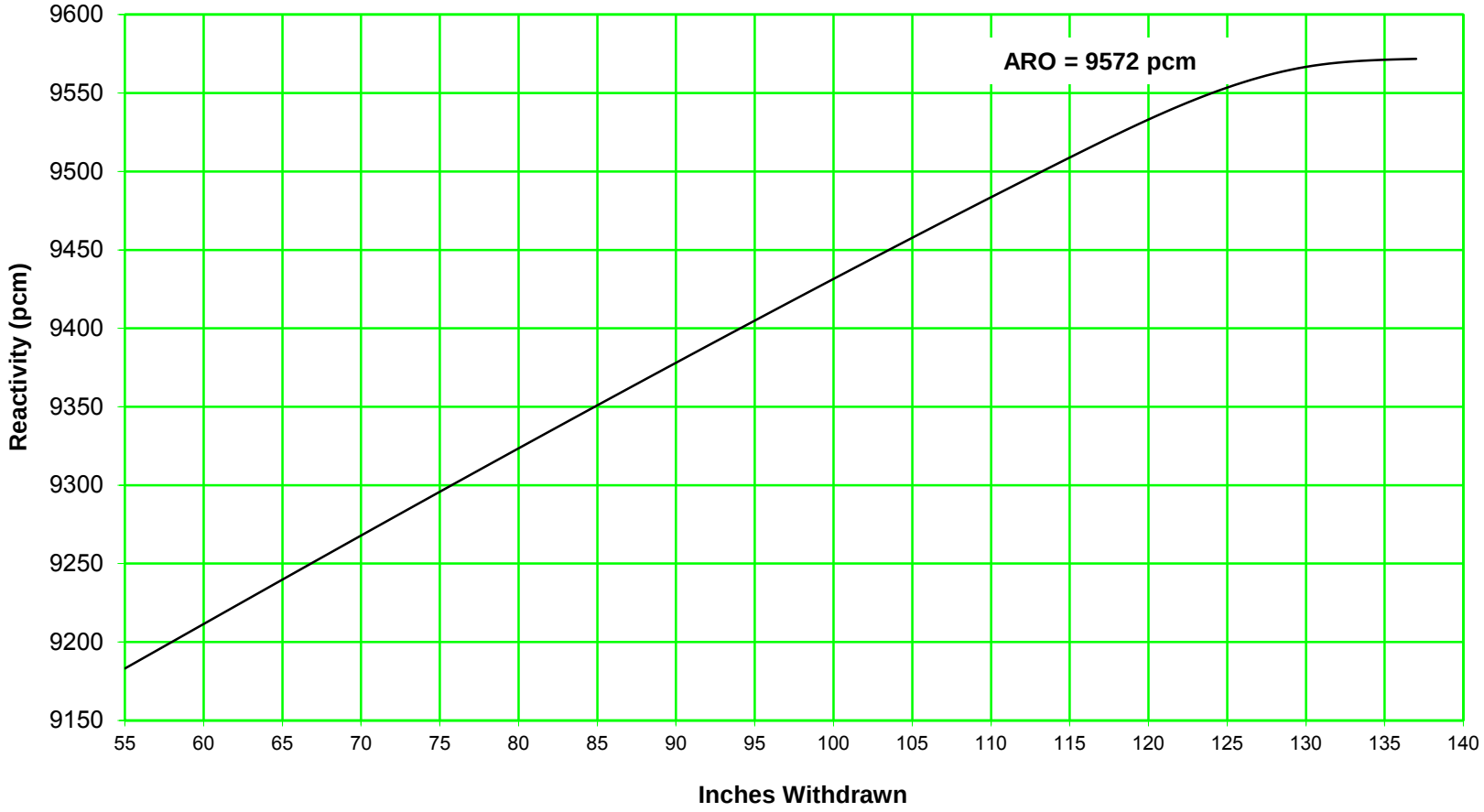
Date of Update ___/___/___

Reference: PSL-1FJF-18-041, Rev. 0, Attachment 1, Page 11

Figure A.10 Rev. 4
St. Lucie Unit 1 Cycle 28
HFP Integral Worth of CEA Lead Group (55 in to ARO), 5000 EFPH

CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)	CEA Position (Inches Withdrawn)	Integral Worth (pcm)
55	9183	76	9301	97	9416	118	9524
56	9189	77	9307	98	9421	119	9528
57	9194	78	9312	99	9426	120	9533
58	9200	79	9318	100	9432	121	9538
59	9206	80	9323	101	9437	122	9542
60	9211	81	9329	102	9442	123	9546
61	9217	82	9334	103	9447	124	9550
62	9223	83	9340	104	9453	125	9553
63	9228	84	9345	105	9458	126	9557
64	9234	85	9351	106	9463	127	9560
65	9240	86	9356	107	9468	128	9562
66	9245	87	9362	108	9473	129	9565
67	9251	88	9367	109	9478	130	9567
68	9257	89	9373	110	9484	131	9568
69	9262	90	9378	111	9489	132	9569
70	9268	91	9383	112	9494	133	9570
71	9274	92	9389	113	9499	134	9571
72	9279	93	9394	114	9504	135	9571
73	9285	94	9400	115	9509	136	9572
74	9290	95	9405	116	9514	137	9572
75	9296	96	9410	117	9519		

Figure A.10 Rev. 4
St. Lucie Unit 1 Cycle 28
HFP Integral Worth of CEA Lead Group (55 in to ARO), 5000 EFPH



Date of Update: _____/ _____ /_____

Reference: PSL-1FJF-18-007, Rev. 0, Attachment 1, Page 40

Figure B.4

St. Lucie Unit 1 Cycle 28

CEA Total Worth
(5000 EFPH, Rev. 4)

CEA TOTAL WORTH

● HZP All Rods In to All Rods Out	=	8629 pcm

STUCK CEA INFORMATION

● Single Worst Stuck CEA Worth [Location: C5, D6 Dual (1)]	=	1192 pcm
● Combined First and Second Worst Stuck CEA Worth [Locations: C5, D6 Dual and D4 (1)]	=	2743 pcm
● Difference Between Worst and Second Worst Stuck CEA Worth (2)	=	1513 pcm

DROPPED CEA INFORMATION

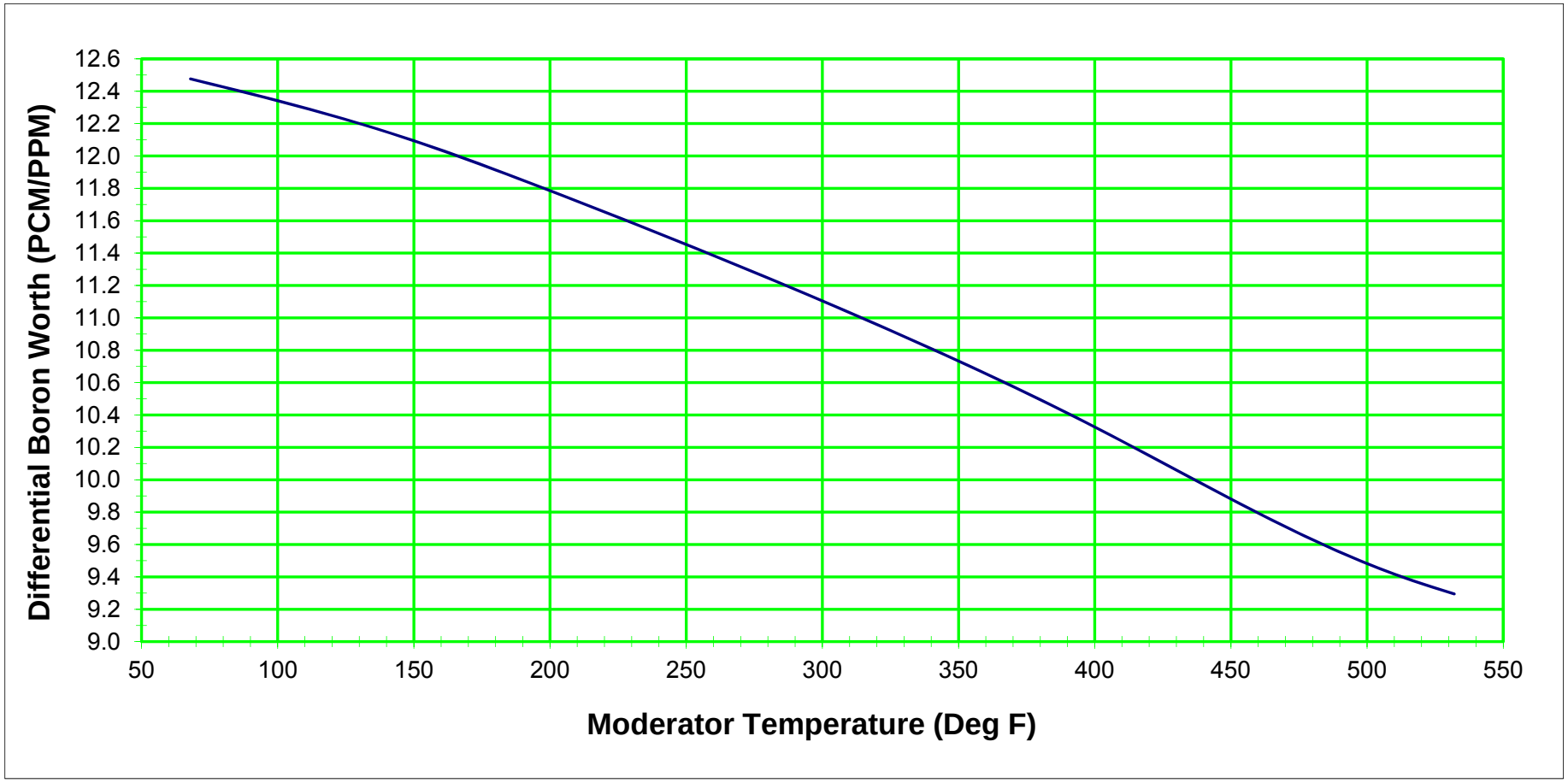
● Highest Single Dropped CEA Worth [Location: G7, J9 Dual (1)]	=	172 pcm

(1) Symmetric locations are also applicable. The CEA worth provided is the minimum of the worst stuck rods at the burnup for all temperatures to be used as a CEA credit if all rods are verified to be in. The maximum stuck rod worth may be higher.

(2) This is the maximum difference over all temperature conditions and may not be equivalent to the delta between the single and combined worths listed on this sheet.

Figure B.5 Rev. 4
St. Lucie Unit 1 Cycle 28

Differential Boron Worth vs RCS Temp.
(5000 EFPH, No Xenon, ARI Minus Worst Stuck CEA)



Date of Update
____/____/____

References: PSL-1FJF-18-004, Rev. 0, Attach. 1 Page 8

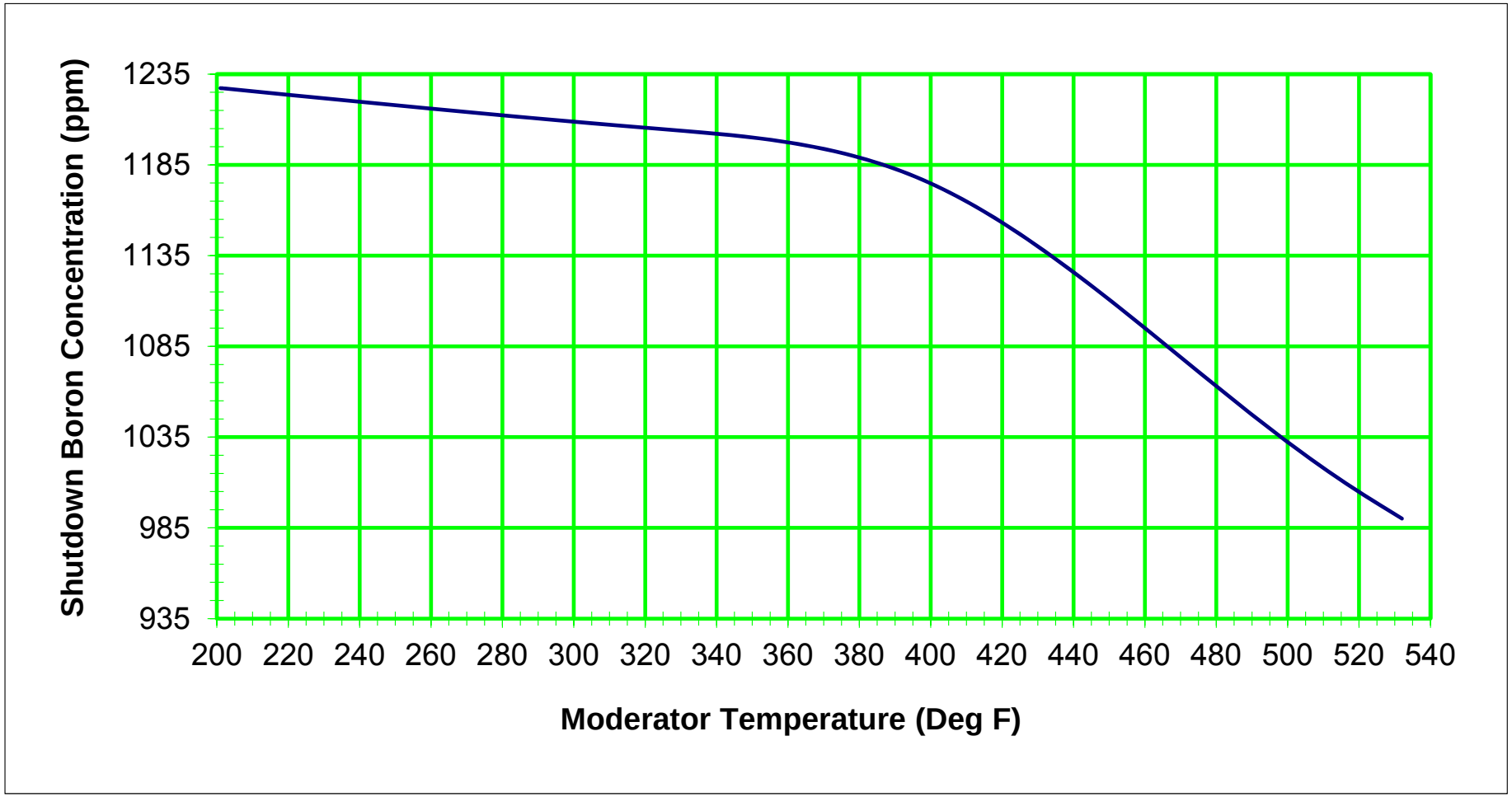
Figure B.5 Rev. 4
Page 1 of 1

St. Lucie Unit 1 Cycle 28
(5000 EFPH)
Differential Boron Worth vs Moderator Temperature
(No Xenon, ARI Minus Worst Stuck CEA)

RCS Temp. (^oF)	Boron Worth (pcm/ppm)	RCS Temp. (^oF)	Boron Worth (pcm/ppm)	RCS Temp. (^oF)	Boron Worth (pcm/ppm)	RCS Temp. (^oF)	Boron Worth (pcm/ppm)
68	12.48	188	11.86	308	11.05	428	10.08
72	12.46	192	11.84	312	11.02	432	10.04
76	12.44	196	11.81	316	10.99	436	10.01
80	12.43	200	11.79	320	10.96	440	9.97
84	12.41	204	11.76	324	10.93	444	9.93
88	12.39	208	11.73	328	10.90	448	9.90
92	12.38	212	11.71	332	10.87	452	9.86
96	12.36	216	11.68	336	10.84	456	9.83
100	12.34	220	11.65	340	10.81	460	9.79
104	12.32	224	11.63	344	10.78	464	9.76
108	12.31	228	11.60	348	10.75	468	9.73
112	12.29	232	11.57	352	10.72	472	9.69
116	12.27	236	11.55	356	10.69	476	9.66
120	12.25	240	11.52	360	10.66	480	9.63
124	12.23	244	11.49	364	10.62	484	9.60
128	12.21	248	11.47	368	10.59	488	9.57
132	12.19	252	11.44	372	10.56	492	9.54
136	12.17	256	11.41	376	10.53	496	9.51
140	12.15	260	11.39	380	10.49	500	9.48
144	12.13	264	11.36	384	10.46	504	9.46
148	12.11	268	11.33	388	10.43	508	9.43
152	12.08	272	11.30	392	10.39	512	9.40
156	12.06	276	11.27	396	10.36	516	9.38
160	12.04	280	11.25	400	10.33	520	9.36
164	12.01	284	11.22	404	10.29	524	9.34
168	11.99	288	11.19	408	10.26	528	9.32
172	11.96	292	11.16	412	10.22	532	9.30
176	11.94	296	11.13	416	10.19		
180	11.91	300	11.10	420	10.15		
184	11.89	304	11.08	424	10.11		

Figure B.6 Rev. 4
St. Lucie Unit 1 Cycle 28
Shutdown Boron Concentration vs RCS Temp.
Modes 2-4 , 5000 EFPH, No Xe, ARI Minus Worst Stuck CEA)

ARI-1 3600 pcm S/D Margin



Date Of Update
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References: PSL-1FJF-18-004, Rev. 0, Attach. 1 Page 24

Figure B.6 Rev. 4

Page 1 of 1

St. Lucie Unit 1 Cycle 28

(5000 EFPH)

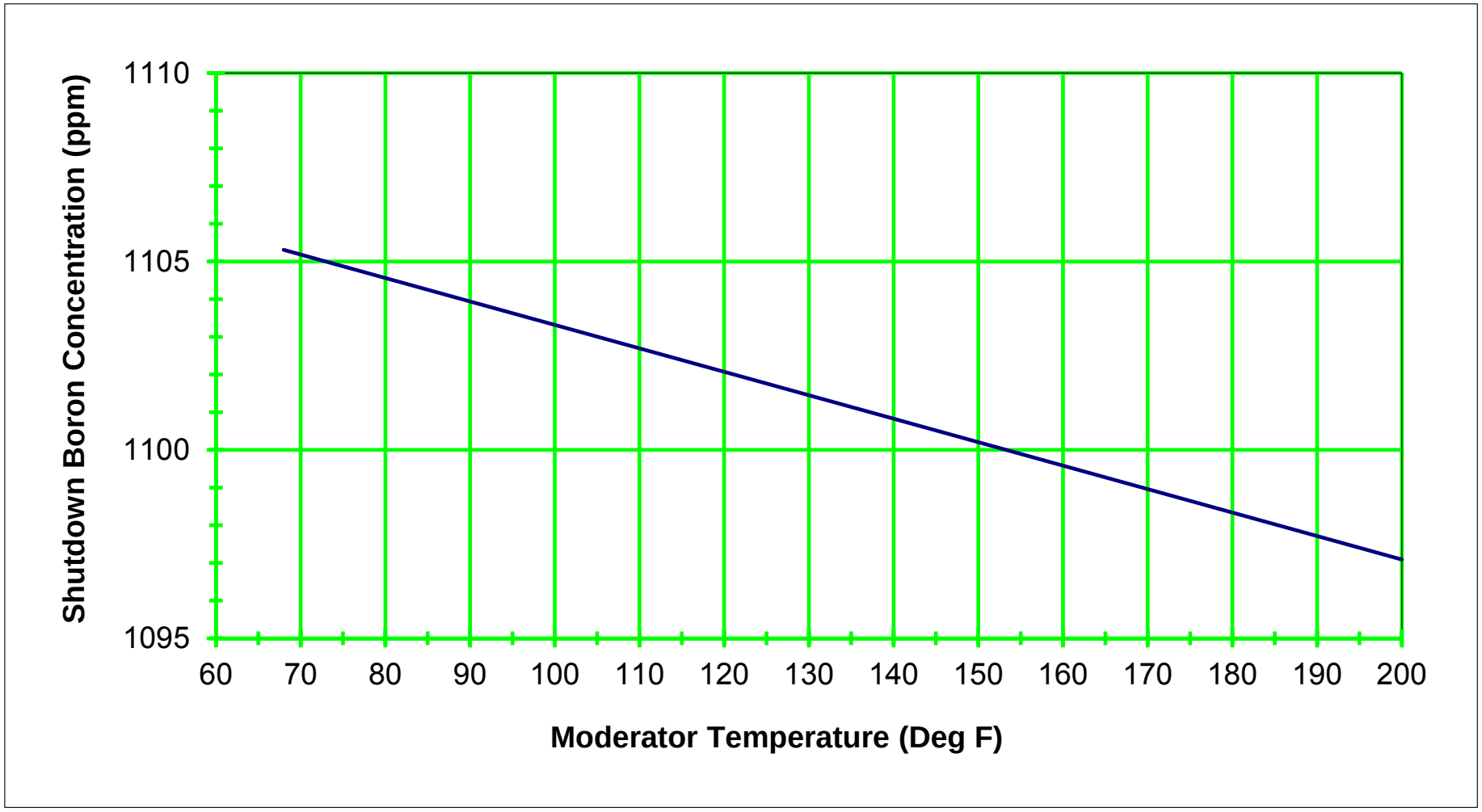
Shutdown Boron Concentration

Modes 2-4 (No Xenon, ARI Minus Worst Stuck CEA)

RCS Temp. (^oF)	Boron (ppm)	RCS Temp. (^oF)	Boron (ppm)	RCS Temp. (^oF)	Boron (ppm)
201	1227	312	1207	424	1148
204	1227	316	1206	428	1143
208	1226	320	1205	432	1137
212	1225	324	1205	436	1132
216	1224	328	1204	440	1126
220	1224	332	1204	444	1120
224	1223	336	1203	448	1114
228	1222	340	1202	452	1108
232	1221	344	1201	456	1101
236	1221	348	1201	460	1095
240	1220	352	1200	464	1089
244	1219	356	1199	468	1082
248	1218	360	1197	472	1076
252	1217	364	1196	476	1069
256	1217	368	1195	480	1063
260	1216	372	1193	484	1057
264	1215	376	1191	488	1050
268	1215	380	1189	492	1044
272	1214	384	1187	496	1038
276	1213	388	1184	500	1032
280	1212	392	1181	504	1026
284	1212	396	1178	508	1021
288	1211	400	1175	512	1015
292	1210	404	1171	516	1010
296	1209	408	1167	520	1005
300	1209	412	1163	524	1000
304	1208	416	1158	528	995
308	1207	420	1153	532	990

Figure B.8 Rev. 4
St. Lucie Unit 1 Cycle 28
Shutdown Boron Concentration vs RCS Temp.
Mode 5 , 5000 EFPH, No Xe, ARI Minus Worst Stuck CEA)

ARI-1 2000 pcm S/D Margin



Date Of Update
____/____/____

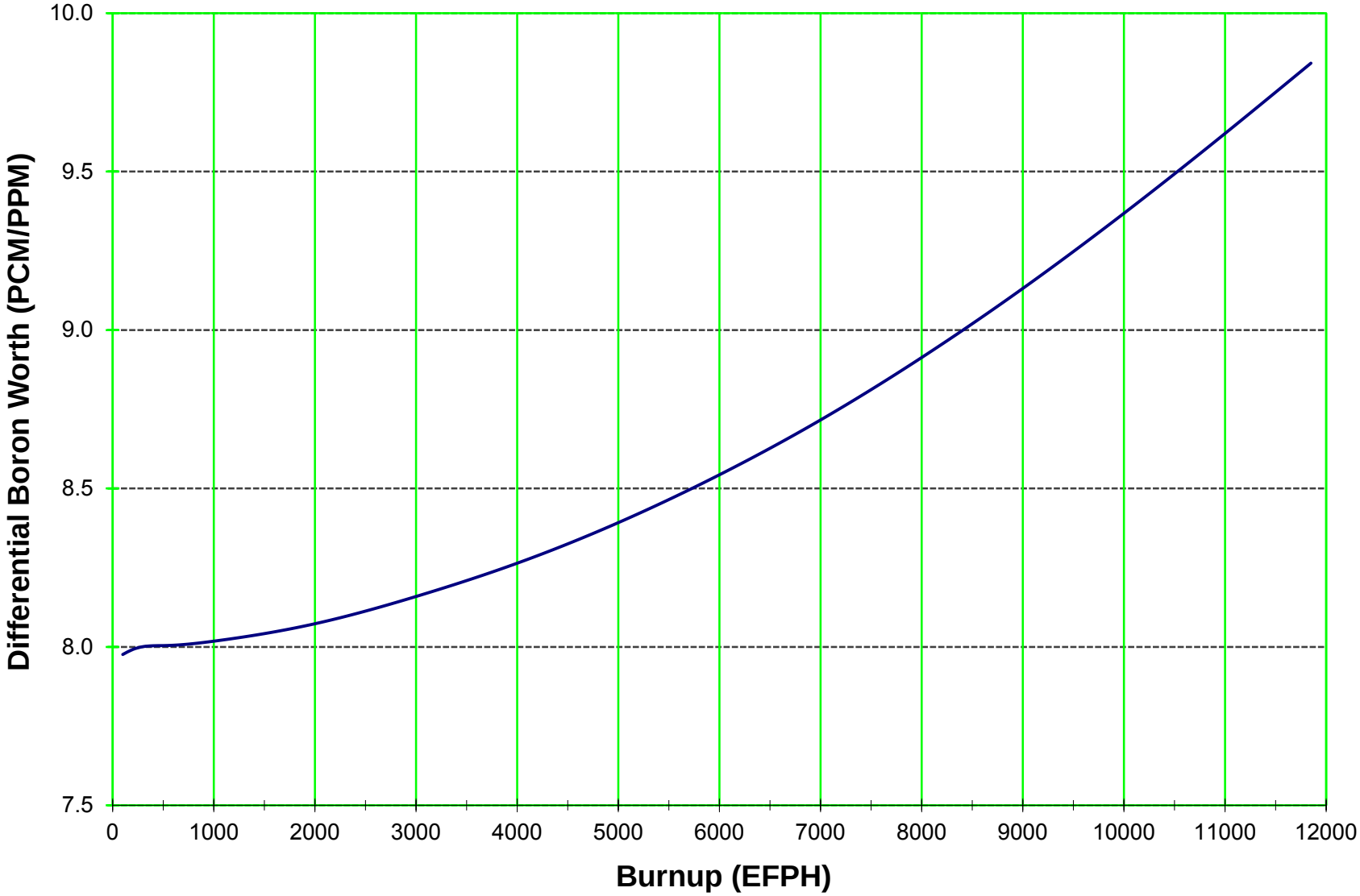
References: PSL-1FJF-18-004, Rev. 0, Attach. 1 Page 42

Figure B.8 Rev. 4
Page 1 of 1

St. Lucie Unit 1 Cycle 28
(5000 EFPH)
Shutdown Boron Concentration
Mode 5 (No Xenon, ARI Minus Worst Stuck CEA)

RCS Temp. (^oF)	Boron (ppm)
68	1105
72	1105
76	1105
80	1105
84	1104
88	1104
92	1104
96	1104
100	1103
104	1103
108	1103
112	1103
116	1102
120	1102
124	1102
128	1102
132	1101
136	1101
140	1101
144	1101
148	1100
152	1100
156	1100
160	1100
164	1099
168	1099
172	1099
176	1099
180	1098
184	1098
188	1098
192	1098
196	1097
200	1097

Figure C.1 Rev. 0
St. Lucie Unit 1 Cycle 28
HFP Differential Boron Worth vs Burnup



Date Of Update
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Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1 Page 9

Figure C.1 Rev. 0
Page 1 of 1

St. Lucie Unit 1 Cycle 28

HFP Differential Boron Worth vs Burnup

Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)	Burnup (EFPH)	Boron Worth (pcm/ppm)
100	7.98	3300	8.19	6500	8.63	9700	9.30
200	7.99	3400	8.20	6600	8.64	9800	9.32
300	8.00	3500	8.21	6700	8.66	9900	9.34
400	8.00	3600	8.22	6800	8.68	10000	9.37
500	8.00	3700	8.23	6900	8.70	10100	9.39
600	8.01	3800	8.24	7000	8.72	10200	9.42
700	8.01	3900	8.25	7100	8.73	10300	9.44
800	8.01	4000	8.26	7200	8.75	10400	9.47
900	8.01	4100	8.28	7300	8.77	10500	9.49
1000	8.02	4200	8.29	7400	8.79	10600	9.52
1100	8.02	4300	8.30	7500	8.81	10700	9.54
1200	8.03	4400	8.31	7600	8.83	10800	9.57
1300	8.03	4500	8.32	7700	8.85	10900	9.59
1400	8.04	4600	8.34	7800	8.87	11000	9.62
1500	8.04	4700	8.35	7900	8.89	11100	9.65
1600	8.05	4800	8.36	8000	8.91	11200	9.67
1700	8.05	4900	8.38	8100	8.93	11300	9.70
1800	8.06	5000	8.39	8200	8.96	11400	9.72
1900	8.07	5100	8.41	8300	8.98	11500	9.75
2000	8.07	5200	8.42	8400	9.00	11600	9.78
2100	8.08	5300	8.43	8500	9.02	11700	9.80
2200	8.09	5400	8.45	8600	9.04	11800	9.83
2300	8.10	5500	8.46	8700	9.06	11850	9.84
2400	8.10	5600	8.48	8800	9.09		
2500	8.11	5700	8.50	8900	9.11		
2600	8.12	5800	8.51	9000	9.13		
2700	8.13	5900	8.53	9100	9.15		
2800	8.14	6000	8.54	9200	9.18		
2900	8.15	6100	8.56	9300	9.20		
3000	8.16	6200	8.58	9400	9.22		
3100	8.17	6300	8.59	9500	9.25		
3200	8.18	6400	8.61	9600	9.27		

Date Of Update
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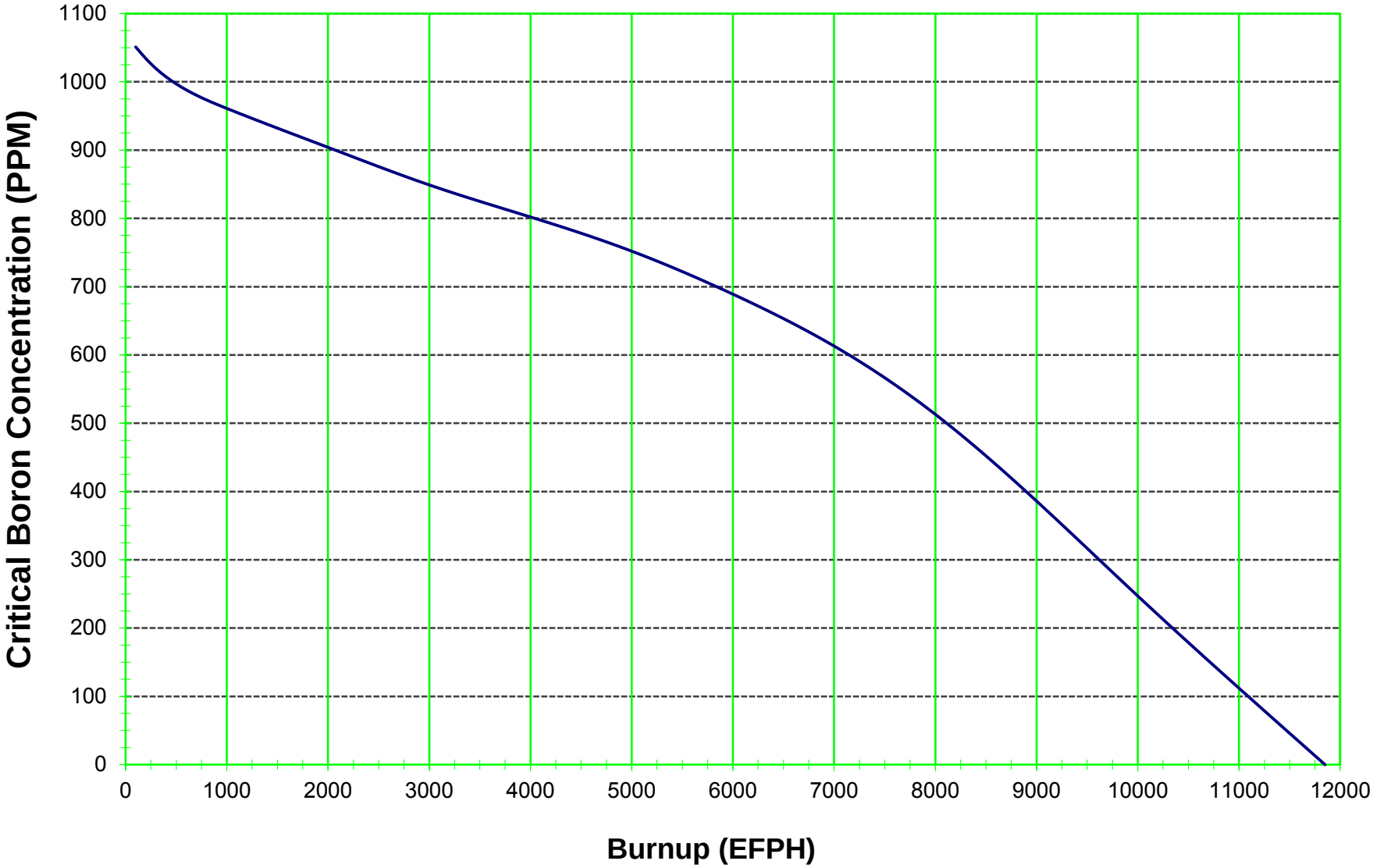
Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1 Page 10

Figure C.2 Rev. 0
St. Lucie Unit 1 Cycle 28
HFP Critical Boron Concentration vs Burnup (Un-normalized)



Date Of Update
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Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1, Page 11

Figure C.2 Rev. 0
Page 1 of 1

St. Lucie Unit 1 Cycle 28

HFP Critical Boron Concentration vs Burnup (Un-normalized)

Burnup (EFPH)	Critical Boron (ppm)	Burnup (EFPH)	Critical Boron (ppm)	Burnup (EFPH)	Critical Boron (ppm)	Burnup (EFPH)	Critical Boron (ppm)
100	1051	3300	834	6500	653	9700	289
200	1034	3400	830	6600	646	9800	275
300	1019	3500	825	6700	638	9900	261
400	1007	3600	820	6800	630	10000	247
500	997	3700	816	6900	621	10100	233
600	988	3800	811	7000	613	10200	220
700	980	3900	807	7100	604	10300	206
800	973	4000	802	7200	595	10400	192
900	967	4100	797	7300	586	10500	179
1000	961	4200	793	7400	576	10600	165
1100	955	4300	788	7500	567	10700	152
1200	949	4400	783	7600	556	10800	139
1300	944	4500	778	7700	546	10900	125
1400	938	4600	773	7800	535	11000	112
1500	932	4700	768	7900	524	11100	99
1600	926	4800	763	8000	513	11200	86
1700	921	4900	758	8100	501	11300	72
1800	915	5000	752	8200	489	11400	59
1900	910	5100	746	8300	477	11500	46
2000	904	5200	740	8400	465	11600	33
2100	898	5300	734	8500	452	11700	20
2200	893	5400	728	8600	439	11800	7
2300	887	5500	722	8700	426	11850	0
2400	881	5600	716	8800	413		
2500	876	5700	709	8900	400		
2600	870	5800	703	9000	386		
2700	865	5900	696	9100	372		
2800	859	6000	689	9200	359		
2900	854	6100	682	9300	345		
3000	849	6200	675	9400	331		
3100	844	6300	668	9500	317		
3200	839	6400	661	9600	303		

Date Of Update
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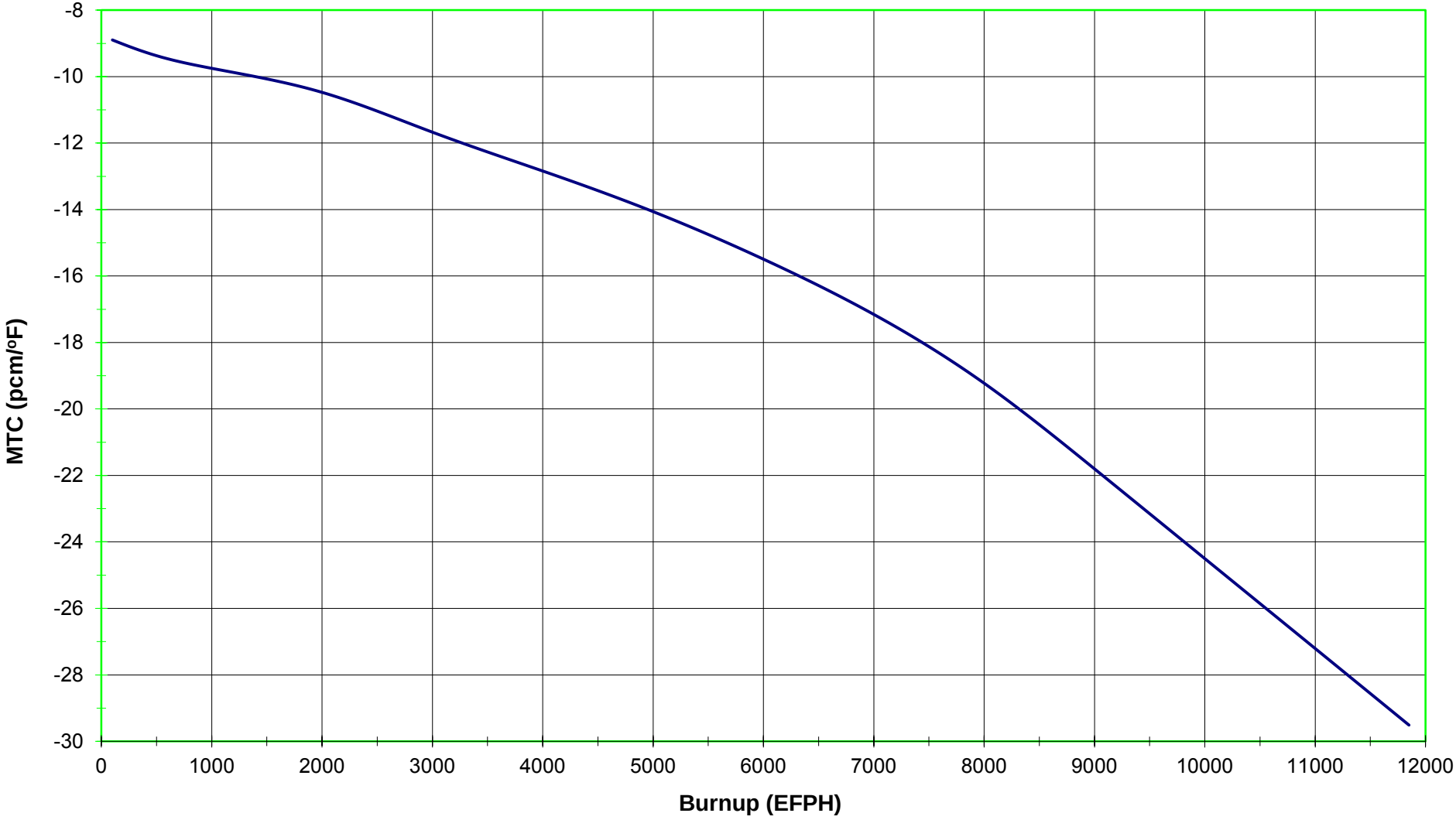
Reference: PSL-1FJF-18-003, Rev. 0, Attachment 1, Page 12

Figure C.4 Rev. 0
St. Lucie Unit 1 Cycle 28
HFP Moderator Temperature Coefficient vs Burnup



Date of Update: ____ / ____ / ____

Reference: PSL-1FJF-18-002 Rev. 0, Attachment 1 Page 5

Figure C.4 Rev. 0
Page 1 of 1

St. Lucie Unit 1 Cycle 28

HFP Moderator Temperature Coefficient vs Burnup

Burnup (EFPH)	MTC (pcm/°F)
100	-8.90
200	-9.03
300	-9.15
400	-9.27
500	-9.37
600	-9.46
700	-9.54
800	-9.62
900	-9.69
1000	-9.75
1100	-9.81
1200	-9.88
1300	-9.94
1400	-10.00
1500	-10.07
1600	-10.14
1700	-10.21
1800	-10.29
1900	-10.38
2000	-10.47
2100	-10.58
2200	-10.68
2300	-10.80
2400	-10.92
2500	-11.04
2600	-11.16
2700	-11.29
2800	-11.42
2900	-11.55
3000	-11.67
3100	-11.80

Burnup (EFPH)	MTC (pcm/°F)
3200	-11.92
3300	-12.03
3400	-12.15
3500	-12.27
3600	-12.38
3700	-12.50
3800	-12.61
3900	-12.73
4000	-12.84
4100	-12.96
4200	-13.07
4300	-13.19
4400	-13.31
4500	-13.43
4600	-13.55
4700	-13.68
4800	-13.80
4900	-13.93
5000	-14.06
5100	-14.19
5200	-14.33
5300	-14.47
5400	-14.61
5500	-14.75
5600	-14.89
5700	-15.04
5800	-15.19
5900	-15.34
6000	-15.49
6100	-15.65
6200	-15.80
6300	-15.96

Burnup (EFPH)	MTC (pcm/°F)
6400	-16.12
6500	-16.29
6600	-16.45
6700	-16.62
6800	-16.80
6900	-16.97
7000	-17.16
7100	-17.34
7200	-17.53
7300	-17.72
7400	-17.92
7500	-18.12
7600	-18.33
7700	-18.55
7800	-18.77
7900	-18.99
8000	-19.23
8100	-19.46
8200	-19.71
8300	-19.96
8400	-20.21
8500	-20.47
8600	-20.73
8700	-21.00
8800	-21.26
8900	-21.53
9000	-21.80
9100	-22.07
9200	-22.34
9300	-22.61
9400	-22.88
9500	-23.15

Burnup (EFPH)	MTC (pcm/°F)
9600	-23.42
9700	-23.69
9800	-23.96
9900	-24.23
10000	-24.50
10100	-24.77
10200	-25.04
10300	-25.31
10400	-25.58
10500	-25.85
10600	-26.12
10700	-26.40
10800	-26.67
10900	-26.94
11000	-27.21
11100	-27.48
11200	-27.75
11300	-28.02
11400	-28.29
11500	-28.56
11600	-28.83
11700	-29.10
11800	-29.38
11850	-29.51

Date Of Update
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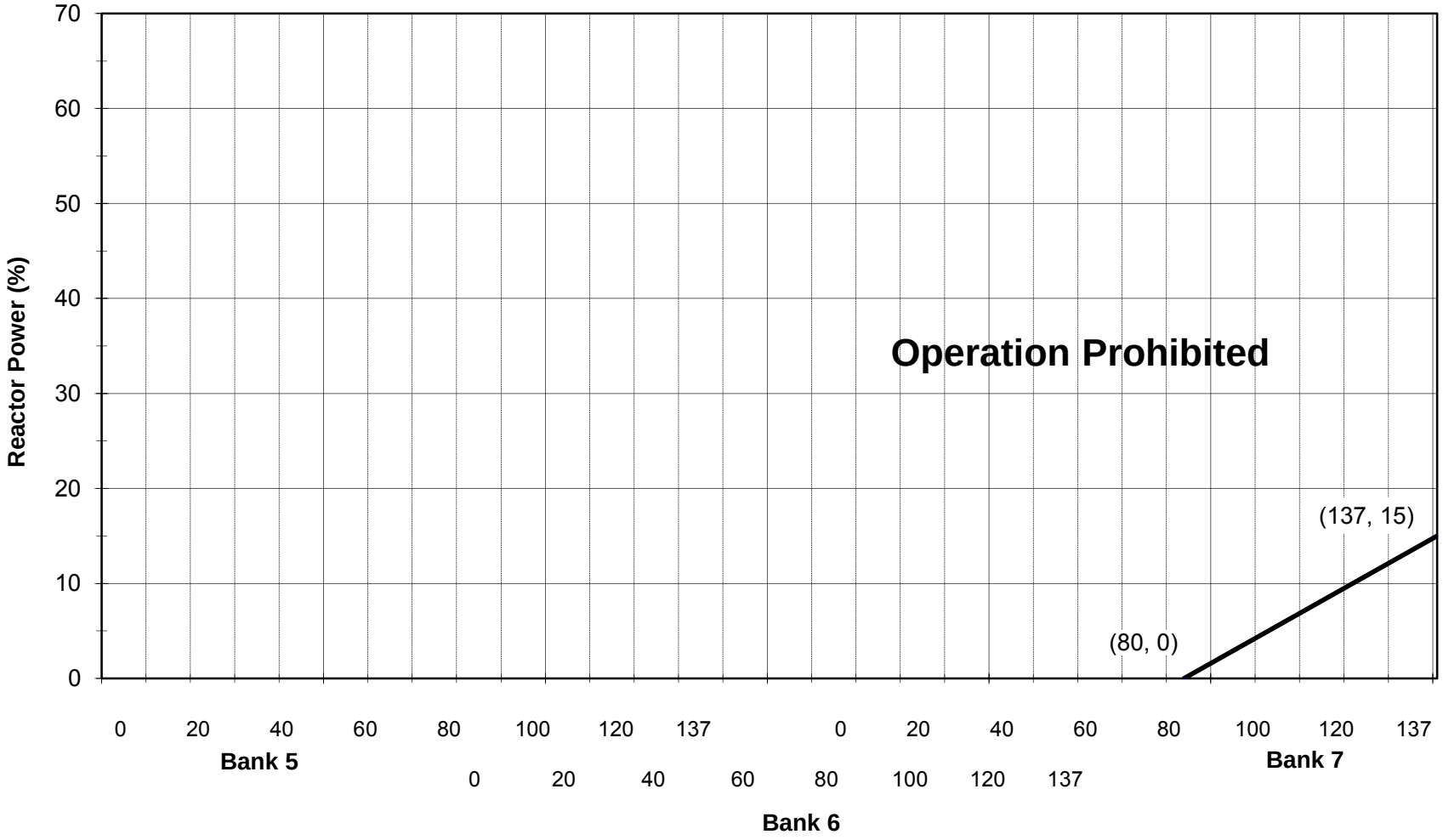
Reference: PSL-1FJF-18-002 Rev. 0, Attachment 1 Page 6

Figure C.5 Rev. 0

St. Lucie Unit 1 Cycle 28
Two Stuck CEA PDIL



Date Of Update: ____/____/____

Figure E.2 Rev. 4
Determination of Xenon Constants for DCS Input
St. Lucie Plant DCS Xenon Constant Calculation Sheet
UNIT 1 CYCLE 28

EXPOSURE 5000 EFPH

IODINE DECAY CONSTANT=λI	=	2.9239E-05	sec-1
XENON DECAY CONSTANT =λXe	=	2.1182E-05	sec-1
FISSION YIELD OF IODINE=γI	=	6.5096E-02	
FISSION YIELD OF XENON =γXe	=	5.6458E-03	
EQUILIBRIUM IODINE CONCENTRATION=I100	=	6.3305E+15	
EQUILIBRIUM XENON CONCENTRATION=Xe100	=	2.5532E+15	
EQUILIBRIUM XENON WORTH=Xew100	=	2.5970E+03	

Determination of Constants:

K1=λI*2 sec/calculation	=	5.8478E-05
K2=λI*2 sec/calculation	=	5.8478E-05
K3=(I100/Xe100) * K1	=	1.4499E-04
K4=(γXe/γI) * K2	=	5.0719E-06
K5= λXe * 2 sec/calculation	=	4.2364E-05
K6= (K3+K4-K5)/100	=	1.0770E-06
K7= -Xew100/100	=	-2.5970E+01

Date of Update: _____

References: PSL-1FJF-18-010, Rev. 0, Attach. 1, Page 5

Table 4.1.4.1
Page 1 of 1

St. Lucie Unit 1 Cycle 28

Integral Rod Worth of All CEA's
ARO to 129" Withdrawn
HFP, Equilibrium Xe

Exposure (EFPH)	Rod Worth (pcm)
100	92
200	92
1000	86
3000	76
5000	69
7000	73
9000	97
11000	124
11850	135

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

FULL LENGTH CEA POSITION

LIMITING CONDITION FOR OPERATION

3.1.3.1 The CEA Block Circuit and all full length (shutdown and regulating) CEAs shall be OPERABLE with each CEA of a given group positioned within 7.5 inches (indicated position) of all other CEAs in its group.

APPLICABILITY: MODES 1* and 2*.

ACTION:

a. With one or more full length CEAs inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.

b. With the CEA Block Circuit inoperable, within 6 hours either:

   1. With one CEA position indicator per group inoperable, take action per Specification 3.1.3.3, or

   2. With the group overlap and/or sequencing interlocks inoperable, maintain CEAs in groups 3, 4, 5 and 6 fully withdrawn and withdraw the CEAs in group 7 to less than 5% insertion and place and maintain the CEA drive system mode switch in either the "Manual" or "Off" position, or

   3. Be in at least HOT STANDBY.

c. With one full length CEA inoperable due to causes other than addressed by Action a above, but within its above specified alignment requirements and either fully withdrawn or within the long term steady state insertion limits if in CEA group 7, operation in MODES 1 and 2 may continue.

d. With one or more full length CEAs misaligned from any other CEAs in its group by more than 7.5 inches but less than 15 inches, operation in MODES 1 and 2 may continue, provided that within one hour the misaligned CEA(s) is either:

   1. Restored to OPERABLE status within its above specified alignment requirements, or

* See Special Test Exceptions 3.10.2 and 3.10.5.

2. Declared inoperable and satisfy SHUTDOWN MARGIN requirements of Specification 3.1.1.1. After declaring the CEA inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6 for up to 7 days per occurrence with a total accumulated time of $\leq$ 14 days per calendar year provided all of the following conditions are met:

   a) Within 1 hour, the remainder of the CEAs in the group with the inoperable CEA shall be aligned to within 7.5 inches of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown on COLR Figure 3.1-2; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.

   b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

   Otherwise, be at least HOT STANDBY within the next 6 hours.

e. With one full length CEA misaligned from any other CEA in its group by 15 or more inches, operation in MODES 1 and 2 may continue provided that the misaligned CEA is positioned within 7.5 inches of other CEAs in its group in accordance with the time constraints shown in COLR Figure 3.1-1a.

f. With one full length CEA misaligned from any other CEA in its group by 15 or more inches beyond the time constraints shown in COLR Figure 3.1-1a, reduce power to $\leq$ 70% of RATED THERMAL POWER prior to completing ACTION f.1 or f.2.

   1. Restored the CEA to OPERABLE status within its specified alignment requirements, or

   2. Declare the CEA inoperable and satisfy the SHUTDOWN MARGIN requirements of Specification 3.1.1.1. After declaring the CEA inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6 provided:

      a) Within 1 hour, the remainder of the CEAs in the group with the inoperable CEA shall be aligned to within 7.5 inches of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown on COLR Figure 3.1-2; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.

FULL LENGTH CEA POSITION (continued)

LIMITING CONDITION FOR OPERATION (continued)

b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

Otherwise, be at least HOT STANDBY within the next 6 hours.

g. With more than one full length CEA inoperable or misaligned from any other CEA in its group by 15 inches (indicated position) or more, be in HOT STANDBY within 6 hours.

h. With one full length CEA inoperable due to causes other than addressed by ACTION a above, and inserted beyond the long term steady state insertion limits but within its above specified alignment requirements, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full-length CEA shall be determined to be within 7.5 inches (indicated position) of all other CEAs in its group in accordance with the Surveillance Frequency Control Program except during time intervals when the Deviation Circuit and/or CEA Block Circuit are inoperable, then verify the individual CEA positions at least once per 4 hours.

4.1.3.1.2 Each full length CEA not fully inserted shall be determined to be OPERABLE by inserting it at least 7.5 inches in accordance with the Surveillance Frequency Control Program.

4.1.3.1.3 The CEA Block Circuit shall be demonstrated OPERABLE in accordance with the Surveillance Frequency Control Program by a functional test which verifies that the circuit prevents any CEA from being misaligned from all other CEAs in its group by more than 7.5 inches (indicated position).

4.1.3.1.4 The CEA Block Circuit shall be demonstrated OPERABLE by a functional test which verifies that the circuit maintains the CEA group overlap and sequencing requirements of Specification 3.1.3.6 and that the circuit prevents the regulating CEAs from being inserted beyond the Power Dependent Insertion Limit of COLR Figure 3.1-2:

*a. Prior to each entry into MODE 2 from MODE 3, except that such verification need not be performed more often than once per 92 days, and

b. In accordance with the Surveillance Frequency Control Program.

* The licensee shall be excepted from compliance during the startup test program for an entry into MODE 2 from MODE 3 made in association with a measurement of power defect.

DELETED

POSITION INDICATOR CHANNELS

LIMITING CONDITION FOR OPERATION

3.1.3.3 All shutdown and regulating CEA reed switch position indicator channels and CEA pulse counting position indicator channels shall be OPERABLE and capable of determining the absolute CEA positions within $\pm$ 2.25 inches.

APPLICABILITY: MODES 1 and 2.

ACTION:

a. Deleted.

b. With a maximum of one reed switch position indicator channel per group or one (except as permitted by ACTION item d. below) pulse counting position indicator channel per group inoperable and the CEA(s) with the inoperable position indicator channel partially inserted, within 6 hours either:

1. Restore the inoperable position indicator channel to OPERABLE status, or

2. Be in HOT STANDBY, or

3. Reduce THERMAL POWER to $\leq$ 70% of the maximum allowable THERMAL POWER level for the existing Reactor Coolant Pump combination; if negative reactivity insertion is required to reduce THERMAL POWER, boration shall be used. Operation at or below this reduced THERMAL POWER level may continue provided that within the next 4 hours either:

a) The CEA group(s) with the inoperable position indicator is fully withdrawn while maintaining the withdrawal sequence required by Specification 3.1.3.6 and when this CEA group reaches its fully withdrawn position, the "Full Out" limit of the CEA with the inoperable position indicator is actuated and verifies this CEA to be fully withdrawn. Subsequent to fully withdrawing this CEA group(s), the THERMAL POWER level may be returned to a level consistent with all other applicable specifications; or

POSITION INDICATOR CHANNELS (Continued)

LIMITING CONDITION FOR OPERATION

b) The CEA group(s) with the inoperable position indicator is fully inserted, and subsequently maintained fully inserted, while maintaining the withdrawal sequence and THERMAL POWER level required by Specification 3.1.3.6 and when this CEA group reaches its fully inserted position, the "Full In" limit of the CEA with the inoperable position indicator is actuated and verifies this CEA to be fully inserted. Subsequent operation shall be within the limits of Specification 3.1.3.6.

c. With a maximum of one reed switch position indicator channel per group or one pulse counting position indicator channel per group inoperable and the CEA(s) with the inoperable position indicator channel at either its fully inserted position or fully withdrawn position, operation may continue provided:

1. The position of this CEA is verified immediately and at least once per 12 hours thereafter by its "Full In" or "Full Out" limit (as applicable),

2. The fully inserted CEA group(s) containing the inoperable position indicator channel is subsequently maintained fully inserted, and

3. Subsequent operation is within the limits of Specification 3.1.3.6.

d. With one or more pulse counting position indicator channels inoperable, operation in MODES 1 and 2 may continue for up to 24 hours provided all of the reed switch position indicator channels are OPERABLE.

SURVEILLANCE REQUIREMENTS

4.1.3.3 Each position indicator channel shall be determined to be OPERABLE by verifying the pulse counting position indicator channels and the reed switch position indicator channels agree within 4.5 inches in accordance with the Surveillance Frequency Control Program except during time intervals when the Deviation circuit is inoperable, then compare the pulse counting position indicator and reed switch position indicator channels at least once per 4 hours.

REACTIVITY CONTROL SYSTEMS

CEA DROP TIME

LIMITING CONDITION FOR OPERATION

3.1.3.4 The individual full length (shutdown and control) CEA drop time, from a fully withdrawn position, shall be $\leq$ 3.1 seconds from when electrical power is interrupted to the CEA drive mechanism until the CEA reaches its 90 percent insertion position with:

a. $T_{avg} \geq 515°F$, and

b. All reactor coolant pumps operating.

APPLICABILITY: MODE 3.

ACTION:

a. With the drop time of any full length CEA determined to exceed the above limit, restore the CEA drop time to within the above limit prior to proceeding to MODE 1 or 2.

b. With the CEA drop times within limits but determined at less than full reactor coolant flow, operation may proceed provided THERMAL POWER is restricted to less than or equal to the maximum THERMAL POWER level allowable for the reactor coolant pump combination operating at the time of CEA drop time determination.

SURVEILLANCE REQUIREMENTS

4.1.3.4 The CEA drop time of full length CEAs shall be demonstrated through measurement prior to reactor criticality:

a. For all CEAs following each removal of the reactor vessel head,

b. For specifically affected individual CEAs following any maintenance on or modification to the CEA drive system which could affect the drop time of those specific CEAs, and

c. In accordance with the Surveillance Frequency Control Program.

REACTIVITY CONTROL SYSTEMS

SHUTDOWN CEA INSERTION LIMIT

LIMITING CONDITION FOR OPERATION

3.1.3.5 All shutdown CEAs shall be withdrawn to at least 129.0 inches.

APPLICABILITY: MODES 1 and 2*#.

ACTION:

With a maximum of one shutdown CEA withdrawn, except for surveillance testing pursuant to Specification 4.1.3.1.2, to less than 129.0 inches, within one hour either:

a. Withdraw the CEA to at least 129.0 inches, or

b. Declare the CEA inoperable and apply Specification 3.1.3.1.

SURVEILLANCE REQUIREMENTS

4.1.3.5 Each shutdown CEA shall be determined to be withdrawn to at least 129.0 inches:

a. Within 15 minutes prior to withdrawal of any CEAs in regulating groups during an approach to reactor criticality, and

b. In accordance with the Surveillance Frequency Control Program.

---

* See Special Test Exception 3.10.2.

\# With $K_{eff} \geq 1.0$.

REACTIVITY CONTROL SYSTEMS

REGULATING CEA INSERTION LIMITS

LIMITING CONDITION FOR OPERATION

3.1.3.6 The regulating CEA groups shall be limited to the withdrawal sequence and to the insertion limits specified in the COLR (regulating CEAs are considered to be fully withdrawn when withdrawn to at least 129.0 inches) with CEA insertion between the Long Term Steady State Insertion Limits and the Power Dependent Insertion Limits restricted to:

a. ≤ 4 hours per 24 hour interval,

b. ≤ 5 Effective Full Power Days per 30 Effective Full Power Day interval, and

c. ≤ 14 Effective Full Power Days per calendar year.

APPLICABILITY: MODES 1* and 2*#.

ACTION:

a. With the regulating CEA groups inserted beyond the Power Dependent Insertion Limits, except for surveillance testing pursuant to Specification 4.1.3.1.2, within two hours either:

1. Restore the regulating CEA groups to within the limits, or

2. Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the CEA group position and insertion limits specified in the COLR.

b. With the regulating CEA groups inserted between the Long Term Steady State Insertion Limits and the Power Dependent Insertion Limits for intervals > 4 hours per 24 hour interval, except during operation pursuant to the provisions of ACTION items c. and d. of Specification 3.1.3.1, operation may proceed provided either:

1. The Short Term Steady State Insertion Limits are not exceeded, or

2. Any subsequent increase in THERMAL POWER is restricted to ≤ 5% of RATED THERMAL POWER per hour.

---

* See Special Test Exception 3.10.2 and 3.10.5.

\# With $K_{eff} \geq 1.0$.

REGULATING CEA INSERTION LIMITS (Continued)

LIMITING CONDITION FOR OPERATION

c. With the regulating CEA groups inserted between the Long Term Steady State Insertion Limits and the Power Dependent Insertion Limits for intervals > 5 EFPD per 30 EFPD interval or > 14 EFPD per calendar year, except during operations pursuant to the provisions of ACTION items c. and d. of Specification 3.1.3.1, either:

1. Restore the regulating groups to within the Long Term Steady State Insertion Limits within two hours, or

2. Be in HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.6 The position of each regulating CEA group shall be determined to be within the Power Dependent Insertion Limits in accordance with the Surveillance Frequency Control Program except during time intervals when the PDIL Auctioneer Alarm Circuit is inoperable, then verify the individual CEA positions at least once per 4 hours. The accumulated times during which the regulating CEA groups are inserted between the Long Term Steady State Insertion Limits and the Power Dependent Insertion Limits shall be determined in accordance with the Surveillance Frequency Control Program.

4.5.3 Operational Guidance for Section 3/4.1 (continued)

2. (continued)

D. T.S. 3.1.2.8 has a requirement to ensure that two of the following four borated water sources are operable:

- 1(2) A BAMT
- 1(2) B BAMT
- Combined BAMT Levels
- RWT

If using the combined BAMT level option, the RWT must be the second borated water source.

E. Boric Acid Makeup Tank (BAMT) batching/dilutions

- Due to the resultant change in boric acid concentration caused by the addition of boric acid of an unknown concentration (or just water), a BAMT should be declared INOPERABLE prior to batching. Compliance with TS 3.1.2 using the other BAMT and the Refueling Water Tank should be confirmed in advance of declaring the affected BAMT INOPERABLE.
- Once the batch is complete, OPERABILITY of the BAMT should be confirmed by performing 1/2-OSP-02.07, Boration Flowpaths and Sources.
- Document performance of the batching evolution in the Narrative Logs.

3. 3/4.1.3 Movable Control Assemblies

A. With the CEA Block Circuit inoperable, with one CEA position indicator per group inoperable and directed to take action per T.S. 3.1.3.3 by the performance of action b.1, then S.R.4.1.3.1.1 no longer applies.

4.5.3 Operational Guidance for Section 3/4.1 (continued)

3. (continued)

B. CEA control malfunctions that result in the inability to move a CEA (e.g., CEA lift rod failure), but do **NOT** impact tripability, do **NOT** result in CEA inoperability. This conclusion is consistent with the NRC's positions in Regulatory Issue Summary (RIS), which provides guidance on operability determinations, and is consistent with the Basis for NUREG-1432 which state that, between required performances of the S.R., "if a CEA(s) is discovered to be immovable, but remains trippable, the CEA is considered to be OPERABLE."

C. Failure to satisfactorily complete 1/2-OSP-66.01, Control Element Assembly Exercise for a single CEA, does **NOT** result in the CEA Block Circuit being declared inoperable. The unsatisfactory performance, or exceeding the surveillance periodicity, will result in the CEA being declared inoperable and only the action for Tech Spec 3.1.3.1.c (Unit 1) or Tech Spec 3.1.3.1.h (Unit 2), will be entered. The associated actions for a single CEA inoperability, including required compensatory surveillances, shall be followed. This is limited to a single CEA inoperability.

JPM TITLE: SRO TIME TO BOIL CALCULATION WITH LOSS OF SDC T.S. APPLICABILITY

JPM NUMBER: L-19-1 NRC JPM A-2 SRO **REV.** 0

TASK NUMBER(S) / TASK TITLE(S): 09003005 / Action due to SDC system out of spec/service conditions
07003470 / Respond to a Loss of the SDC system

K/A NUMBERS / K/A VALUES: (RO SRO): 2.1.37 SRO (4.6) Knowledge of procedures, guidelines, or limitations associated with reactivity management.

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:
☒ RO ☒ SRO ☐ STA ☐ Non-Lic ☐ SRO CERT ☐ OTHER: ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: [ ] Perform: [X]

EVALUATION LOCATION: In-Plant: [ ] Control Room: [ ]
Simulator: [ ] Other: [X]
Lab: [ ]

Time for Completion: 15 Minutes Time Critical: No

Alternate Path [NRC]: No
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10.	Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11.	Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16.	If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☐	☐	☒

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:
- 1-AOP-03.02 Shutdown Cooling Abnormal Operations
- 1-ONP-01.04, Plant Condition 4, Shutdown Cooling in Operation-Reduced Inventory Operations.

General References:
- 1-AOP-03.02 Shutdown Cooling Abnormal Operations
- 1-ONP-01.04, Plant Condition 4, Shutdown Cooling in Operation-Reduced Inventory Operations.

Task Standards: This JPM is complete when the applicant determines the time to core boiling and time boiling will occur, and determines the required Tech Spec actions

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit 1 is in a Refueling outage.
- Core shuffle or reload has **NOT** been completed.
- A loss of shutdown cooling has just occurred.

INITIATING CUES:

You are the Unit Supervisor determine the time to core boiling and time boiling will occur using 1-AOP-03.02, Shutdown Cooling Abnormal Operations, and determine the required Tech Spec actions

Given:

- RCS temperature is 114°F, Mode 6
- RCS level is 31 feet
- 1A Shutdown Cooling Train in Operation
- The Unit was tripped on May 20, at 0615

Subsequently:

- On May 24, 0715, the 1A LPSI pump tripped, and the 1B LPSI failed to start
- Current date / time is May 24, 0720

Time To Core Boiling _____.
Time Boiling Will Occur_____.
Required Tech Spec Actions_____.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

ATTACHMENT 1	
Performance Step: 1 **Critical NO**	**Record the following information** • **Time SDC was lost**
Standard:	Examinee Records 0715
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 2 **Critical: NO**	**Record** the following information • RCS Temperature •
Standard:	Records 114ºF
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 3 **Critical: NO**	ATTACHMENT 1 step 1A Record the following information Vessel / Cavity Level
Standard:	Records 31 ft.
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE.**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 4 **Critical NO**	Record the following information Time since shutdown (hours)
Standard:	Examinee Records 96 hours
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 5 **Critical YES**	Record time to boil at mid-loop per Table 1
Standard:	Examinee 12.3 minutes
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	• Temperature between columns, select higher temperature • Time since shutdown between rows, select the lesser time

Performance Step: 6 **Critical YES**	Record additional time to boil for a $100ft^3$ volume per Table 2
Standard:	0.857 (minutes / $100ft^3$)
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE:**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	• Temperature between columns, select higher temperature • Time since shutdown between rows, select the lesser time

Performance Step: 7 **Critical: NO**	Record additional $100ft^3$ volumes above mid-loop per Table 3
Standard:	1.21 (100 ft^3)
Evaluator Cue:	**NONE** **EVALUATOR'S NOTE:**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 8 **Critical YES**	Calculate Time to Boil as Follows:
Standard:	Calculate Time to Boil as Follows: (__12.3__) + [(_0.857_) x (__1.21__)] = 13.34 min Time to boil Additional Time to boil Additional 100 ft^3 volumes Time to Boil Step 1.B Step 1.C Step 1.D Time to Boil 13.34 minutes (13 –13.34 minutes is acceptable)
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 9 **Critical YES**	IF core shuffle or reload has NOT been completed, THEN CALCULATE time boiling will occur as follows: (__0715__) + (_13.34_) = (0728.34) Time SDC lost Time to boil Time boiling will occur Step 1.A Step 1.E
Standard:	Time 0728 to 0729 is acceptable
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 10 **Critical YES**	Determine the required Tech Spec actions
Standard:	Applicant will determine T.S. 3.9.8.2 Actions a and b are applicable. **3.9.8.2** Two independent shutdown cooling loops shall be OPERABLE and at least one shutdown cooling loop shall be in operation.* **APPLICABILITY:** MODE 6 when the water level above the top of irradiated fuel assemblies seated within the reactor pressure vessel is less than 23 feet. **ACTION:** a. With less than the required shutdown cooling loops OPERABLE, within one (1) hour 1) initiate corrective action to return the required loops to OPERABLE status, or 2) establish greater than or equal to 23 feet of water above irradiated fuel assemblies seated within the reactor pressure vessel. b. With no shutdown cooling loop in operation, suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of Technical Specification 3.9.1. and within one (1) hour initiate corrective action to return the required shutdown cooling loop to operation. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Terminating Cues: **This JPM is complete when the applicant determines the time to core boiling and time boiling will occur, and determines the required Tech Spec actions**

The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

- Unit 1 is in a Refueling outage.
- Core shuffle or reload has **NOT** been completed.
- A loss of shutdown cooling has just occurred.

INITIATING CUES:

You are the Unit Supervisor determine the time to core boiling and time boiling will occur using 1-AOP-03.02, Shutdown Cooling Abnormal Operations, and determine the required Tech Spec actions

Given:

- RCS temperature is 114°F, Mode 6
- RCS level is 31 feet
- 1A Shutdown Cooling Train in Operation
- The Unit was tripped on May 20, at 0615

Subsequently:

- On May 24, 0715, the 1A LPSI pump tripped, and the 1B LPSI failed to start
- Current date / time is May 24, 0720

Time To Core Boiling_____.
Time Boiling Will Occur_____.
Required Tech Spec Actions_____.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 1 of 9)

NOTE

During Core Offload / Reload conditions, Time to Boil is only required to be calculated once per shift unless otherwise directed by the Shift Manager.

1. **DETERMINE** estimated time to core boiling as follows (Section 6.2, Commitment 2):

A. **RECORD** the following information at the time SDC was lost:

Time Shutdown Cooling Lost from Section 4.2, Step 2 _____

RCS Temperature from Section 4.2, Step 2 _____ ºF

Vessel / Cavity Level _____ ft

Time since shutdown (hours) _____

B. **RECORD** time to boil at mid-loop per Table 1:
_____ (minutes)

C. **RECORD** additional time to boil for a 100 ft^3 volume per Table 2:
_____ (minutes / 100 ft^3).

D. **RECORD** additional 100 ft^3 volumes above mid-loop per Table 3:
_____ (100 ft^3)

E. **CALCULATE** Time to Boil as follows:

$$\left(\frac{\text{Time to boil}}{\text{Step 1.B}}\right) + \left[\left(\frac{\text{Additional time to boil}}{\text{Step 1.C}}\right) \text{x} \left(\frac{\text{Additional 100 ft}^3\text{ volumes}}{\text{Step 1.D}}\right)\right] = \frac{\text{\_\_\_\_\_}}{\text{Time to Boil}} \text{ min}$$

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 2 of 9)

F. IF Full Core Offload is in progress, THEN **CALCULATE** Time to Boil as follows: (Section 6.1.3, Management Directive 1)

$$\left[\left(\frac{\text{\_\_\_\_\_}}{\begin{matrix}\text{Time to Boil}\\ \text{Step 1.E}\end{matrix}}\right)\times\left(\frac{\text{\_\_\_\_\_}}{\begin{matrix}\text{Time to Boil Multiplier}\\ \text{Table 4}\end{matrix}}\right)\right]=\frac{\text{\_\_\_\_\_}}{\text{Time to Boil}}\ \text{min}$$

G. If Reload is in progress OR complete, THEN **CALCULATE** Time to Boil as follows: (Section 6.1.3, Management Directive 1)

$$\left[\left(\frac{\text{\_\_\_\_\_}}{\begin{matrix}\text{Time to Boil}\\ \text{Step 1.E}\end{matrix}}\right)\times(1.35)\,\text{x}\left(\frac{\text{\_\_\_\_\_}}{\begin{matrix}\text{Time to Boil Multiplier}\\ \text{Table 5}\end{matrix}}\right)\right]=\frac{\text{\_\_\_\_\_}}{\text{Time to Boil}}\ \text{min}$$

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 3 of 9)

NOTE

- Temperatures between columns, select higher temperature.
- Time since shutdown between rows, select the lesser time.

Table 1
Time to Boil (minutes) at Mid-Loop

		RCS Temperature (°F)							
Shutdown Time (Hours)	60	80	90	100	110	120	130	140	200
24	13.1	11.4	10.5	9.64	8.77	7.90	7.03	6.17	1.08
48	16.0	13.9	12.8	11.8	10.7	9.66	8.60	7.54	1.32
60	17.3	15.0	13.9	12.7	11.6	10.4	9.30	8.16	1.43
72	18.6	16.1	14.9	13.7	12.4	11.2	9.98	8.76	1.54
90	20.4	17.7	16.4	15.0	13.7	12.3	11.0	9.62	1.69
102	21.6	18.7	17.3	15.9	14.4	13.0	11.6	10.2	1.78
120	23.2	20.1	18.6	17.0	15.5	14.0	12.4	10.9	1.91
132	24.2	21.0	19.4	17.8	16.2	14.6	13.0	11.4	2.00
144	25.1	21.8	20.1	18.5	16.8	15.1	13.5	11.8	2.07
240	31.0	26.9	24.8	22.8	20.7	18.7	16.6	14.6	2.56
300	33.8	29.3	27.0	24.8	22.6	20.3	18.1	15.9	2.79
360	36.3	31.5	29.0	26.6	24.2	21.8	19.4	17.1	2.99
480	40.9	35.5	32.8	30.1	27.3	24.6	21.9	19.3	3.38
600	45.4	39.4	36.4	33.3	30.4	27.3	24.3	21.4	3.75
840	54.2	47.0	43.4	39.8	36.2	32.6	29.0	25.5	4.47
1440	73.9	64.1	59.2	54.3	49.4	44.5	39.6	34.8	6.10

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 4 of 9)

NOTE

- Temperatures between columns, select higher temperature.
- Time since shutdown between rows, select the lesser time.

Table 2
Additional Time To Boil (minutes) for Each 100 cubic feet of RCS Volume
(Section 6.1.3, Management Directive 2)

	RCS Temperature (°F)								
Shutdown Time (Hours)	60	80	90	100	110	120	130	140	200
24	0.913	0.792	0.731	0.671	0.610	0.550	0.490	0.430	0.0754
48	1.12	0.968	0.893	0.819	0.746	0.672	0.598	0.525	0.0921
60	1.21	1.05	0.967	0.887	0.807	0.727	0.647	0.568	0.0996
72	1.30	1.12	1.04	0.952	0.866	0.781	0.695	0.610	0.107
90	1.42	1.23	1.14	1.04	0.951	0.857	0.763	0.669	0.117
102	1.50	1.30	1.20	1.10	1.00	0.905	0.805	0.707	0.124
120	1.61	1.40	1.29	1.19	1.08	0.972	0.865	0.760	0.133
132	1.68	1.46	1.35	1.24	1.13	1.01	0.902	0.792	0.139
144	1.75	1.52	1.40	1.28	1.17	1.05	0.937	0.823	0.144
240	2.16	1.87	1.73	1.58	1.44	1.30	1.16	1.01	0.178
300	2.35	2.04	1.88	1.73	1.57	1.42	1.26	1.11	0.194
360	2.52	2.19	2.02	1.85	1.69	1.52	1.35	1.19	0.208
480	2.85	2.47	2.28	2.09	1.90	1.71	1.53	1.34	0.235
600	3.16	2.74	2.53	2.32	2.11	1.90	1.69	1.49	0.261
840	3.77	3.27	3.02	2.77	2.52	2.27	2.02	1.77	0.311
1440	5.14	4.46	4.12	3.78	3.44	3.10	2.76	2.42	0.424

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 5 of 9)

NOTE

If elevation is between rows, select the lesser value.

Table 3
Additional Volume (100 cubic feet) Above Mid-Loop
(Section 6.1.3, Management Directive 2)

Vessel Head Installed or Not Installed			Vessel Head Not Installed			Vessel Head Not Installed	
Elevation	Additional Volume		Elevation	Additional Volume		Elevation	Additional Volume
Feet	100 ft3		Feet	100 ft3		Feet	100 ft3
29.5	0.00		36.5	14.20		48.5	229.00
30.0	0.40		37.0	23.15		49.0	237.95
30.5	0.81		37.5	32.10		49.5	246.90
31.0	1.21		38.0	41.05		50.0	255.85
31.5	1.61		38.5	50.00		50.5	264.80
32.0	2.02		39.0	58.95		51.0	273.75
32.5	2.42		39.5	67.90		51.5	282.70
33.0	2.82		40.0	76.85		52.0	291.65
33.5	3.23		40.5	85.80		52.5	300.60
34.0	3.63		41.0	94.75		53.0	309.55
34.5	4.04		41.5	103.70		53.5	318.50
35.0	4.44		42.0	112.65		54.0	327.45
35.5	4.84		42.5	121.60		54.5	336.40
36.0	5.25		43.0	130.55		55.0	345.35
			43.5	139.50		55.5	354.30
			44.0	148.45		56.0	363.25
			44.5	157.40		56.5	372.70
			45.0	166.35		57.0	381.15
			45.5	175.30		57.5	390.10
			46.0	184.25		58.0	399.05
			46.5	193.20		58.5	408.00
			47.0	202.15		59.0	416.95
			47.5	211.10		59.5	425.90
			48.0	220.05		60.0	434.85

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 6 of 9)

NOTE

If the number of assemblies OFFLOADED is between rows, then use the SMALLER number of assemblies OFFLOADED to get the most conservative (smaller) Time-to-Boil Multiplier.

Table 4
Time to Boil Multiplier during **OFFLOAD**

Number of Assemblies OFFLOADED	Number of Assemblies in CORE	Time-to-Boil Multiplier (1/Decay Heat Fraction)
0	217	1.00
5	212	1.02
10	207	1.04
15	202	1.06
20	197	1.09
25	192	1.11
30	187	1.14
35	182	1.16
40	177	1.19
45	172	1.22
50	167	1.26
55	162	1.29
60	157	1.33
65	152	1.36
70	147	1.40
75	142	1.45
80	137	1.49
85	132	1.54
90	127	1.59
95	122	1.65
100	117	1.70
105	112	1.77
110	107	1.84
115	102	1.93
120	97	2.03
125	92	2.14

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 7 of 9)

Number of Assemblies OFFLOADED	Number of Assemblies in CORE	Time-to-Boil Multiplier (1/Decay Heat Fraction)
130	87	2.26
135	82	2.40
140	77	2.56
145	72	2.73
150	67	2.94
155	62	3.18
160	57	3.46
165	52	3.79
170	47	4.19
175	42	4.69
180	37	5.33
190	27	7.30
200	17	11.60
210	7	21.70
216	1	21.70

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 8 of 9)

NOTE

If the number of assemblies RELOADED is between rows, then use the LARGER number of assemblies RELOADED to get the most conservative (smaller) Time-to-Boil Multiplier.

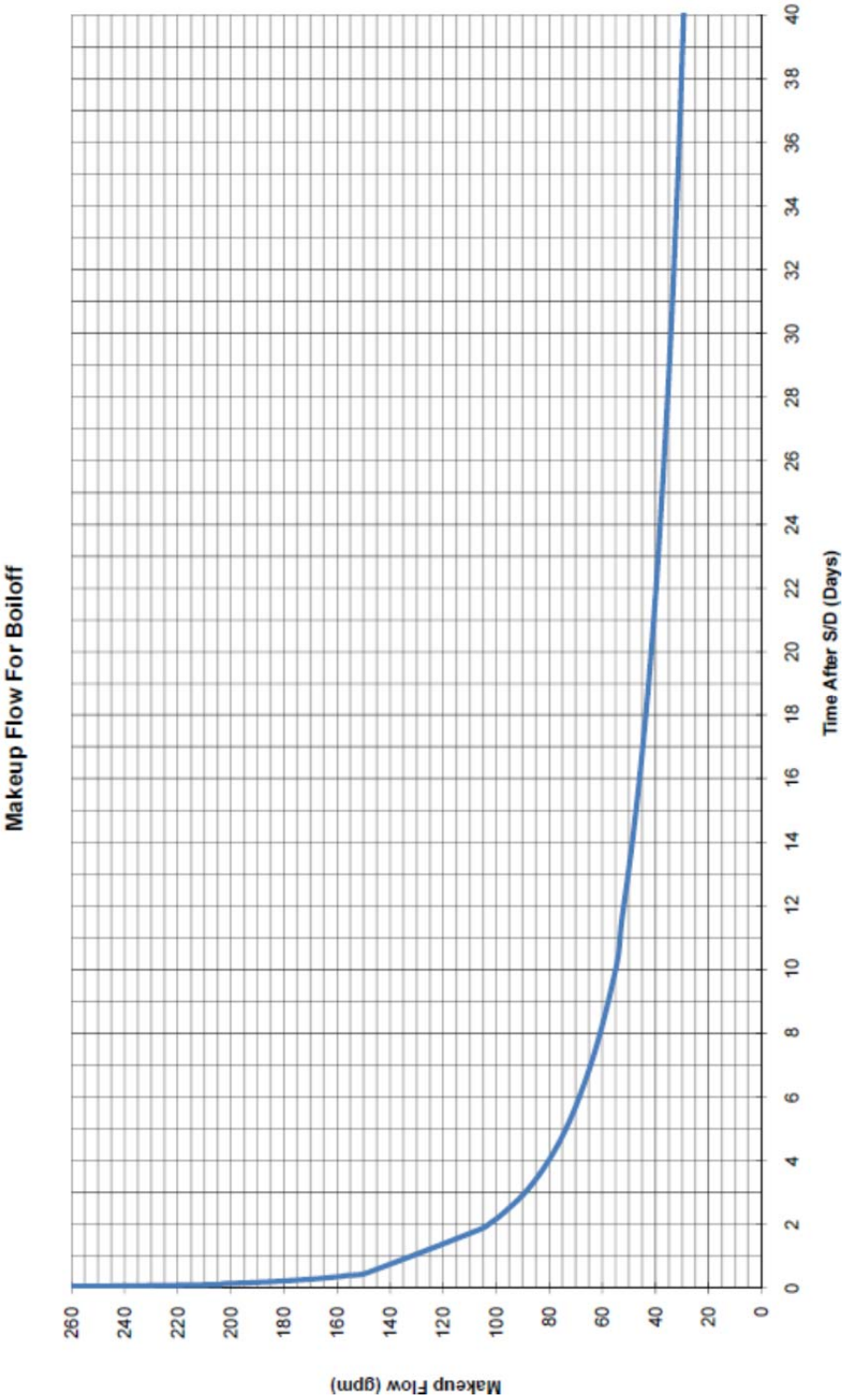
Table 5
Time to Boil Multiplier during **RELOAD**

Number of Assemblies RELOADED	Time-to-Boil Multiplier (1/Decay Heat Fraction)
1	21.70
5	21.70
10	21.70
15	14.46
20	10.85
25	8.68
30	7.23
35	6.20
40	5.42
45	4.82
50	4.34
55	3.94
60	3.61
65	3.33
70	3.10
75	2.89
80	2.71
85	2.55
90	2.41
95	2.28
100	2.17
105	2.06
110	1.97
115	1.88
120	1.80
125	1.73
130	1.66

ATTACHMENT 1
Estimated Time to Core Boiling
(Page 9 of 9)

Number of Assemblies RELOADED	Time-to-Boil Multiplier (1/Decay Heat Fraction)
135	1.60
140	1.55
145	1.49
150	1.44
155	1.40
160	1.35
165	1.31
170	1.27
175	1.24
180	1.20
190	1.14
200	1.08
210	1.03
217	1.00

FIGURE 2
FLOW TO MAKE UP FOR BOIL-OFF
(Page 1 of 1)



3/4.9 REFUELING OPERATIONS

BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 With the reactor vessel head unbolted or removed, the boron concentration of all filled portions of the Reactor Coolant System and the refueling cavity shall be maintained within the limit specified in the COLR.

APPLICABILITY: MODE 6*.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at ≥ 40 gpm of greater than or equal to 1900 ppm boron or its equivalent to restore boron concentration to within limits.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The boron concentration limit shall be determined prior to:

a. Removing or unbolting the reactor vessel head, and

b. Withdrawal of any full length CEA in excess of 3 feet from its fully inserted position.

4.9.1.2 The boron concentration of the refueling cavity shall be determined by chemical analysis in accordance with the Surveillance Frequency Control Program.

* The reactor shall be maintained in MODE 6 when the reactor vessel head is unbolted or removed.

REFUELING OPERATIONS

INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.9.2 As a minimum, two wide range logarithmic neutron flux monitors shall be operating, each with continuous visual indication in the control room and one with audible indication in the containment.

APPLICABILITY: MODE 6.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of Technical Specification 3.9.1. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.2 Each wide range logarithmic neutron flux monitor shall be demonstrated OPERABLE by performance of:

a. A CHANNEL FUNCTIONAL TEST in accordance with the Surveillance Frequency Control Program.

b. A CHANNEL FUNCTIONAL TEST within 8 hours prior to the start of CORE ALTERATIONS, and

c. A CHANNEL CHECK in accordance with the Surveillance Frequency Control Program during CORE ALTERATIONS.

REFUELING OPERATIONS

DECAY TIME

LIMITING CONDITION FOR OPERATION

3.9.3 The reactor shall be subcritical for a minimum of 72 hours.

APPLICABILITY: During movement of irradiated fuel in the reactor pressure vessel.

ACTION:

With the reactor subcritical for less than 72 hours, suspend all operations involving movement of irradiated fuel in the reactor pressure vessel. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.3 The reactor shall be determined to have been subcritical for at least 72 hours by verification of the date and time of subcriticality prior to movement of irradiated fuel in the reactor pressure vessel.

REFUELING OPERATIONS

CONTAINMENT PENETRATIONS

LIMITING CONDITION FOR OPERATION

3.9.4 The containment penetrations shall be in the following status:

a. The equipment door closed and held in place by a minimum of four bolts.

b. A minimum of one door in each airlock is closed.

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere shall be either:

1. Closed by isolation valve, blind flange, or manual valve except for valves that are open on an intermittent basis under administrative control, or

2. Be capable of being closed by an OPERABLE automatic containment isolation valve, or

3. Be capable of being closed by an OPERABLE containment vacuum relief valve.

Note: Penetration flow path(s) providing direct access from the containment atmosphere to the outside atmosphere may be unisolated under administrative controls.

APPLICABILITY: During movement of recently irradiated fuel within the containment.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving movement of recently irradiated fuel in the containment. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.4 Each of the above required containment penetrations shall be determined to be either in its closed/isolated condition or capable of being closed by an OPERABLE automatic containment isolation valve within 72 hours prior to the start of and in accordance with the Surveillance Frequency Control Program during movement of recently irradiated fuel in the containment by:

a. Verifying the penetrations are in their closed/isolated condition, or

b. Testing of containment isolation valves per the applicable portions of Specifications 4.6.3.1.1. and 4.6.3.1.2.

INTENTIONALLY DELETED

INTENTIONALLY DELETED

INTENTIONALLY DELETED

REFUELING OPERATIONS

SHUTDOWN COOLING AND COOLANT CIRCULATION

HIGH WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.1 At least one shutdown cooling loop shall be OPERABLE and in operation*.

APPLICABILITY: MODE 6 when the water level above the top of irradiated fuel assemblies seated within the reactor pressure vessel is greater than or equal to 23 feet.

ACTION:

a. With less than one shutdown cooling loop in operation, suspend all operations involving an increase in reactor decay heat load or operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of Technical Specification 3.9.1. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.8.1 At least one shutdown cooling loop shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 3000 gpm in accordance with the Surveillance Frequency Control Program.

4.9.8.1.1 Verify required shutdown cooling loop locations susceptible to gas accumulation are sufficiently filled with water in accordance with the Surveillance Frequency Control Program.

---

* The shutdown cooling loop may be removed from operation for up to 1 hour per 8 hour period during the performance of CORE ALTERATIONS in the vicinity of reactor pressure vessel hot legs, provided no operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SHUTDOWN MARGIN of Technical Specification 3.9.1.

REFUELING OPERATIONS

LOW WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.2 Two independent shutdown cooling loops shall be OPERABLE and at least one shutdown cooling loop shall be in operation.*

APPLICABILITY: MODE 6 when the water level above the top of irradiated fuel assemblies seated within the reactor pressure vessel is less than 23 feet.

ACTION:

a. With less than the required shutdown cooling loops OPERABLE, within one (1) hour 1) initiate corrective action to return the required loops to OPERABLE status, or 2) establish greater than or equal to 23 feet of water above irradiated fuel assemblies seated within the reactor pressure vessel.

b. With no shutdown cooling loop in operation, suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of Technical Specification 3.9.1. and within one (1) hour initiate corrective action to return the required shutdown cooling loop to operation. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.8.2 At least one shutdown cooling loop shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 3000 gpm in accordance with the Surveillance Frequency Control Program.

4.9.8.2.1 Verify shutdown cooling loop locations susceptible to gas accumulation are sufficiently filled with water in accordance with the Surveillance Frequency Control Program.

---

* One required shutdown cooling loop may be inoperable for up to 2 hours for surveillance testing, provided that the other shutdown cooling loop is OPERABLE and in operation.

REFUELING OPERATIONS

CONTAINMENT ISOLATION SYSTEM

LIMITING CONDITION FOR OPERATION

3.9.9 The containment isolation system shall be OPERABLE.

APPLICABILITY: During movement of recently irradiated fuel assemblies within containment.

ACTION:

With the containment isolation system inoperable, either suspend all operations involving movement of recently irradiated fuel assemblies within containment or close each of the penetrations providing direct access from the containment atmosphere to the outside atmosphere.

SURVEILLANCE REQUIREMENTS

4.9.9 The containment isolation system shall be demonstrated OPERABLE within 72 hours prior to the start of and in accordance with the Surveillance Frequency Control Program during movement of recently irradiated fuel assemblies by verifying that containment isolation occurs on manual initiation and on a high radiation signal from two of the containment radiation monitoring instrumentation channels.

REFUELING OPERATIONS

WATER LEVEL – REACTOR VESSEL

LIMITING CONDITION FOR OPERATION

3.9.10 At least 23 feet of water shall be maintained over the top of irradiated fuel assemblies seated within the reactor pressure vessel.

APPLICABILITY: During CORE ALTERATIONS.
During movement of irradiated fuel assemblies within containment.

ACTION:

With the requirements of the above specifications not satisfied, immediately suspend CORE ALTERATIONS and movement of irradiated fuel assemblies within containment, and immediately initiate action to restore refueling cavity water level to within limits.

SURVEILLANCE REQUIREMENTS

4.9.10 The water level shall be determined to be at least its minimum required depth within 2 hours prior to the start of and in accordance with the Surveillance Frequency Control Program during CORE ALTERATIONS and during movement of irradiated fuel assemblies within containment.

REFUELING OPERATIONS

SPENT FUEL STORAGE POOL

LIMITING CONDITION FOR OPERATION

3.9.11 The Spent Fuel Pool shall be maintained with:

a. The fuel storage pool water level greater than or equal to 23 ft over the top of irradiated fuel assemblies seated in the storage racks, and

b. The fuel storage pool boron concentration greater than or equal to 1900 ppm.

APPLICABILITY: Whenever irradiated fuel assemblies are in the spent fuel storage pool.

ACTION:

a. With the water level requirement not satisfied, immediately suspend all movement of fuel assemblies and crane operations with loads in the fuel storage areas and restore the water level to within its limit within 4 hours.

b. With the boron concentration requirement not satisfied, immediately suspend all movement of fuel assemblies in the fuel storage pool and initiate action to restore the fuel storage pool boron concentration to within the required limit.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.11 The water level in the spent fuel storage pool shall be determined to be at least its minimum required depth in accordance with the Surveillance Frequency Control Program when irradiated fuel assemblies are in the fuel storage pool.

4.9.11.1 Verify the fuel storage pool boron concentration is within limit in accordance with the Surveillance Frequency Control Program.

REFUELING OPERATIONS

FUEL POOL VENTILATION SYSTEM – FUEL STORAGE

LIMITING CONDITION FOR OPERATION

3.9.12 At least one fuel pool ventilation system shall be OPERABLE.

APPLICABILITY: Whenever recently irradiated fuel is in the spent fuel pool.

ACTION:

a. With no fuel pool ventilation system OPERABLE, suspend all operations involving movement of recently irradiated fuel within the spent fuel pool or crane operation with loads over the recently irradiated spent fuel until at least one fuel pool ventilation system is restored to OPERABLE status.

b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.12 The above required fuel pool ventilation system shall be demonstrated OPERABLE:

a. In accordance with the Surveillance Frequency Control Program by initiating flow through the HEPA filter and charcoal adsorber train and verifying that the train operates for at least 15 minutes.

b. In accordance with the Surveillance Frequency Control Program or (1) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (2) following painting, fire or chemical release in any ventilation zone communicating with the system by:

SURVEILLANCE REQUIREMENTS (Continued)

1. Verifying that the charcoal adsorbers remove ≥ 99% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the ventilation system at a flow rate of 10,350 cfm ± 10%.

2. Verifying that the HEPA filter banks remove ≥ 99% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the ventilation system at a flow rate of 10,350 cfm ± 10%.

3. Verifying that a laboratory analysis of a carbon sample from either at least one test canister or at least two carbon samples removed from one of the charcoal adsorbers demonstrates a removal efficiency of ≥ 85% for radioactive methyl iodide when the sample is tested in accordance with ASTM D3803-1989 (30°C, 95% RH). The carbon samples not obtained from test canisters shall be prepared by either:

   a) Emptying one entire bed from a removed adsorber tray, mixing the adsorbent thoroughly, and obtaining samples at least two inches in diameter and with a length equal to the thickness of the bed, or

   b) Emptying a longitudinal sample from an adsorber tray, mixing the adsorbent thoroughly, and obtaining samples at least two inches in diameter and with a length equal to the thickness of the bed.

4. Verifying a system flow rate of 10,350 cfm ± 10% during system operation when tested in accordance with ANSI N510-1975.

SURVEILLANCE REQUIREMENTS (Continued)

c. In accordance with the Surveillance Frequency Control Program by:

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is < 4.15 inches Water Gauge while operating the ventilation system at a flow rate of 10,350 cfm ± 10%.

2. Verifying that the air flow distribution is uniform within 20% across HEPA filters and charcoal adsorbers when tested in accordance with ANSI N510-1975.

3. Verifying that the ventilation system maintains the spent fuel storage pool area at a negative pressure of ≥ 1/8 inches Water Gauge relative to the outside atmosphere during system operation.

d. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter banks remove ≥ 99% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the ventilation system at a flow rate of 10,350 cfm ± 10%.

e. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorbers remove ≥ 99% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the ventilation system at a flow rate of 10,350 cfm ± 10%.

JPM TITLE: **Perform 2C Intake Cooling Water Pump Code Run and Evaluate Pump Operability - Unit 2**

JPM NUMBER: **L-19-1 NRC JPM A-3 SRO** **REV. 0**

TASK NUMBER(S) / TASK TITLE(S): **09201030 / Perform Immediate Operability Determination**
07203250 / Implement Surveillance procedures

K/A NUMBERS / K/A VALUES: (RO SRO) **2.2.37 SRO (4.6) Ability to determine operability and/or availability of safety related equipment.**

Justification (FOR K/A VALUES <3.0): **N/A**

TASK APPLICABILITY:
☒ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** _____
APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: ☐ Perform: ☒ X

EVALUATION LOCATION: In-Plant: ☐ Control Room: ☐
Simulator: ☐ Other: ☒ X
Lab: ☐

Time for Completion: 15 Minutes Time Critical: No

Alternate Path [NRC]: No
Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS	YES	NO	N/A
1. Are all items on the signature page filled in correctly?	☒	☐	☐
2. Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3. Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4. Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5. Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6. Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7. If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8. Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9. Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10. Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11. Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12. Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13. Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14. Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15. Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16. If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☒	☐	☐

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1000) made to the material after initial approval.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:

- 2-OSP-21.01C, 2C INTAKE COOLING WATER PUMP CODE RUN, Steps 4.2.19, 4.2.20 and Attachment 2.
- ADM-29.02, ASME CODE TESTING OF PUMPS AND VALVES
- Calculator

General References:

- None

Task Standards:

The applicant will:

- Enter pump data into the surveillance procedure steps.
- Evaluate the results to determine if pump status.
- Evaluate and determine pump operability.

This JPM is complete when the applicant returns the cue sheet, filled out surveillance procedure, calculation, and pump operability determination to the examiner.

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit 2 is at 100% power.
- 2-OSP-21.01C, 2C INTAKE COOLING WATER PUMP CODE RUN is in progress.

INITIATING CUES:

- You are an extra SRO performing a code run on the 2C ICW pump; you are to record and evaluate the test data per attachment 2, and complete 2-OSP-21.01C steps 4.2.19 and 4.2.20.
- Additionally, as the SRO, determine operability of the 2C ICW pump per ADM-29.02, ASME Code Testing of Pumps and Valves.

- **INDICATE** status: 2C ICW pump.
- No computers are available to perform this calculation.
- The ANPO has Transmitted the pump data from Attachment 2 as follows:
  - **Intake Level**
    - -3.44 ft.
  - **Pump Disc Press. (PI-21-5C)**
    - 43 psig
  - **Vibration (Peak Velocity)**
    - UMN .06208 in/sec
    - UME .05777 in/sec
    - UMA .06126 in/sec
  - **Vibration Instr. No.**
    - PSL-2592

The 2C ICW is:	**OPERABLE / INOPERABLE**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

Start Time:

2-OSP-21.01C, 2C INTAKE COOLING WATER PUMP CODE RUN	
Performance Step: 1 Critical YES	**Record and evaluate the test data**
Standard:	

REVISION NO.: 26 | PROCEDURE NO.: 2-OSP-21.01C | PROCEDURE TITLE: 2C INTAKE COOLING WATER PUMP CODE RUN ST. LUCIE UNIT 2 | PAGE: 22 of 53 | INITIAL

4.2 2C ICW Pump Code Run on B Header (continued)

19. Perform the following:

A. CALCULATE pump head. _____

Actual pump head = 41 + (a x 2.307) – (b +18)

where: a = PI-21-5C, 2C ICW Pump Disch Press
b = Intake level

Actual pump head = 41 + (43 psig x 2.307) – (-3.44 ft +18)

Actual pump head = 125.6 ft CRITICAL STEP

B. RECORD calculated pump head in Table 1 of Attachment 2, 2C ICW Quarterly Pump Code Run. _____

C. VERIFY calculated pump head Acceptance Criteria. _____

Acceptance Criteria	Results (✓)
Calculated pump head is 126.3 to 140.8 ft.	☐ SAT ☑ UNSAT

CRITCAL STEP

20. PERFORM the following:

A. VERIFY vibration Acceptance Criteria. _____

Location	Acceptance Criteria	Results (✓)
UMN	Vibration is < 0.195 in/sec	☑ SAT ☐ UNSAT
UME	Vibration is < 0.119 in/sec	☑ SAT ☐ UNSAT
UMA	Vibration is < 0.167 in/sec	☑ SAT ☐ UNSAT

Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY ___ UNSATISFACTORY _**
Comments:	

Performance Step: 2 **Critical: YES**	**Determine the status of the 2C ICW Pump**
Standard:	

REVISION NO.:	PROCEDURE TITLE:	PAGE:
26	2C INTAKE COOLING WATER PUMP CODE RUN	53 of 53
PROCEDURE NO.: 2-OSP-21.01C	ST. LUCIE UNIT 2	

ATTACHMENT 2
2C ICW Quarterly Pump Code Run
(Page 1 of 1)

Date: _____ / _____ / _____ Vibration Instr. No. _____

Table 1
2C ICW Pump Flow and Vibration Data

Parameter		Reading	Acceptance Criteria		
			Allowable Range	Alert Range	Required Action
Intake Level		-3.44 ft.	N/A	N/A	N/A
Pump Disch. Press. (PI-21-5C)		43 psig	N/A	N/A	N/A
Calculated Pump Head *		125.6 ft.	126.3 to 140.8	123.6 to < 126.3	< 123.6 or > 140.8
Peak Velocity **	UMN	.06208 in./sec.	< 0.195	0.195 to 0.468	> 0.468
	UME	.05777 in./sec.	<0.119	0.119 to 0.286	> 0.286
	UMA	.06126 in./sec.	< 0.167	0.167 to 0.401	> 0.401

* Calculated Pump Head = 41 ft. + (Disch. Press. x 2.307) - (Intake Level + 18 ft.).
** See Attachment 1, 2C ICW Pump Vibration Reading Locations, for measurement points.

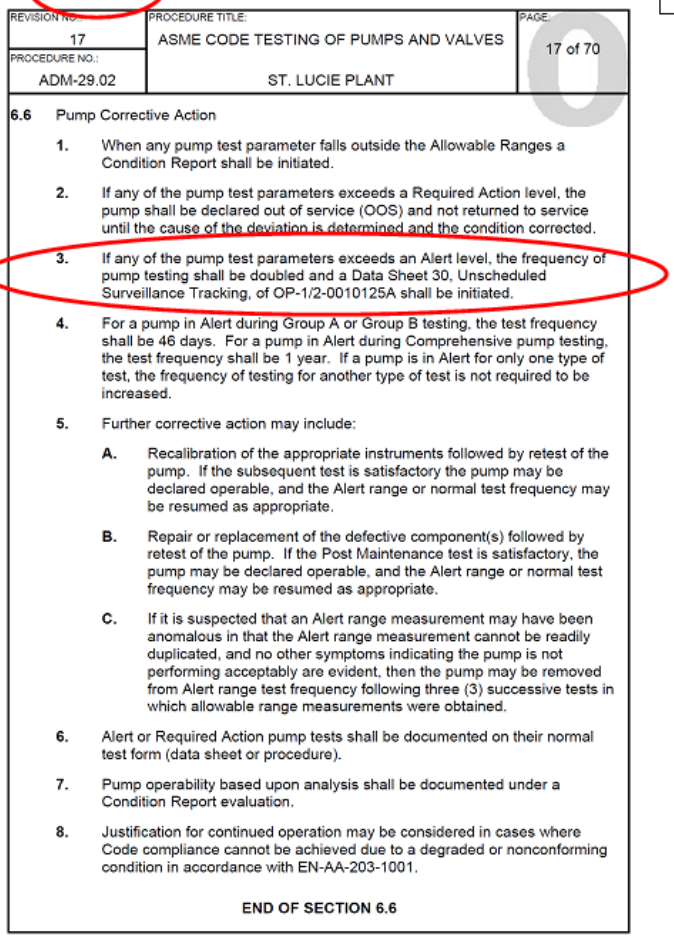
1. **INDICATE** purpose of test:
   - ☑ Code Run
   - ☐ Post Maintenance (explain) _____
   - ☐ Other (explain) _____

2. **EVALUATE** the test data with respect to acceptance criteria and **INDICATE** status:

CRITCAL STEP

   - ☐ ACCEPTABLE
   - ☑ ALERT RANGE
   - ☐ REQUIRED ACTION RANGE

Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 3 **Critical: YES**	**Determine the Operability of the 2C ICW Pump**
Standard:	**The 2C ICW is: OPERABLE / INOPERABLE** — **CRITICAL STEP** 
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

REVISION NO.: 17 | PROCEDURE TITLE: ASME CODE TESTING OF PUMPS AND VALVES | PAGE: 17 of 70
PROCEDURE NO.: ADM-29.02 | ST. LUCIE PLANT

6.6 Pump Corrective Action

1. When any pump test parameter falls outside the Allowable Ranges a Condition Report shall be initiated.
2. If any of the pump test parameters exceeds a Required Action level, the pump shall be declared out of service (OOS) and not returned to service until the cause of the deviation is determined and the condition corrected.
3. If any of the pump test parameters exceeds an Alert level, the frequency of pump testing shall be doubled and a Data Sheet 30, Unscheduled Surveillance Tracking, of OP-1/2-0010125A shall be initiated.
4. For a pump in Alert during Group A or Group B testing, the test frequency shall be 46 days. For a pump in Alert during Comprehensive pump testing, the test frequency shall be 1 year. If a pump is in Alert for only one type of test, the frequency of testing for another type of test is not required to be increased.
5. Further corrective action may include:
   - **A.** Recalibration of the appropriate instruments followed by retest of the pump. If the subsequent test is satisfactory the pump may be declared operable, and the Alert range or normal test frequency may be resumed as appropriate.
   - **B.** Repair or replacement of the defective component(s) followed by retest of the pump. If the Post Maintenance test is satisfactory, the pump may be declared operable, and the Alert range or normal test frequency may be resumed as appropriate.
   - **C.** If it is suspected that an Alert range measurement may have been anomalous in that the Alert range measurement cannot be readily duplicated, and no other symptoms indicating the pump is not performing acceptably are evident, then the pump may be removed from Alert range test frequency following three (3) successive tests in which allowable range measurements were obtained.
6. Alert or Required Action pump tests shall be documented on their normal test form (data sheet or procedure).
7. Pump operability based upon analysis shall be documented under a Condition Report evaluation.
8. Justification for continued operation may be considered in cases where Code compliance cannot be achieved due to a degraded or nonconforming condition in accordance with EN-AA-203-1001.

END OF SECTION 6.6

Terminating Cues:	**The applicant will:** **• Enter pump data into the surveillance procedure steps.** **• Evaluate the results to determine if pump status.** **• Evaluate and determine pump operability.**
The JPM is complete.	**This JPM is complete when the applicant returns the cue sheet, filled out surveillance procedure, calculation, and pump operability determination to the examiner.**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO** _____

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: **ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.**

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

- Unit 2 is at 100% power.
- 2-OSP-21.01, 2C INTAKE COOLING WATER PUMP CODE RUN is in progress.

INITIATING CUES:

- You are an extra SRO performing a code run on the 2C ICW pump; you are to record and evaluate the test data per attachment 2, and complete 2-OSP-21.01C steps 4.2.19 and 4.2.20.
- Additionally, as the SRO, determine operability of the 2C ICW pump per ADM-29.02, ASME Code Testing of Pumps and Valves.

- **INDICATE** status: 2C ICW pump.
- No computers are available to perform this calculation.
- The ANPO has Transmitted the pump data from Attachment 2 as follows:
  - **Intake Level**
    - -3.44 ft.
  - **Pump Disc Press. (PI-21-5C)**
    - 43 psig
  - **Vibration (Peak Velocity)**
    - UMN .06208 in/sec
    - UME .05777 in/sec
    - UMA .06126 in/sec
  - **Vibration Instr. No.**
    - PSL-2592

The 2C ICW is: OPERABLE / INOPERABLE circle one

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

REVISION NO.:	PROCEDURE TITLE:	PAGE:
26	2C INTAKE COOLING WATER PUMP CODE RUN	22 of 53
PROCEDURE NO.:	ST. LUCIE UNIT 2	INITIAL
2-OSP-21.01C		

4.2 2C ICW Pump Code Run on B Header (continued)

19. Perform the following:

A. **CALCULATE** pump head. _____

$$\text{Actual pump head} = 41 + (\underline{\ a\ } \times 2.307) - (\underline{\ b\ } + 18)$$

where: a = PI-21-5C, 2C ICW Pump Disch Press
b = Intake level

$$\text{Actual pump head} = 41 + (\_\_\_\_\_ \times 2.307) - (\_\_\_\_\_ + 18)$$

$$\text{Actual pump head} = \_\_\_\_\_$$

B. **RECORD** calculated pump head in Table 1 of Attachment 2, 2C ICW Quarterly Pump Code Run. _____

C. **VERIFY** calculated pump head Acceptance Criteria. _____

Acceptance Criteria	Results (✓)
Calculated pump head is 126.3 to 140.8 ft.	☐ SAT ☐ UNSAT

20. **PERFORM** the following:

A. **VERIFY** vibration Acceptance Criteria. _____

Location	Acceptance Criteria	Results (✓)
UMN	Vibration is < 0.195 in/sec	☐ SAT ☐ UNSAT
UME	Vibration is < 0.119 in/sec	☐ SAT ☐ UNSAT
UMA	Vibration is < 0.167 in/sec	☐ SAT ☐ UNSAT

REVISION NO.:	PROCEDURE TITLE:	PAGE:
26	2C INTAKE COOLING WATER PUMP CODE RUN	53 of 53
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2-OSP-21.01C		

ATTACHMENT 2
2C ICW Quarterly Pump Code Run
(Page 1 of 1)

Date: _____ / _____/ _____ Vibration Instr. No. _____

Table 1
2C ICW Pump Flow and Vibration Data

Parameter		Reading	Acceptance Criteria		
			Allowable Range	Alert Range	Required Action
Intake Level		ft.	N/A	N/A	N/A
Pump Disch. Press. (PI-21-5C)		psig	N/A	N/A	N/A
Calculated Pump Head *		ft.	126.3 to 140.8	123.6 to < 126.3	< 123.6 or > 140.8
Peak Velocity **	UMN	in./sec.	< 0.195	0.195 to 0.468	> 0.468
	UME	in./sec.	<0.119	0.119 to 0.286	> 0.286
	UMA	in./sec.	< 0.167	0.167 to 0.401	> 0.401

* Calculated Pump Head = 41 ft. + (Disch. Press. x 2.307) - (Intake Level + 18 ft.).
** See Attachment 1, 2C ICW Pump Vibration Reading Locations, for measurement points.

1. **INDICATE** purpose of test:

   ☐ Code Run

   ☐ Post Maintenance (explain) _____

   ☐ Other (explain) _____

2. **EVALUATE** the test data with respect to acceptance criteria and **INDICATE** status:

   ☐ ACCEPTABLE

   ☐ ALERT RANGE

   ☐ REQUIRED ACTION RANGE

REVISION NO.:	PROCEDURE TITLE:	PAGE:
17	ASME CODE TESTING OF PUMPS AND VALVES	17 of 70
PROCEDURE NO.: ADM-29.02	ST. LUCIE PLANT	

6.6 Pump Corrective Action

1. When any pump test parameter falls outside the Allowable Ranges a Condition Report shall be initiated.

2. If any of the pump test parameters exceeds a Required Action level, the pump shall be declared out of service (OOS) and not returned to service until the cause of the deviation is determined and the condition corrected.

3. If any of the pump test parameters exceeds an Alert level, the frequency of pump testing shall be doubled and a Data Sheet 30, Unscheduled Surveillance Tracking, of OP-1/2-0010125A shall be initiated.

4. For a pump in Alert during Group A or Group B testing, the test frequency shall be 46 days. For a pump in Alert during Comprehensive pump testing, the test frequency shall be 1 year. If a pump is in Alert for only one type of test, the frequency of testing for another type of test is not required to be increased.

5. Further corrective action may include:

A. Recalibration of the appropriate instruments followed by retest of the pump. If the subsequent test is satisfactory the pump may be declared operable, and the Alert range or normal test frequency may be resumed as appropriate.

B. Repair or replacement of the defective component(s) followed by retest of the pump. If the Post Maintenance test is satisfactory, the pump may be declared operable, and the Alert range or normal test frequency may be resumed as appropriate.

C. If it is suspected that an Alert range measurement may have been anomalous in that the Alert range measurement cannot be readily duplicated, and no other symptoms indicating the pump is not performing acceptably are evident, then the pump may be removed from Alert range test frequency following three (3) successive tests in which allowable range measurements were obtained.

6. Alert or Required Action pump tests shall be documented on their normal test form (data sheet or procedure).

7. Pump operability based upon analysis shall be documented under a Condition Report evaluation.

8. Justification for continued operation may be considered in cases where Code compliance cannot be achieved due to a degraded or nonconforming condition in accordance with EN-AA-203-1001.

END OF SECTION 6.6

NOTE

Either Section 4.1 or Section 4.2 may be performed to complete the 2C ICW Code Run testing.

4.2 2C ICW Pump Code Run on B Header

1. IF ICW inlet temperature is greater than 88ºF, THEN **PERFORM** one of the following: (Section 8.1.3, Management Directive 1)

   - **OBTAIN** an evaluation to demonstrate operability prior to performing this procedure. N/A <88 ˚F

   - **DECLARE** ICW train B inoperable when strainer upstream isolation valve SB21232, SS-21-1B UPSTRM ISOL, is unlocked and throttled. LFG N/A <88 ˚F

2. **CIRCLE** type of test performance. LFG

   - Code Run
   - Post Maintenance
   - Other: (_____)

3. **RECORD** vibration instrument number in Section 5.2, Step 1 AND on Attachment 2, 2C ICW Quarterly Pump Code Run. LFG

4. **ENSURE** SB21165, 2C ICW PUMP X-TIE DISCH TO “A” TRAIN ISOL, is LOCKED CLOSED. (INTK/9/N-4/W-C) BFG ANPO

5. IF SB21165, 2C ICW PUMP X-TIE DISCH TO “A” TRAIN ISOL, is LOCKED CLOSED AND the "V" notch on indicator plate and valve indicator arrow are **NOT** aligned, THEN **NOTIFY** Site Programs Engineering. (INTK/9/N-4/W-C) LFG

6. **ENSURE** the 2C ICW Pump is operating on the 2B Header per 2-NOP-21.03C, 2C Intake Cooling Water System Operation. LFG

4.2 2C ICW Pump Code Run on B Header (continued)

NOTE

Section 4.2, Step 7 and Section 4.2, Step 8 may be performed concurrently.

7. **PERFORM** the following:

A. **CHECK** ICW Pump 2C and associated valves and piping for the following: BFG / ANPO

- Leakage
- Abnormal Conditions

B. IF any leakage or abnormal conditions are identified, THEN **DOCUMENT** in Section 5.2, Documentation. BFG / ANPO

NOTE

The Auto/Manual status of TCVs in the turbine building should be evaluated for the impact of changing ICW flow prior to cross-tying heat exchangers (TCW, Blowdown, Seal Oil, H2, Exciter, Lube Oil, and EH).

8. **ENSURE** the following valves OPEN:

- SB212001, ICW CROSS-TIE TO 2A/2B OBHX ISOL (TGB/32/N-21/E-G) GF / NPO
- SB21215, 2A/2B TCW HX ICW INLET CROSS-TIE BYPASS (TGB/27/S-20/E-G) GF / NPO

4.2 2C ICW Pump Code Run on B Header (continued)

9. **PERFORM** the following:

A. **VERIFY** SS-21-1B, 2B CCW HX ICW INLET STRNR, is **NOT** in Auto Backwash cycle. (CCW/26/N-E/W-4) BUG / SNPO

B. **ENSURE** SS-21-1B, 2B CCW HX ICW INLET STRNR, Auto/Man selector switch is in MAN. BUG / SNPO

C. **ENSURE** HCV-21-7B, SS-21-1B DEBRIS DISCH ISOL, is CLOSED. (CCW/19/N-E/E-3) BUG / SNPO

10. **CLOSE** MV-21-2, 'B' ICW TRAIN TO TCW HXS. (RTGB 202) LEG

11. **OPEN** TCV-14-4B, 2B CCW HX OUTLET, by performing one of the following:

A. IF Stroke Timing of TCV-14-4B, 2B CCW HX OUTLET, is required, THEN **OPEN** TCV-14-4B, 2B CCW HX OUTLET, per 2-OSP-99.08B, B Train Quarterly Non Check Valve Cycle Test. (CCW/15/N-D/W-4) BUG / SNPO

B. IF Stroke Timing of TCV-14-4B, 2B CCW HX OUTLET, is **NOT** performed, THEN **OPEN** TCV-14-4B, 2B CCW HX OUTLET, by performing the following: (CCW/15/N-D/W-4)

(1) **PLACE** TIC-14-4B, 2B CCW HX TEMP (Controller), in MANUAL. BUG / SNPO

(2) At TCV-14-4B, 2B CCW HX OUTLET, **PERFORM** the following:

a. **REMOVE** the 3-way valve quick disconnect end cap. BUG / SNPO

b. **ISOLATE** the air supply to the valve positioner. BUG / SNPO

c. **ADJUST** the 3-way valve to the vent position. BUG / SNPO

4.2 2C ICW Pump Code Run on B Header (continued)

11. B. (2) (continued)

d. **VERIFY** TCV-14-4B, 2B CCW HX OUTLET, is OPEN.

BUG
SNPO

NOTE

ICW flow has a significant effect on calculated pump head during the ICW pump surveillance. Accurately establishing 14,000 gpm flow is essential for determining pump operability. Fluctuations in flow on FIS-21-9B,2B CCW HX ICW OUTLET FLOW, should NOT exceed +/-200 gpm.

12. **THROTTLE** SB21232, SS-21-1B UPSTRM ISOL, to obtain ICW flow of 14,000 gpm as indicated on FIS-21-9B, 2B CCW HX ICW OUTLET FLOW. (CCW/26/N-3/E-3)

BUG
SNPO

13. IF ICW inlet temperature is greater than 88ºF AND an evaluation is **NOT** obtained to demonstrate operability, THEN **DECLARE** ICW train B inoperable. (Section 8.1.3, Management Directive 1)

N/A <88 ˚F

14. **RECORD** ICW flow as indicated on FIS-21-9B, 2B CCW HX ICW FLOW.

BUG
SNPO

FIS-21-9B 14,000 gpm Time NOW

15. IF any of the following conditions exist on FIS-21-9B, 2B CCW HX OUTLET ICW FLOW:

- Fluctuations in flow exceed +/- 200 gpm from 14,000 gpm
- Gauge accuracy is suspect

THEN **REQUEST** I&C perform the following:

- **VENT** FIS-21-9B, 2B CCW HX ICW OUTLET FLOW, and its associated lines.

LSG
I&C

- IF I&C determines calibration is necessary, THEN **CALIBRATE** transmitter FIS-21-9B, 2B CCW HX ICW OUTLET FLOW.

LSG
I&C

4.2 2C ICW Pump Code Run on B Header (continued)

NOTE

- When the ICW pump temporary gauge isolation valve is opened, the affected pump and header the pump is aligned to shall be declared inoperable but available.
- Field operator shall remain locally and in radio communication with the Control Room while temporary gauge is in service to restore valve closure in case of an emergency header demand.

16. WHEN two minutes has elapsed, THEN **PERFORM** the following:

A. **OPEN** SH21204, ROOT VALVE FOR PI-21-5C. (INTK/23/N-3/W-C)

BFG
ANPO

B. **RECORD** the following in Table 1 of Attachment 2, 2C ICW Quarterly Pump Code Run

- Pressure from temporary gauge located at PI-21-5C, 2C ICW PUMP DISCH PRESS
- Intake level from LT-21-9A or LT-21-9B on PDR-21-1 (RTGB 202) or Intake Level Gauge at Unit 1 intake.

C. **CLOSE** SH21204, ROOT VALVE FOR PI-21-5C. (INTK/23/N-3/W-C)

BFG
ANPO

17. Referring to Attachment 1, 2C ICW Pump Vibration Reading Locations, **TAKE** vibration readings AND **RECORD** in Table 1 of Attachment 2, 2C ICW Quarterly Pump Code Run.

BFG
ANPO

18. **TRANSMIT** recorded data from Attachment 2, Table 1 to Control Room.

BFG
ANPO

4.2 2C ICW Pump Code Run on B Header (continued)

19. Perform the following:

A. **CALCULATE** pump head. _____

$$\text{Actual pump head} = 41 + (\_\_a\_\_ \times 2.307) - (\_\_b\_\_ + 18)$$

where: a = PI-21-5C, 2C ICW Pump Disch Press
b = Intake level

$$\text{Actual pump head} = 41 + (\_\_\_\_\_ \times 2.307) - (\_\_\_\_\_ + 18)$$

$$\text{Actual pump head} = \_\_\_\_\_$$

B. **RECORD** calculated pump head in Table 1 of Attachment 2, 2C ICW Quarterly Pump Code Run. _____

C. **VERIFY** calculated pump head Acceptance Criteria. _____

Acceptance Criteria	Results (✓)
Calculated pump head is 126.3 to 140.8 ft.	☐ SAT ☐ UNSAT

20. **PERFORM** the following:

A. **VERIFY** vibration Acceptance Criteria. _____

Location	Acceptance Criteria	Results (✓)
UMN	Vibration is < 0.195 in/sec	☐ SAT ☐ UNSAT
UME	Vibration is < 0.119 in/sec	☐ SAT ☐ UNSAT
UMA	Vibration is < 0.167 in/sec	☐ SAT ☐ UNSAT

ATTACHMENT 2
2C ICW Quarterly Pump Code Run
(Page 1 of 1)

Date: _____ / _____/ _____ Vibration Instr. No. _____

Table 1
2C ICW Pump Flow and Vibration Data

Parameter		Reading	Acceptance Criteria		
			Allowable Range	Alert Range	Required Action
Intake Level		ft.	N/A	N/A	N/A
Pump Disch. Press. (PI-21-5C)		psig	N/A	N/A	N/A
Calculated Pump Head *		ft.	126.3 to 140.8	123.6 to < 126.3	< 123.6 or > 140.8
Peak Velocity **	UMN	in./sec.	< 0.195	0.195 to 0.468	> 0.468
	UME	in./sec.	<0.119	0.119 to 0.286	> 0.286
	UMA	in./sec.	< 0.167	0.167 to 0.401	> 0.401

* Calculated Pump Head = 41 ft. + (Disch. Press. x 2.307) - (Intake Level + 18 ft.).
** See Attachment 1, 2C ICW Pump Vibration Reading Locations, for measurement points.

1. **INDICATE** purpose of test:

☐ Code Run

☐ Post Maintenance (explain) _____

☐ Other (explain) _____

2. **EVALUATE** the test data with respect to acceptance criteria and **INDICATE** status:

☐ ACCEPTABLE

☐ ALERT RANGE

☐ REQUIRED ACTION RANGE

6.3 Pump Testing

1. Pumps shall be tested in accordance with the requirements outlined in ADM-29.01A, Inservice Testing (IST) Program for Pumps and Valves.

2. Surveillances shall be conducted such that test parameters are measured, observed, or calculated and the results compared with the acceptable limits specified in the surveillance test procedure.

3. All pumps scoped into the IST Program are to be classified as either Group A and Group B pumps. Group A pumps are operated continuously or routinely during normal operation, cold shutdown, or refueling operations. Group B pumps are in standby systems that are not operated routinely except for testing.

4. All pumps scoped into the IST Program shall be tested at the Comprehensive Flow rate in addition to quarterly Group A or Group B requirements.

5. During Group A and Comprehensive pump testing, the pump shall be run for a minimum of 2 minutes after conditions stabilize prior to collecting and recording data. Group B pump test data can be collected and recorded as soon as conditions stabilize.

6. During all pump testing, the Control Room should be informed of any abnormality found during the test, such as:

A. Pump and motor casing temperatures are hot to touch.

B. Unusual odors are detected.

C. Unusual oil color is observed.

D. Unusual noises are observed.

E. Vibration monitoring location devices are installed. If not installed, testing may continue provided the correct vibration monitoring location can be verified.

END OF SECTION 6.3

6.4 Pump Reference Values

1. For each IST pump test an IST Pump Reference Value Evaluation Sheet, Appendix A, shall specify the current pump reference values, Alert and Required Action ranges, and test dates when reference values were established.

2. Group A and Group B Test Reference Values should be determined at points of operation readily duplicated during subsequent inservice testing.

3. Comprehensive Pump Test Reference Values shall be determined within ± 20% of design flow.

4. Test implementing procedures shall specify the acceptance criteria derived from the IST Pump Reference Value Evaluation Sheets.

5. When a reference value or set of reference values may have been affected by repair, replacement, or routine servicing of a pump, a new set of values shall be determined, or the previous value reconfirmed by an inservice test run prior to return of the pump to normal service.

6. If new reference values are desired for some reason other than above, the pump shall be run using existing conditions and the results analyzed. If operation is satisfactory, a second test run at the new reference conditions shall follow as soon as practical. The results of the new test shall establish the additional set of reference values.

7. Changes to pump reference values should be processed as follows:

A. A new IST Pump Reference Value Evaluation Sheet, Appendix A, shall be completed.

B. Changes shall be reviewed by an IST qualified engineer.

C. Test procedures shall be revised in accordance with AD-AA-100-1004, Preparation, Revision, Review and Approval of Site-Specific Procedures to specify the new acceptance criteria.

END OF SECTION 6.4

6.5 Pump Acceptance Criteria

1. Pump test acceptance criteria shall be based on ranges of variation around the reference values, as per Applicable Tables of ASME OM Code - 2004, 2006 addenda, Subsection B, Inservice Testing of Pumps in Light-Water Reactor Power Plants, except where Technical Specification or other conditions are noted that indicate the pump will not perform it's intended safety function, thus requiring more limiting acceptance criteria.

2. The ranges for pump acceptance criteria are as follows:

A. Required Action High

B. Alert High

C. Allowable Range

D. Alert Low

E. Required Action Low

END OF SECTION 6.5

6.6 Pump Corrective Action

1. When any pump test parameter falls outside the Allowable Ranges a Condition Report shall be initiated.

2. If any of the pump test parameters exceeds a Required Action level, the pump shall be declared out of service (OOS) and not returned to service until the cause of the deviation is determined and the condition corrected.

3. If any of the pump test parameters exceeds an Alert level, the frequency of pump testing shall be doubled and a Data Sheet 30, Unscheduled Surveillance Tracking, of OP-1/2-0010125A shall be initiated.

4. For a pump in Alert during Group A or Group B testing, the test frequency shall be 46 days. For a pump in Alert during Comprehensive pump testing, the test frequency shall be 1 year. If a pump is in Alert for only one type of test, the frequency of testing for another type of test is not required to be increased.

5. Further corrective action may include:

A. Recalibration of the appropriate instruments followed by retest of the pump. If the subsequent test is satisfactory the pump may be declared operable, and the Alert range or normal test frequency may be resumed as appropriate.

B. Repair or replacement of the defective component(s) followed by retest of the pump. If the Post Maintenance test is satisfactory, the pump may be declared operable, and the Alert range or normal test frequency may be resumed as appropriate.

C. If it is suspected that an Alert range measurement may have been anomalous in that the Alert range measurement cannot be readily duplicated, and no other symptoms indicating the pump is not performing acceptably are evident, then the pump may be removed from Alert range test frequency following three (3) successive tests in which allowable range measurements were obtained.

6. Alert or Required Action pump tests shall be documented on their normal test form (data sheet or procedure).

7. Pump operability based upon analysis shall be documented under a Condition Report evaluation.

8. Justification for continued operation may be considered in cases where Code compliance cannot be achieved due to a degraded or nonconforming condition in accordance with EN-AA-203-1001.

END OF SECTION 6.6

JPM TITLE: SRO GAS RELEASE PERMIT REVIEW

JPM NUMBER: L-19-1 NRC JPM A-4 SRO **REV.** 0

TASK NUMBER(S) / TASK TITLE(S):

K/A NUMBERS / K/A VALUES: (RO SRO) Task 2.3.4 SRO (3.7) Knowledge of radiation exposure limits under normal or emergency conditions.

Justification (FOR K/A VALUES <3.0): N/A

TASK APPLICABILITY:
☐ RO ☒ SRO ☐ STA ☐ Non-Lic ☐ SRO CERT ☐ OTHER: ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: ☐ Perform: ☒ X

EVALUATION LOCATION:

In-Plant:	☐	Control Room:	☐
Simulator:	☐	Other:	X
Lab:	☐		

Time for Completion: 15 Minutes Time Critical: No

Alternate Path [NRC]: No

Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10.	Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11.	Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16.	If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☐	☐	☒

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:
- 2-NOP-06.20 Controlled Batch Gaseous Release to Atmosphere Att. 5 Gaseous Release Permit Unit-2

General References:
- 2-NOP-06.20 Controlled Batch Gaseous Release to Atmosphere

Task Standards: This JPM is complete when The applicant has reviewed the radioactive Gas release permit and determines if the permit is unacceptable to perform the release.

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIAL CONDITIONS:

- Unit-2 is in Mode 6, Radiation Protection has requested a Containment Purge be initiated.
- A Gaseous Release Permit # G-18-500-B has been issued and requires approval by the Unit Supervisor.

INITIATING CUES :

You are the Unit Supervisor, you are to review Gaseous Release Permit # G-18-500-B and determine if the Main Containment Purge can be performed.

Note any anomalies below:

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

2-NOP-06.20 Controlled Batch Gaseous Release to Atmosphere	
Performance Step: 1 **Critical No**	**REVIEW ATTACHMENT 5 GASEOUS RELASE PERMIT UNIT-2**
Standard:	REVIEWS ATTACHMENT 5 GASEOUS RELASE PERMIT UNIT-2 for errors
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY** _____ **UNSATISFACTORY** _____
Comments:	

Performance Step: 2 **Critical: YES**	**Identifies Error: Section II Actual Concentration is listed in the Mini Purge line the release is for a Main Purge**
Standard:	

REVISION NO.: 5 | PROCEDURE NO.: 2-NOP-06.20 | PROCEDURE TITLE: CONTROLLED GASEOUS BATCH RELEASE TO ATMOSPHERE ST. LUCIE UNIT 2 | PAGE: 41 of 41

ATTACHMENT 5
Gaseous Release Permit - Unit 2
(Page 1 of 1)

I.	**GASEOUS PERMIT NUMBER**	**SAMPLE DATE AND TIME**	**GDT NAME OR PURGE**
	G-18-500-B	12/5/18 2300	UNIT-2 MAIN PURGE
II.	**LIMITS**		**ACTUAL CONCENTRATION**
	GDT = 20 µCi/cc		N/A µCi/cc
	Containment Purge = 4.76E-03 µCi/cc		N/A µCi/cc
	Containment Mini-Purge = 0.01 µCi/cc		5.90E-03 µCi/cc
	Maximum Discharge Flow Rate GDT _____ #/hr	GDT Decreases or 1.000E+01 C.F.M. Flow Setting	
	Waste Gas Monitor Setpoints: Alert N/A µCi/cc	High: N/A µCi/cc	
	Waste Gas Monitor Source Check Performed By: N/A Signature		
	GRP LIMS #	MONITOR SOURCE CHECK LIMS #	
	PRE-RELEASE REMARKS: _____		
III.	**REVIEW - APPROVAL (PRIOR TO RELEASE)**		
	Main Purge or Mini-Purge ≥ 5.00E-03 µCi/cc **Radiochemist / Chemistry Supervisor** N/A Signature		
	Mini-Purge < 5.00E-03 µCi/cc and meets the requirements of STS 3.6.1.7.b **Permit Preparer** Fred Franks Signature		
	GDT ≥ 25% of Section II. **Radiochemist / Chemistry Supervisor** N/A Signature		
	GDT < 25% of Section II. **Permit Preparer** N/A Signature		
	Unit Supervisor _____ Signature		
IV.	Start Date_____ Start Time_____ Stop Date_____ Stop Time_____		
	Start GDT Pressure_____ Stop GDT Pressure_____		
	Channel Check of Plant Vent Monitor during release. PIG A (423)_____ Initial PIG B (433)_____ Initial WRGM (621)_____ Initial		
V.	**REVIEW - APPROVAL (POST RELEASE)**		
	Unit Supervisor _____ Signature		
	Radiochemist / Chemistry Supervisor _____ Signature		

Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 3 **Critical: YES**	**Identifies Error: Section III Actual Concentration is greater than 5.00E-03 and requires another signature for approval.**
Standard:	

REVISION NO.: 5 | PROCEDURE NO.: 2-NOP-06.20 | PROCEDURE TITLE: CONTROLLED GASEOUS BATCH RELEASE TO ATMOSPHERE ST. LUCIE UNIT 2 | PAGE: 41 of 41

ATTACHMENT 5
Gaseous Release Permit - Unit 2
(Page 1 of 1)

I. GASEOUS PERMIT NUMBER	**SAMPLE DATE AND TIME**	**GDT NAME OR PURGE**
G-18-500-B	12/5/18 2300	UNIT-2 MAIN PURGE
II. LIMITS		**ACTUAL CONCENTRATION**
GDT = 20 µCi/cc		N/A µCi/cc
Containment Purge = 4.76E-03 µCi/cc		N/A µCi/cc
Containment Mini-Purge = 0.01 µCi/cc		5.90E-03 µCi/cc
Maximum Discharge Flow Rate GDT _____ #/hr	GDT Decreases or 1.000E+01 C.F.M. Flow Setting	
Waste Gas Monitor Setpoints: Alert N/A µCi/cc	High: N/A µCi/cc	
Waste Gas Monitor Source Check Performed By: N/A Signature		
GRP LIMS #	MONITOR SOURCE CHECK LIMS #	
PRE-RELEASE REMARKS: _____		
III. REVIEW - APPROVAL (PRIOR TO RELEASE)		
Main Purge or Mini-Purge ≥ 5.00E-03 µCi/cc	**Radiochemist / Chemistry Supervisor** N/A Signature	
Mini-Purge < 5.00E-03 µCi/cc and meets the requirements of STS 3.6.1.7.b	**Permit Preparer** Fred Fanks Signature	
GDT ≥ 25% of Section II.	**Radiochemist / Chemistry Supervisor** N/A Signature	
GDT < 25% of Section II.	**Permit Preparer** N/A Signature	
	Unit Supervisor _____ Signature	
IV. Start Date_____	Start Time_____ Stop Date_____ Stop Time_____	
Start GDT Pressure_____	Stop GDT Pressure_____	
Channel Check of Plant Vent Monitor during release. PIG A (423)_____ Initial	PIG B (433)_____ Initial WRGM (621)_____ Initial	
V. REVIEW - APPROVAL (POST RELEASE)		
	Unit Supervisor _____ Signature	
	Radiochemist / Chemistry Supervisor _____ Signature	

Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Terminating Cues: **This JPM is complete when The applicant has reviewed the Gas release permit and determines it is unacceptable**
The JPM is complete.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).

EXAMINER NOTE: ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIAL CONDITIONS:

- Unit-2 is in Mode 6, Radiation Protection has requested a Containment Purge be initiated.
- A Gaseous Release Permit # G-18-500-B has been issued and requires approval by the Unit Supervisor.

INITIATING CUES :

You are the Unit Supervisor, you are to review Gaseous Release Permit # G-18-500-B and determine if the Main Containment Purge can be performed.

Note any anomalies below:

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

REVISION NO.: 5	PROCEDURE TITLE: CONTROLLED GASEOUS BATCH RELEASE TO ATMOSPHERE	PAGE: 41 of 41
PROCEDURE NO.: 2-NOP-06.20	ST. LUCIE UNIT 2	

ATTACHMENT 5
Gaseous Release Permit - Unit 2
(Page 1 of 1)

I. GASEOUS PERMIT NUMBER	SAMPLE DATE AND TIME	GDT NAME OR PURGE
G-18-500-B	12/5/18 2300	UNIT-2 MAIN PURGE

II. LIMITS	ACTUAL CONCENTRATION
GDT = 20 µCi/cc	N/A µCi/cc
Containment Purge = 4.76E-03 µCi/cc	N/A µCi/cc
Containment Mini-Purge = 0.01 µCi/cc	5.90E-03 µCi/cc

Maximum Discharge Flow Rate
GDT _____ #/hr GDT Decreases or 1.000E+01 C.F.M. Flow Setting

Waste Gas Monitor Setpoints: Alert N/A µCi/cc High: N/A µCi/cc
Waste Gas Monitor Source Check Performed By: N/A Signature

GRP LIMS # MONITOR SOURCE CHECK LIMS #

PRE-RELEASE REMARKS: _____

III. REVIEW - APPROVAL (PRIOR TO RELEASE)

Main Purge or Mini-Purge ≥ 5.00E-03 µCi/cc
Radiochemist / Chemistry Supervisor N/A Signature

Mini-Purge < 5.00E-03 µCi/cc and meets the requirements of STS 3.6.1.7.b
Permit Preparer Fred Fanks Signature

GDT ≥ 25% of Section II. **Radiochemist / Chemistry Supervisor** N/A Signature

GDT < 25% of Section II. **Permit Preparer** N/A Signature

Unit Supervisor _____ Signature

IV. Start Date_____ Start Time_____ Stop Date_____ Stop Time_____

Start GDT Pressure_____ Stop GDT Pressure_____

Channel Check of Plant Vent Monitor during release.
PIG A (423)_____ Initial PIG B (433)_____ Initial WRGM (621)_____ Initial

V. REVIEW - APPROVAL (POST RELEASE)

Unit Supervisor _____ Signature

Radiochemist / Chemistry Supervisor _____ Signature

JPM TITLE: **SRO EALS & Notification for a security event**

JPM NUMBER: **L-19-1 NRC JPM A-5 SRO** **REV. 0**

TASK NUMBER(S) / TASK TITLE(S): **09200180 / Classify Plant Events (EPIP)**

K/A NUMBERS / K/A VALUES: (RO SRO) **2.4.44 SRO (4.4) Knowledge of emergency plan protective action recommendations.**

Justification (FOR K/A VALUES <3.0): **N/A**

TASK APPLICABILITY:
☐ **RO** ☒ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** ☐ **OTHER:** ____

APPLICABLE METHOD OF TESTING: Simulate/Walkthrough: ☐ Perform: ☒ X

EVALUATION LOCATION: In-Plant: ☐ Control Room: ☐

Simulator: ☐ Other: ☒ X

Lab: ☐

Time for Completion: 15/15 Minutes Time Critical: YES

Alternate Path [NRC]: NO

Alternate Path [INPO]: N/A

Developed by:	Instructor/Developer	Date
Reviewed by:	Instructor (Instructional Review)	Date
Validated by:	SME (Technical Review)	Date
Approved by:	Training Supervision	Date
Approved by:	Training Program Owner	Date

JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

ALL STEPS IN THIS CHECKLIST ARE TO BE PERFORMED PRIOR TO USE.

REVIEW STATEMENTS		YES	NO	N/A
1.	Are all items on the signature page filled in correctly?	☒	☐	☐
2.	Has the JPM been reviewed and validated by SMEs?	☒	☐	☐
3.	Can the required conditions for the JPM be appropriately established in the simulator if required?	☒	☐	☐
4.	Do the performance steps accurately reflect trainee's actions in accordance with plant procedures?	☒	☐	☐
5.	Is the standard for each performance item specific as to what controls, indications and ranges are required to evaluate if the trainee properly performed the step?	☒	☐	☐
6.	Has the completion time been established based on validation data or incumbent experience?	☒	☐	☐
7.	If the task is time critical, is the time critical portion based upon actual task performance requirements?	☐	☐	☒
8.	Is the job level appropriate for the task being evaluated if required?	☒	☐	☐
9.	Is the K/A appropriate to the task and to the licensee level if required?	☒	☐	☐
10.	Is justification provided for tasks with K/A values less than 3.0?	☐	☐	☒
11.	Have the performance steps been identified and classified (Critical / Sequence / Time Critical) appropriately?	☒	☐	☐
12.	Have all special tools and equipment needed to perform the task been identified and made available to the trainee?	☒	☐	☐
13.	Are all references identified, current, accurate, and available to the trainee?	☒	☐	☐
14.	Have all required cues (as anticipated) been identified for the evaluator to assist task completion?	☒	☐	☐
15.	Are all critical steps supported by procedural guidance? (e.g., if licensing, EP or other groups were needed to determine correct actions, then the answer should be NO.)	☒	☐	☐
16.	If the JPM is to be administered to an LOIT student, has the required knowledge been taught to the individual prior to administering the JPM? TPE does not have to be completed, but the JPM evaluation may not be valid if they have not been taught the required knowledge.	☐	☐	☒

All questions/statements must be answered "YES" or "N/A" or the JPM is not valid for use. If all questions/statements are answered "YES" or "N/A," then the JPM is considered valid and can be performed as written. The individual(s) performing the initial validation shall sign and date the cover sheet.

Protected Content: NONE

UPDATE LOG: Indicate in the following table any minor changes or major revisions (as defined in TR-AA-230-1003) made to the material after initial approval. Or use separate Update Log form TR-AA-230-1003-F16.

#	DESCRIPTION OF CHANGE	REASON FOR CHANGE	AR/TWR#	PREPARER SUPERVISOR	DATE DATE

Required Materials:

- EPIP-01, "Classification of Emergencies"
- EPIP-02, "Duties and Responsibilities of the Emergency Coordinator"
- EPIP-08, "Off-Site Notifications and Protective Action Recommendations"

General References:

- EPIP-01, "Classification of Emergencies"
- EPIP-02, "Duties and Responsibilities of the Emergency Coordinator"
- EPIP-08, "Off-Site Notifications and Protective Action Recommendations"

Task Standards: This JPM is complete when the event has been classified, the notification form is completed, and the State Watch Office is notified.

IMPLEMENTATION INSTRUCTIONS:

1. **ENSURE all Applicants have a copy of the following:**
   a. **A current revision of the EPIP-01 Classification Tables.**
   b. **A current copy of EPIP-08.**
   c. **The Applicant handout package from this JPM face down on the desk.**
2. **Read only the initiating Cues to the applicants.**
3. **Direct the applicants to turn over the Applicant handout package and read the Initial Conditions.**
4. **Record the start the time for the JPM after the initial conditions have been read and inform the applicants that they may begin the JPM.**
5. **Retrieve the CLASSIFICATION ANSWER SHEET as the Applicants complete it not to exceed the + 15 minute mark.**
6. **Retrieve the COMPLETED FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM as the Applicants complete it not to exceed the + 15 minute mark from the time recorded on the applicants classification answer sheet.**

I will explain the initial conditions, which step(s) to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.

INITIATING CUES:

- You are the Shift Manager in the Unit-2 control room.
- You are tasked with:
  - Classifying the event per EPIP-01, "Classification of Emergencies".
  - Fill out the Florida Nuclear Plant Emergency Notification Form per EPIP-08 "Off-Site Notifications and Protective Action Recommendations".
- These actions are **TIME CRITICAL**.
  - Record Classification information on the Classification Sheet and return to proctor immediately after completion.
  - Record Florida Nuclear Plant Emergency Notification form completion time on step 15 and return to the proctor.

INITIAL CONDITIONS:

- Security called the Shift Manager and reported that multiple intruders have parachuted into the protected area.
- Small arms fire has been exchanged and the intruders have been neutralized, security has incurred casualties.
- Unit-2 has been manually tripped. 2-EOP-01, Standard Post Trip Actions have been completed and the crew is transitioning to 2-EOP-02 Reactor Trip Recovery.
- Met Tower Data is attached.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

JPM PERFORMANCE INFORMATION

Start Time: _____

NOTE: When providing "Evaluator Cues" to the examinee, care must be exercised to avoid prompting the examinee. Typically cues are only provided when the examinee's actions warrant receiving the information (i.e., the examinee looks or asks for the indication).

NOTE: Critical steps are marked with a "Y" below the performance step number. Failure to meet the standard for any critical step shall result in failure of this JPM.

Performance Step: 1 **Critical YES**	The SM shall classify the abnormal condition in accordance with EPIP-01 "Classification of Emergencies". **Step is critical and must be ≤15 minutes of the START TIME**
Standard:	**CLASSIFY** the event as "**SITE AREA EMERGENCY**" under **HS4**, Hostile Action Within the Protected Area
Evaluator Cue:	**ACKNOWLEDGE EVENT CLASSIFICATION** **NOTE: Record the time initial event classification is made for determining the time critical notification of agencies:** **Classification Time: _____ (≤15 minutes of the START TIME)**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Performance Step: 2 **Critical: YES**	Complete required notifications in accordance with Appendix A, EPIP-08, Off-site Notifications and PAR's. **Step is critical to ensure the correct information is transmitted to the State Agencies.**
Standard:	**COMPLETE** 'Florida Nuclear Plant Emergency Notification Form' (form similar to Attachment 1) using instructions in Attachments 1A or 1B per EPIP-08 Step 2.A.2. **Completion Time: _____ (≤15 minutes of the CLASSIFICATION TIME)**
Evaluator Cue:	**NONE**
Performance:	**SATISFACTORY _____ UNSATISFACTORY _____**
Comments:	

Terminating Cues: **This JPM is complete when the event has been classified and the notification form is complete.**

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

Stop Time: _____

KEY

CLASSIFICATION SHEET

CLASSIFY the event as an SITE AREA EMERGENCY under H / S / 4 .

CLASSIFICATION COMPLETION TIME_____<15 MIN_____.

RECOMMENDED PARs_____NONE_____.

REVISION NO.:	PROCEDURE TITLE:	PAGE:
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ATTACHMENT 1
FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM
(Page 1 of 1)

On-line Verification: ☐ SWP/DEM ☐ DOH/BRC ☐ St. Lucie County/Ft. Pierce ☐ Martin County

1.* A. [X] THIS IS A DRILL B. ☐ THIS IS AN EMERGENCY

2. A. Date: Today B. * Contact Time: _____ C. Reported by: (Name) _____
D. Message Number: _____ E. Reported from: [X] Control Room ☐ TSC ☐ EOF
F. [X] Initial / New Classification OR ☐ Update Notification

3.* Site: A. ☐ Crystal River Unit 3 B. ☐ St. Lucie Unit 1 C. [X] St. Lucie Unit 2
D. ☐ Turkey Point Unit 3 E. ☐ Turkey Point Unit 4

4.* Emergency Classification: A. ☐ Notification of Unusual Event B. ☐ Alert
C. [X] Site Area Emergency D. ☐ General Emergency

5.* A. [X] Emergency Declaration: B. ☐ Emergency Termination: Date: Today Time: _____

6.* Reason for Emergency Declaration: A. [X] EAL Number H / S / 4 OR B. ☐ Description:
Alpha / Alpha / Numeric

7. Additional Information or Update: A. [X] None OR B. ☐ Description:

8.* Weather Data: A. Wind direction from 92 degrees B. Downwind Sectors Affected: MNP

9.* Release Status: A. [X] None (Go to Item 11) B. ☐ In progress C. ☐ Has occurred, but stopped (Go to Item 11)

10. Release Significance Category at the Site Boundary:

A. ☐ Under evaluation B. ☐ Release within normal operating limits
C. ☐ Non-Significant (fraction of protective action guide range) D. ☐ Protective action guide range
E. ☐ Liquid release (no actions required)

11.* UTILITY PROTECTIVE ACTION RECOMMENDATIONS FOR THE PUBLIC:

A. [X] No utility recommended actions at this time.

B. ☐ The utility recommends the following protective actions:

		Evacuate Sectors	Shelter Sectors	Monitor & Prepare Sectors
Evacuate Zones: _____	0 – 2	_____	_____	_____
Shelter Zones: _____	2 – 5	_____	_____	_____
	5 – 10	_____	_____	_____

AND consider issuance of potassium iodide (KI)"

If form is completed in the Control Room, go to Item 15. If completed in the TSC or EOF, continue with item 12.

12. Plant Conditions: A. Reactor Shutdown? ☐ Yes ☐ No B. Core Adequately Cooled? ☐ Yes ☐ No
C. Containment Intact? ☐ Yes ☐ No D. Core Condition: ☐ Stable ☐ Degrading

13. Weather Data: A. * Wind Speed _____ mph B. Stability Class _____

14. Additional Release Information: A. ☐ Not Applicable (Go to Item 15)

Distance	*Projected Thyroid Dose (CDE) for ____ hour(s)*	*Projected Total Dose (TEDE) for ____ hour(s)*
1 Mile (Site Boundary)	B. _____ mrem	C. _____ mrem
2 Miles	D. _____ mrem	E. _____ mrem
5 Miles	F. _____ mrem	G. _____ mrem
10 Miles	H. _____ mrem	I. _____ mrem

15. (Do Not Read) EC or RM Approval Signature: _____ Date: __/__/__ Time: _____

Message Received By: Name: _____ Date: __/__/__ Time: _____

* Items are evaluated for NRC Performance Indicators (PI's)

EPIP-08-F01 Form Revision: 4

END OF ATTACHMENT 1

Examinee: _____ **Evaluator:** _____

☐ **RO** ☐ **SRO** ☐ **STA** ☐ **Non-Lic** ☐ **SRO CERT** **Date:** _____

☐ **LOIT RO** ☐ **LOIT SRO**

PERFORMANCE RESULTS: **SAT:** ☐ **UNSAT:** ☐

Remediation required: **YES** ☐ **NO** ☐

COMMENTS/FEEDBACK: (Comments shall be made for any steps graded unsatisfactory).
PLACEKEEPING COMMENTS:

EXAMINER NOTE: ENSURE ALL EXAM MATERIAL IS COLLECTED AND PROCEDURES CLEANED, AS APPROPRIATE.

EVALUATOR'S SIGNATURE: _____

NOTE: Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.

Handout Package for Applicant

TURNOVER SHEET

INITIATING CUES:

- You are the Shift Manager in the Unit-2 control room.
- You are tasked with:
  - Classifying the event per EPIP-01, “Classification of Emergencies”.
  - Fill out the Florida Nuclear Plant Emergency Notification Form per EPIP-08 “Off-Site Notifications and Protective Action Recommendations”.
- These actions are **TIME CRITICAL**.
  - Record Classification information on the Classification Sheet and return to proctor immediately after completion.
  - Record Florida Nuclear Plant Emergency Notification form completion time on step 15 and return to the proctor.

INITIAL CONDITIONS:

- Security called the Shift Manager and reported that multiple intruders have parachuted into the protected area.
- Small arms fire has been exchanged and the intruders have been neutralized, security has incurred casualties.
- Unit-2 has been manually tripped 2-EOP-01 Standard Post Trip Actions have been completed and the crew is transitioning to 2-EOP-02 Reactor Trip Recovery.
- Met Tower Data is attached.

NOTE: Ensure the turnover sheet that was given to the examinee is returned to the evaluator.

MET Tower Data

	10 METER	60 METER
15-MINUTE AVERAGE WIND SPEED	43 MPH	53 MPH
15-MINUTE AVERAGE WIND DIRECTION	92 DEG	111 DEG
15-MINUTE AVERAGE TEMPERATURE	76°F	79°F
15-MINUTE AVERAGE ΔT	3°F	

CLASSIFICATION ANSWER SHEET

NAME_____

CLASSIFY the event as _____under ____/____/____.

CLASSIFICATION COMPLETION TIME_____.

RECOMENDED PARs_____.

REVISION NO.:	PROCEDURE TITLE:	PAGE:
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ATTACHMENT 1
FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM
(Page 1 of 1)

On-line Verification: ☐ SWP/DEM ☐ DOH/BRC ☐ St. Lucie County/Ft. Pierce ☐ Martin County

1.* A. ☐ THIS IS A DRILL B. ☐ THIS IS AN EMERGENCY

2. A. Date: ___/___/___ B. * Contact Time: _____ C. Reported by: (Name) _____
D. Message Number: _____ E. Reported from: ☐ Control Room ☐ TSC ☐ EOF
F. ☐ Initial / New Classification OR ☐ Update Notification

3.* Site: A. ☐ Crystal River Unit 3 B. ☐ St. Lucie Unit 1 C. ☐ St. Lucie Unit 2
D. ☐ Turkey Point Unit 3 E. ☐ Turkey Point Unit 4

4.* Emergency Classification: A. ☐ Notification of Unusual Event B. ☐ Alert
C. ☐ Site Area Emergency D. ☐ General Emergency

5.* A. ☐ Emergency Declaration: B. ☐ Emergency Termination: Date: ___/___/___ Time: _____

6.* Reason for Emergency Declaration: A. ☐ EAL Number ____/____/____ OR B. ☐ Description:
Alpha / Alpha / Numeric
_____

7. Additional Information or Update: A. ☐ None OR B. ☐ Description:

_____

_____

8.* Weather Data: A. Wind direction from _____ degrees B. Downwind Sectors Affected: _____

9.* Release Status: A. ☐ None (Go to Item 11) B. ☐ In progress C. ☐ Has occurred, but stopped (Go to Item 11)

10. Release Significance Category at the Site Boundary:

A. ☐ Under evaluation B. ☐ Release within normal operating limits
C. ☐ Non-Significant (fraction of protective action guide range) D. ☐ Protective action guide range
E. ☐ Liquid release (no actions required)

11.* UTILITY PROTECTIVE ACTION RECOMMENDATIONS FOR THE PUBLIC:

A. ☐ No utility recommended actions at this time.

B. ☐ The utility recommends the following protective actions:

		Evacuate Sectors	Shelter Sectors	Monitor & Prepare Sectors
Evacuate Zones: _____	OR 0 – 2	_____	_____	_____
Shelter Zones: _____	2 – 5	_____	_____	_____
	5 – 10	_____	_____	_____

AND consider issuance of potassium iodide (KI)"

If form is completed in the Control Room, go to item 15. If completed in the TSC or EOF, continue with item 12.

12. Plant Conditions: A. Reactor Shutdown? ☐ Yes ☐ No B. Core Adequately Cooled? ☐ Yes ☐ No
C. Containment Intact? ☐ Yes ☐ No D. Core Condition: ☐ Stable ☐ Degrading

13. Weather Data: A. * Wind Speed _____ mph B. Stability Class _____

14. Additional Release Information: A. ☐ Not Applicable (Go to Item 15)

Distance	*Projected Thyroid Dose (CDE) for ____ hour(s)*	*Projected Total Dose (TEDE) for ____ hour(s)*
1 Mile (Site Boundary)	B. _____ mrem	C. _____ mrem
2 Miles	D. _____ mrem	E. _____ mrem
5 Miles	F. _____ mrem	G. _____ mrem
10 Miles	H. _____ mrem	I. _____ mrem

15. (Do Not Read) EC or RM Approval Signature: _____ Date: ___/___/___ Time: _____

Message Received By: Name: _____ Date: ___/___/___ Time: _____

* Items are evaluated for NRC Performance Indicators (PI's)

EPIP-08-F01 Form Revision: 4

END OF ATTACHMENT 1