MNS ILT 18-1 SRO NRC Examination

Question	K/A Number K/A Description	K/A System	Tier/Group	Importance RO/SRO
1 1	**SYS012 K6.08** Knowledge of the effect of a loss or malfunction of the following will have on the RPS: (CFR: 41.7 / 45/7)	**Reactor Protection System (RPS)** COLSS	T/G 2 / 1	**RO 3.6* SRO 3.7***
2 2	**SYS013 K2.01** Knowledge of bus power supplies to the following: (CFR: 41.7)	**Engineered Safety Features Actuation System (ESFAS)** ESFAS/safeguards equipment control	T/G 2 / 1	**RO 3.6* SRO 3.8**
3 3	**SYS022 A3.01** Ability to monitor automatic operation of the CCS, including: (CFR: 41.7 / 45.5)	**Containment Cooling System (CCS)** Initiation of safeguards mode of operation	T/G 2 / 1	**RO 4.1 SRO 4.3**
4 4	**SYS025 A2.06** Ability to (a) predict the impacts of the following malfunctions or operations on the ice condenser system; correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)	**Ice Condenser System** Decreasing ice condenser temperature	T/G 2 / 1	**RO 2.5* SRO 2.7***
5 5	**SYS026 K1.01** Knowledge of the physical connections and/or cause-effect relationships between the CSS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)	**Containment Spray System (CSS)** ECCS	T/G 2 / 1	**RO 4.2 SRO 4.2**
6 6	**SYS039 K4.06** Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)	**Main and Reheat Steam System (MRSS)** Prevent reverse steam flow on steam line break	T/G 2 / 1	**RO 3.3 SRO 3.6**
7 7	**SYS059 K3.02** Knowledge of the effect that a loss or malfunction of the MFW will have on the following: (CFR: 41.7 / 45.6)	**Main Feedwater (MFW) System** AFW system	T/G 2 / 1	**RO 3.6 SRO 3.7**

Question	K/A Number K/A Description	K/A System		Tier/Group	Importance RO/SRO
8 8	**SYS061 K6.02** Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: (CFR: 41.7 / 45.7)	**Auxiliary / Emergency Feedwater (AFW) System**	Pumps	T/G 2 / 1	**RO 2.6 SRO 2.7**
9 9	**SYS062 A1.01** Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ac distribution system controls including: (CFR: 41.5 / 45.5)	**AC Electrical Distribution System**	Significance of D/G load limits	T/G 2 / 1	**RO 3.4 SRO 3.8**
10 10	**SYS062 A2.05** Ability to (a) predict the impacts of the following malfunctions or operations on the ac distribution system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)	**AC Electrical Distribution System**	Methods for energizing a dead bus	T/G 2 / 1	**RO 2.9 SRO 3.3***
11 11	**SYS063 K3.02** Knowledge of the effect that a loss or malfunction of the DC electrical system will have on the following: (CFR: 41.7 / 45.6)	**DC Electrical Distribution System**	Components using DC control power	T/G 2 / 1	**RO 3.5 SRO 3.7**
12 12	**SYS003 2.4.11** SYS003 GENERIC	**Reactor Coolant Pump System (RCPS)**	Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)	T/G 2 / 1	**RO 4.0 SRO 4.2**
13 13	**SYS003 K5.03** Knowledge of the operational implications of the following concepts as they apply to the RCPS: (CFR: 41.5 / 45.7)	**Reactor Coolant Pump System (RCPS)**	Effects of RCP shutdown on T-ave., including the reason for the unreliability of T-ave. in the shutdown loop	T/G 2 / 1	**RO 3.1 SRO 3.5**

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14 14	**SYS004 A1.06** Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CVCS controls including: (CFR: 41.5 / 45.5)	**Chemical and Volume Control System**	VCT level	T/G 2 / 1	**RO 3.0 SRO 3.2**
15 15	**SYS005 A4.01** Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)	**Residual Heat Removal System (RHRS)**	Controls and indication for RHR pumps	T/G 2 / 1	**RO 3.6* SRO 3.4**
16 16	**SYS005 K5.01** Knowledge of the operational implications of the following concepts as they apply the RHRS: (CFR: 41.5 / 45.7)	**Residual Heat Removal System (RHRS)**	Nil ductility transition temperature (brittle fracture)	T/G 2 / 1	**RO 2.6 SRO 2.9**
17 17	**SYS006 K4.30** Knowledge of ECCS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)	**Emergency Core Cooling System (ECCS)**	Containment isolation	T/G 2 / 1	**RO 3.6 SRO 3.9**
18 18	**SYS007 K5.02** Knowledge of the operational implications of the following concepts as they apply to PRTS: (CFR: 41.5 / 45.7)	**Pressurizer Relief Tank/Quench Tank System (PRTS)**	Method of forming a steam bubble in the PZR	T/G 2 / 1	**RO 3.1 SRO 3.4**
19 19	**SYS008 K2.02** Knowledge of bus power supplies to the following: (CFR: 41.7)	**Component Cooling Water System (CCWS)**	CCW pump, including emergency backup	T/G 2 / 1	**RO 3.0* SRO 3.2***
20 20	**SYS008 K3.03** Knowledge of the effect that a loss or malfunction of the CCWS will have on the following:	**Component Cooling Water System (CCWS)**	RCP	T/G 2 / 1	**RO 4.1 SRO 4.2**

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21 21	**SYS010 A4.01**	**Pressurizer Pressure Control System (PZR PCS)**		T/G 2 / 1	**RO 3.7 SRO 3.5**
	Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)		PZR spray valve		
22 22	**SYS012 K4 05**	**Reactor Protection System (RPS)**		T/G 2 / 1	**RO 2.7 SRO 2.9**
	Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)		Spurious trip protection		
23 23	**SYS064 2.2.4**	**Emergency Diesel Generator (ED/G) System**		T/G 2 / 1	**RO 3.6 SRO 3.6**
	SYS064 GENERIC		(multi-unit license) Ability to explain the variations in control board/control room layouts, systems, instrumentation, and procedural actions between units at a facility. (CFR: 41.6 / 41.7 / 41.10 / 45.1 / 45.13)		
24 24	**SYS064 K1.02**	**Emergency Diesel Generator (ED/G) System**		T/G 2 / 1	**RO 3.1 SRO 3.6***
	Knowledge of the physical connections and/or cause-effect relationships between the ED/G system and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)		D/G cooling water system		
25 25	**SYS073 A2.02**	**Process Radiation Monitoring (PRM) System**		T/G 2 / 1	**RO 2.7 SRO 3.2**
	Ability to (a) predict the impacts of the following malfunctions or operations on the PRM system; and (b) based on those predictions, use procedures to cor- rect, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)		Detector failure		
26 26	**SYS076 K2.01**	**Service Water System (SWS)**		T/G 2 / 1	**RO 2.7* SRO 2.7**
	Knowledge of bus power supplies to the following: (CFR: 41.7)		Service water		

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27 27	**SYS078 A4.01** Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)	**Instrument Air System (IAS)**	Pressure gauges	T/G 2 / 1	**RO 3.1 SRO 3.1**
28 28	**SYS103 A3.01** Ability to monitor automatic operation of the containment system, including: (CFR: 41.7 / 45.5)	**Containment System**	Containment isolation	T/G 2 / 1	**RO 3.9 SRO 4.2**
29 29	**SYS002 K5.11** Knowledge of the operational implications of the following concepts as they apply to the RCS: (CFR: 41.5 / 45.7)	**Reactor Coolant System (RCS)**	Relationship between effects of the primary coolant system and the secondary coolant system	T/G 2 / 2	**RO 4.0 SRO 4.2**
30 30	**SYS014 A1.04** Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RPIS controls, including: (CFR: 41.5 / 45.5)	**Rod Position Indication System (RPIS)**	Axial and radial power distribution	T/G 2 / 2	**RO 3.5 SRO 3.8**
31 31	**SYS017 K6.01** Knowledge of the effect of a loss or malfunction of the following ITM system components: (CFR: 41.7 / 45.7)	**In-Core Temperature Monitor (ITM) System**	Sensors and detectors	T/G 2 / 2	**RO 2.7 SRO 3.0**
32 32	**SYS027 K2.01** Knowledge of bus power supplies to the following: (CFR: 41.7)	**Containment Iodine Removal System (CIRS)**	Fans	T/G 2 / 2	**RO 3.1* SRO 3.4***
33 33	**SYS029 K1.05** Knowledge of the physical connections and/or cause-effect relationships between the Containment Purge System and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)	**Containment Purge System (CPS)**	Containment air cleanup and recirculation system	T/G 2 / 2	**RO 2.9* SRO 3.1***

Question	K/A Number K/A Description	K/A System		Tier/Group	Importance RO/SRO
34 34	**SYS033 2.4.49** SYS033 GENERIC	**Spent Fuel Pool Cooling System (SFPCS)**	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls. (CFR: 41.10 / 43.2 / 45.6)	T/G 2 / 2	**RO 4.6 SRO 4.4**
35 35	**SYS034 K4.03** Knowledge of design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)	**Fuel Handling Equipment System (FHES)**	Overload protection	T/G 2 / 2	**RO 2.6 SRO 3.3**
36 36	**SYS035 A4.05** Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)	**Steam Generator System (S/GS)**	Level Control to enhance natural circulation	T/G 2 / 2	**RO 3.8 SRO 4.0**
37 37	**SYS068 A3.02** Ability to monitor automatic operation of the Liquid Radwaste System including: (CFR: 41.7 / 45.5)	**Liquid Radwaste System (LRS)**	Automatic isolation	T/G 2 / 2	**RO 3.6 SRO 3.6**
38 38	**SYS079 A2.01** Ability to (a) predict the impacts of the following malfunctions or operations on the SAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)	**Station Air System (SAS)**	Cross-connection with IAS	T/G 2 / 2	**RO 2.9 SRO 3.2**
39 39	**EPE007 2.4.4** EPE007 GENERIC	**Reactor Trip**	Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures. (CFR: 41.10 / 43.2 / 45.6)	T/G 1 / 1	**RO 4.5 SRO 4.7**

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40 40	**APE008 AK3.03** Knowledge of the reasons for the following responses as they apply to the Pressurizer Vapor Space Accident: (CFR 41.5,41.10 / 45.6 / 45.13)	**Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck O** Actions contained in EOP for PZR vapor space accident/ LOCA	T/G 1 / 1	**RO 4.1 SRO 4.6**
41 41	**EPE009 EK1.02** Knowledge of the operational implications of the following concepts as they apply to the small break LOCA: (CFR 41.8 / 41.10 / 45.3)	**Small Break LOCA** Use of steam tables	T/G 1 / 1	**RO 3.5 SRO 4.2**
42 42	**EPE011 EK3.13** Knowledge of the reasons for the following responses as the apply to the Large Break LOCA: (CFR 41.5 / 41.10 / 45.6 / 45.13)	**Large Break LOCA** Hot-leg injection/recirculation	T/G 1 / 1	**RO 3.8 SRO 4.2**
43 43	**APE022 2.2.3** APE022 GENERIC	**Loss of Reactor Coolant Makeup** (multi-unit license) Knowledge of the design, procedural, and operational differences between units. (CFR: 41.5 / 41.6 / 41.7 / 41.10 / 45.12)	T/G 1 / 1	**RO 3.8 SRO 3.9**
44 44	**APE025 AK3.03** Knowledge of the reasons for the following responses as they apply to the Loss of Residual Heat Removal System: (CFR 41.5,41.10 / 45.6 / 45.13)	**Loss of Residual Heat Removal System (RHRS)** Immediate actions contained in EOP for Loss of RHRS	T/G 1 / 1	**RO 3.9 SRO 4.1**
45 45	**APE026 AA1. 07** Ability to operate and / or monitor the following as they apply to the Loss of Component Cooling Water: (CFR 41.7 / 45.5 / 45.6)	**Loss of Component Cooling Water (CCW)** Flow rates to the components and systems that are serviced by the CCWS; interactions among the components	T/G 1 / 1	**RO 2.9 SRO 3.0**

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46 46	**APE027 AK1.02**	**Pressurizer Pressure Control System (PZR PCS) Malfunction**		T/G 1 / 1	**RO 2.8 SRO 3.1**
	Knowledge of the operational implications of the following concepts as they apply to Pressurizer Pressure Control Malfunctions: (CFR 41.8 / 41.10 / 45.3)		Expansion of liquids as temperature increases		
47 47	**EPE029 EK2.06**	**Anticipated Transient Without Scram (ATWS)**		T/G 1 / 1	**RO 2.9* SRO 3.1***
	Knowledge of the interrelations between the ATWS and the following: (CFR 41.7 / 45.7)		Breakers, relays, and disconnects		
48 48	**EPE038 2.1.31**	**Steam Generator Tube Rupture (SGTR)**		T/G 1 / 1	**RO 4.6 SRO 4.3**
	EPE038 GENERIC		Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup. (CFR: 41.10 / 45.12)		
49 49	**APE040 AA1.06**	**Steam Line Rupture**		T/G 1 / 1	**RO 4.0 SRO 4.1**
	Ability to operate and / or monitor the following as they apply to the Steam Line Rupture: (CFR 41.7 / 45.5 / 45.6)		S/G and steam line pressures and flows		
50 50	**APE054 AA2.04**	**Loss of Main Feedwater (MFW)**		T/G 1 / 1	**RO 4.2 SRO 4.3**
	Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): (CFR: 43.5 / 45.13)		Proper operation of AFW pumps and regulating valves		
51 51	**EPE055 EA2.06**	**Loss of Offsite and Onsite Power (Station Blackout)**		T/G 1 / 1	**RO 3.7 SRO 4.1**
	Ability to determine or interpret the following as they apply to a Station Blackout : (CFR 43.5 / 45.13)		Faults and lockouts that must be cleared prior to re- energizing buses		
52 52	**APE056 AK1.01**	**Loss of Offsite Power**		T/G 1 / 1	**RO 3.7 SRO 4.2**
	Knowledge of the operational implications of the following concepts as they apply to Loss of Offsite Power: CFR 41.8 / 41.10 / 45.3)		Principle of cooling by natural convection		

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53 53	**APE057 AA1.01** Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus: (CFR 41.7 / 45.5 / 45.6)	**Loss of Vital AC Electrical Instrument Bus**	Manual inverter swapping	T/G 1 / 1	**RO 3.7* SRO 3.7**
54 54	**APE065 AA2.07** Ability to determine and interpret the following as they apply to the Loss of Instrument Air: (CFR: 43.5 / 45.13)	**Loss of Instrument Air**	Whether backup nitrogen supply is controlling valve position	T/G 1 / 1	**RO 2.8* SRO 3.2***
55 55	**WE04 EK2.1** Knowledge of the interrelations between the (LOCA Outside Containment) and the following: (CFR: 41.7 / 45.7)	**LOCA Outside Containment**	Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	T/G 1 / 1	**RO 3.5 SRO 3.9**
56 56	**WE05 EK2.2** Knowledge of the interrelations between the (Loss of Secondary Heat Sink) and the following: (CFR: 41.7 / 45.7)	**Loss of Secondary Heat Sink**	Facility*s heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	T/G 1 / 1	**RO 3.9 SRO 4.2**
57 57	**APE003 2.4.47** APE003 GENERIC	**Dropped Control Rod**	Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material. (CFR: 41.10 / 43.5 / 45.12)	T/G 1 / 2	**RO 4.2 SRO 4.2**
58 58	**APE005 AK2.02** Knowledge of the interrelations between the Inoperable / Stuck Control Rod and the following: (CFR 41.7 / 45.7)	**Inoperable/Stuck Control Rod**	Breakers, relays, disconnects, and control room switches	T/G 1 / 2	**RO 2.5 SRO 2.6**
59 59	**APE024 AA1.22** Ability to operate and / or monitor the following as they apply to Emergency Boration: (CFR 41.7 / 45.5 / 45.6)	**Emergency Boration**	Safety injection valves, switches, flow meters, and indicators	T/G 1 / 2	**RO 3.2* SRO 3.2**

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60 60	**APE032 AA2.02**	**Loss of Source Range Nuclear Instrumentation**		T/G 1 / 2	**RO 3.6 SRO 3.9**
	Ability to determine and interpret the following as they apply to the Loss of Source Range Nuclear Instrumentation: (CFR: 43.5 / 45.13)		Expected change in source range count rate when rods are moved		
61 61	**APE033 AK3.01**	**Loss of Intermediate Range Nuclear Instrumentation**		T/G 1 / 2	**RO 3.2 SRO 3.6**
	Knowledge of the reasons for the following responses as they apply to the Loss of Intermediate Range Nuclear Instrumentation: (CFR 41.5,41.10 / 45.6 / 45.13)		Termination of startup following loss of intermediate range instrumentation		
62 62	**APE061 AK1.01**	**Area Radiation Monitoring (ARM) System Alarms**		T/G 1 / 2	**RO 2.5* SRO 2.9?**
	Knowledge of the operational implications of the following concepts as they apply to Area Radiation Monitoring (ARM) System Alarms: CFR 41.8 / 41.10 / 45.3)		Detector limitations		
63 63	**APE067 AA1.01**	**Plant Fire On Site**		T/G 1 / 2	**RO 3.6 SRO 3.6**
	Ability to operate and / or monitor the following as they apply to the Plant Fire on Site: (CFR 41.7 / 45.5 / 45.6)		Respirator air pack		
64 64	**WE10 2.1.23**	**Natural Circulation with Steam Void in Vessel with/without**		T/G 1 / 2	**RO 4.3 SRO 4.4**
	WE10 GENERIC		Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)		
65 65	**WE13 EK3.2**	**Steam Generator Overpressure**		T/G 1 / 2	**RO 2.9 SRO 3.3**
	Knowledge of the reasons for the following responses as they apply to the (Steam Generator Overpressure) (CFR: 41.5 / 41.10, 45.6, 45.13)		Normal, abnormal and emergency operating procedures associated with (Steam Generator Overpressure).		
66 66	**GEN2.1 2.1.1**	**GENERIC - Conduct of Operations**		T/G 3 / 0	**RO 3.8 SRO 4.2**
	Conduct of Operations		Knowledge of conduct of operations requirements. (CFR: 41.10 / 45.13)		

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67 67	**GEN2.1 2.1.44** Conduct of Operations	**GENERIC - Conduct of Operations**	Knowledge of RO duties in the control room during fuel handling, such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation. (CFR: 41.10 / 43.7 / 45.12)	T/G 3 / 0	**RO 3.9 SRO 3.8**
68 68	**GEN2.2 2.2.35** Equipment Control	**GENERIC - Equipment Control**	Ability to determine Technical Specification Mode of Operation. (CFR: 41.7 / 41.10 / 43.2 / 45.13)	T/G 3 / 0	**RO 3.6 SRO 4.5**
69 69	**GEN2.2 2.2.41** Equipment Control	**GENERIC - Equipment Control**	Ability to obtain and interpret station electrical and mechanical drawings. (CFR: 41.10 / 45.12 / 45.13)	T/G 3 / 0	**RO 3.5 SRO 3.9**
70 70	**GEN2.2 2.2.6** Equipment Control	**GENERIC - Equipment Control**	Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13)	T/G 3 / 0	**RO 3.0 SRO 3.6**
71 71	**GEN2.3 2.3.15** Radiation Control	**GENERIC - Radiation Control**	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.12 / 43.4 / 45.9)	T/G 3 / 0	**RO 2.9 SRO 3.1**
72 72	**GEN2.3 2.3.7** Radiation Control	**GENERIC - Radiation Control**	Ability to comply with radiation work permit requirements during normal orabnormal conditions. (CFR: 41.12 / 45.10)	T/G 3 / 0	**RO 3.5 SRO 3.6**
73 73	**GEN2.4 2.4.16** Emergency Procedures / Plan	**GENERIC - Emergency Procedures / Plan**	Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, abnormal operating procedures, and severe accident management guidelines. (CFR: 41.10 / 43.5 / 45.13)	T/G 3 / 0	**RO 3.5 SRO 4.4**

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74 74	**GEN2.4 2.4.17**	**GENERIC - Emergency Procedures / Plan**		T/G 3 / 0	**RO 3.9 SRO 4.3**
	Emergency Procedures / Plan		Knowledge of EOP terms and definitions. (CFR: 41.10 / 45.13)		
75 75	**GEN2.4 2.4.28**	**GENERIC - Emergency Procedures / Plan**		T/G 3 / 0	**RO 3.2 SRO 4.1**
	Emergency Procedures / Plan		Knowledge of procedures relating to a security event (non-safeguards information). (CFR: 41.10 / 43.5 / 45.13)		
76 76	**SYS006 2.2.37**	**Emergency Core Cooling System (ECCS)**		T/G 2 / 1	**RO 3.6 SRO 4.6**
	SYS006 GENERIC		Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)		
77 77	**SYS022 2.2.12**	**Containment Cooling System (CCS)**		T/G 2 / 1	**RO 3.7 SRO 4.1**
	SYS022 GENERIC		Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)		
78 78	**SYS059 A2.04**	**Main Feedwater (MFW) System**		T/G 2 / 1	**RO 2.9* SRO 3.4***
	Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)		Feeding a dry S/G		
79 79	**SYS064 A2.10**	**Emergency Diesel Generator (ED/G) System**		T/G 2 / 1	**RO 2.4 SRO 2.9**
	Ability to (a) predict the impacts of the following malfunctions or operations on the ED/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)		Unloading (reduction of generated power) in steps over a period of time ..		

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80 80	**SYS073 A2.02**	**Process Radiation Monitoring (PRM) System**		T/G 2 / 1	**RO 2.7 SRO 3.2**
	Ability to (a) predict the impacts of the following malfunctions or operations on the PRM system; and (b) based on those predictions, use procedures to cor- rect, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)		Detector failure		
81 81	**SYS001 A2.04**	**Control Rod Drive System**		T/G 2 / 2	**RO 3.2* SRO 3.8***
	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 : (CFR: 41.5/43.5/45.3/45.13)		Positioning of axial shaping rods and their effect on SDM		
82 82	**SYS072 A2.03**	**Area Radiation Monitoring (ARM) System**		T/G 2 / 2	**RO 2.7 SRO 2.9**
	Ability to (a) predict the impacts of the following malfunctions or operations on the ARM system- and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 43.3 / 45.13)		Blown power-supply fuses		
83 83	**SYS086 2.4.21**	**Fire Protection System (FPS)**		T/G 2 / 2	**RO 4.0 SRO 4.6**
	SYS086 GENERIC		Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc. (CFR: 41.7 / 43.5 / 45.12)		
84 84	**EPE007 EA2.04**	**Reactor Trip**		T/G 1 / 1	**RO 4.4 SRO 4.6**
	Ability to determine or interpret the following as they apply to a reactor trip: (CFR 41.7 / 45.5 / 45.6)		If reactor should have tripped but has not done so, manually trip the reactor and carry out actions in ATWS EOP		

Question	K/A Number / K/A Description		K/A System		Tier/Group	Importance RO/SRO			
85	**EPE009**	**EA2.38**	**Small Break LOCA**		T/G 1 / 1	**RO**	**3.9**	**SRO**	**4.3**
85	Ability to determine or interpret the following as they apply to a small break LOCA: (CFR 43.5 / 45.13)			Existence of head bubble					
86	**EPE011**	**EA2.08**	**Large Break LOCA**		T/G 1 / 1	**RO**	**3.4***	**SRO**	**3.9***
86	Ability to determine or interpret the following as they apply to a Large Break LOCA: (CFR 43.5 / 45.13)			Conditions necessary for recovery when accident reaches stable phase ...					
87	**APE026**	**2.4.46**	**Loss of Component Cooling Water (CCW)**		T/G 1 / 1	**RO**	**4.2**	**SRO**	**4.2**
87	APE026 GENERIC			Ability to verify that the alarms are consistent with the plant conditions. (CFR: 41.10 / 43.5 / 45.3 / 45.12)					
88	**APE057**	**2.4.8**	**Loss of Vital AC Electrical Instrument Bus**		T/G 1 / 1	**RO**	**3.8**	**SRO**	**4.5**
88	APE057 GENERIC			Knowledge of how abnormal operating procedures are used in conjunction with EOPs. (CFR: 41.10 / 43.5 / 45.13)					
89	**APE062**	**2.4.9**	**Loss of Nuclear Service Water**		T/G 1 / 1	**RO**	**3.8**	**SRO**	**4.2**
89	APE062 GENERIC			Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)					
90	**APE003**	**AA2.03**	**Dropped Control Rod**		T/G 1 / 2	**RO**	**3.6**	**SRO**	**3.8**
90	Ability to determine and interpret the following as they apply to the Dropped Control Rod: (CFR: 43.5 / 45.13)			Dropped rod, using in-core/ex-core instrumentation, in-core or loop temperature measurements					
91	**APE036**	**2.4.31**	**Fuel Handling Incidents**		T/G 1 / 2	**RO**	**4.2**	**SRO**	**4.1**
91	APE036 GENERIC			Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)					

Question	K/A Number / K/A Description	K/A System		Tier/Group	Importance RO/SRO
92 92	**APE037 AA2.03** Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: (CFR: 43.5 / 45.13)	**Steam Generator (S/G) Tube Leak**	That the expected indication on main steam lines from the S/Gs should show increasing radiation levels	T/G 1 / 2	**RO 3.4 SRO 3.9**
93 93	**APE067 2.4.41** APE067 GENERIC	**Plant Fire On Site**	Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11)	T/G 1 / 2	**RO 2.9 SRO 4.6**
94 94	**GEN2.1 2.1.13** Conduct of Operations	**GENERIC - Conduct of Operations**	Knowledge of facility requirements for controlling vital/controlled access. (CFR: 41.10 / 43.5 / 45.9 / 45.10)	T/G 3 / 0	**RO 2.5 SRO 3.2**
95 95	**GEN2.1 2.1.45** Conduct of Operations	**GENERIC - Conduct of Operations**	Ability to identify and interpret diverse indications to validate the response of another indication. (CFR: 41.7 / 43.5 / 45.4)	T/G 3 / 0	**RO 4.3 SRO 4.3**
96 96	**GEN2.2 2.2.23** Equipment Control	**GENERIC - Equipment Control**	Ability to track Technical Specification limiting conditions for operations. (CFR: 41.10 / 43.2 / 45.13)	T/G 3 / 0	**RO 3.1 SRO 4.6**
97 97	**GEN2.2 2.2.37** Equipment Control	**GENERIC - Equipment Control**	Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)	T/G 3 / 0	**RO 3.6 SRO 4.6**
98 98	**GEN2.3 2.3.6** Radiation Control	**GENERIC - Radiation Control**	Ability to approve release permits. (CFR: 41.13 / 43.4 / 45.10)	T/G 3 / 0	**RO 2.0 SRO 3.8**
99 99	**GEN2.4 2.4.18** Emergency Procedures / Plan	**GENERIC - Emergency Procedures / Plan**	Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.1 / 45.13)	T/G 3 / 0	**RO 3.3 SRO 4.0**

Question	K/A Number K/A Description	K/A System		Tier/Group	Importance RO/SRO
100 100	**GEN2.4 2.4.31** Emergency Procedures / Plan	**GENERIC - Emergency Procedures / Plan**	Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)	T/G 3 / 0	**RO 4.2 SRO 4.1**

Facility: **McGuire**		Date of Examination:	**4/2018**
Examination Level:	**RO**	Operating Test Number:	**N18-1**

Administrative Topic (see Note)	Type Code*	Describe activity to be performed	
Conduct of Operations	D, P, R	2.1.25 (3.9)	Ability to interpret reference materials, such as graphs, curves, tables, etc.
		JPM:	Calculate Boration Needed for a Specified Rod Change
Conduct of Operations	D, R	2.1.7 (4.4)	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.
		JPM:	Calculate QPTR with an Inoperable Power Range Instrument
Equipment Control	D, R	2.2.12 (3.7)	Knowledge of Surveillance Procedures.
		JPM:	Perform NC Loop Operability Verification in Mode 4
Radiation Control	M, R	2.3.14 (3.4)	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.
		JPM:	Predict Radiation Levels While Responding to a Damaged Spent Fuel Pool

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

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

RO Admin JPM Summary

A1a This is a Bank JPM. The operator will be given a set of initial conditions and told that it is desired to withdrawal the Bank D Control Rods about 45 steps. The operator will be given Section 5.1 of the Core Data Book, as well as the Reactor Engineering Data (RED) - Control Room Data, and asked to manually determine the amount of Boric Acid that will be necessary to add, to complete the rod height adjustment. The operator will be expected to determine that a Boric Acid Addition of approximately 255.6 gallons is calculated in accordance with the attached KEY. A similar version of this JPM appeared on the 2016 Initial License Exam and was randomly selected for the 2018 Exam.

A1b This is a Bank JPM. With the plant at 74% power, the operator will be told that the Unit 1 OAC failed and is not operating, and that PR-41 has been removed from service. The operator will be directed to calculate QPTR in accordance with PT/1/A/4600/21A (Loss of Operator Aid Computer while in Mode 1) and to identify all Technical Specification LCOs that are NOT met. The operator will be expected to calculate the QPTR (Per Attached Key) and determine that Technical Specification LCO 3.2.4 is not met.

A2 This is a Bank JPM. The operator will be told that the Plant is in Mode 5 with NCS Temperature at 188°F and stable, and will be provided with current plant data regarding the decay heat removal systems. The operator will be directed to perform Enclosure 13.5 (NC Loop Operability Verification in Mode 4) of PT/1/A/4600/003 C (Weekly Surveillance Items), in preparation to transition to Mode 4. The operator will be expected to complete Enclosure 13.5 in accordance with the Attached KEY.

A3 This is a modified Bank JPM. The operator will be given a set of conditions reflecting a damaged and leaking Spent Fuel Pool with a full core off-loaded, where attempts of makeup have failed, but are expected to be successful within four hours. The operator will also be given a present Spent Fuel Pool leak rate and level. The operator will be directed to refer to Enclosure 13 (Spent Fuel Pool Radiation Level vs. Water level Above Fuel) of AP/1/A/5500/41 (Loss of Spent Fuel Pool Cooling or Level), and determine the expected radiation levels one hour, two hours, three hours and four hours from now, based on the last known leak rate. The operator will be expected to determine the expected dose rate within ±50%.

Facility: **McGuire**		Date of Examination:	**4/2018**
Examination Level:	**SRO**	Operating Test Number:	**N18-1**

Administrative Topic (see Note)	Type Code*	Describe activity to be performed	
Conduct of Operations	D, P, R	2.1.25 (4.2) JPM:	Ability to interpret reference materials, such as graphs, curves, tables, etc. Perform/Review a Manual NC Leakage Calculation
Conduct of Operations	M, R	2.1.4 (3.8) JPM:	Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc. Determine License Status
Equipment Control	D, R	2.2.12 (4.1) JPM:	Knowledge of Surveillance Procedures. Determine Procedure Sections that Must be Performed
Radiation Control	D, R	2.3.6 (3.8) JPM:	Ability to approve release permits. Approve a Liquid Release Permit
Emergency Procedures/Plan	M, R	2.4.44 (4.4) JPM:	Knowledge of emergency plan protective action recommendations. Provide an Updated PAR

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

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

SRO Admin JPM Summary

A1a This is a Bank JPM. The operator will be told that Unit 1 is at 100% power, the Unit 1 OAC point M1L4554 is out of service, and that PT/1/A/4200/040 (Reactor Coolant Leakage Detection) has been completed showing that total NCS Leakage is 1.6 gpm. The operator will be given Enclosure 13.2 (NC Leakage Determination Using Manual Calculations) of PT/1/A/4150/001B (Reactor Coolant Leakage Calculation) with the necessary raw data compiled on a Data Sheet; and directed to complete the calculations within the Enclosure. The operator will be expected to complete all calculations in accordance with the provided Key, identify any Technical Specification Limits that have been exceeded, and identify with all Technical Specification ACTION. This JPM appeared on the 2015 Initial License Exam and was randomly selected for the 2018 Exam.

A1b This is a modified Bank JPM. The operator will be provided with the work histories and qualifications of three Senior Reactor Operators that have not stood a Control Room shift in the current quarter. The operator will be directed to determine whether or not any of these SROs can be assigned to an upcoming shift as the CRS. The operator will be expected to determine that two SROs are eligible and the other SRO is not eligible to be assigned to the upcoming shift.

A2 This is a Bank JPM. The operator will be told that a plant startup is in progress in accordance with OP/1/A/6100/003 (Controlling Procedure for Unit Operation), and that the crew has just stabilized the plant at 3.6% power and in a 10-minute hold. The operator will be provided with a listing of failed OAC Alarms; and directed to assess the OAC Points using PT/1/A/4600/021B (Loss of Operator Aid Computer while in Mode 2); specifically, to identify all procedure sections that must be performed, all personnel and/or organizations that must be notified, and all procedure Enclosures or other procedures that must be performed as power is raised. The operator will be expected to identify the five procedure sections that must be performed as 12.2, 12.5, 12.9, 12.10 and 12.13; identify that the Engineering OAC Group must be notified, and that Enclosure 13.2 Part A needs to be performed (per Attached KEY).

A3 This is a Bank JPM. The operator will be provided with a list of equipment that is Out-of-Service (OOS) which will include some Liquid Radwaste monitoring equipment. The operator will be told that Unit 1 and Unit 2 are in Mode 1 at 100% power, that there are no on-going liquid radiation releases, that Attachment 1 ('B' WMT Release Using 'B' WMT Pump) of OP/0/B/6200/607 (Liquid Waste Release – WMT ‘B’ with WMT Pump ‘B’) is in progress in preparation for release of the B Waste Monitor Tank, that Attachment 10 ('B' WMT Release Authorization) has been initiated, that RP has just delivered the LWR package # 2018067 to the Control Room, and that all available RC Pumps are running. The operator will be directed to review and approve LWR Package # 2018067 by performing Steps 9-12 of Attachment 10 (‘B’ WMT Release Authorization) of OP/0/B/6200/607; and if LWR Package # 2018067 cannot be approved, identify why not. The operator will be expected to determine that LWR Package # 2018067 cannot be approved because the recommended Release Rate is GREATER THAN the Allowable Release Rate and 0EMF49 has NOT been source checked.

A4 This is a modified JPM. The operator will be placed in a post-accident condition with a Large Break LOCA with a release from the Containment. The operator will be told that a General Emergency has been declared, and provided with the initial Protective Action

Recommendation (PAR). The operator will be given a subsequent set of plant conditions and meteorological data, and asked to prepare an EXPANDED PAR and submit the Emergency Notification Form to the Emergency Coordinator for approval. The operator will be expected to determine the EXPANDED PAR for the current conditions and complete the Emergency Power Plant Emergency Notification Form per the provided KEY within 15 minutes.

Facility:	**McGuire**	Date of Examination:	**4/2018**
Exam Level (circle one):	*RO (only)* / SRO(I) **/ SRO (U)**	Operating Test No.:	**N18-1**

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

System / JPM Title		Type Code*	Safety Function
A.	**APE 026 Loss of Component Cooling Water [APE 026 AA1.02 (3.2/3.3)]** **Respond to High VCT Temperature**	**S, P, D, A**	**8**
B.	**026 Containment Spray System [026 A4.01 (4.5/4.3)]** **Align the Containment Spray System to Cold Leg Recirculation**	**S, D, A, EN, L**	**5**
C.	**APE 024 Emergency Boration [APE 024 AA1.17 (3.9/3.9)]** **Emergency Borate in Mode 6**	**S, N, A, L**	**1**
D.	010 Pressurizer Pressure Control System [010 A4.02 (3.6/3.4)] Remove Pressurizer Heaters from Service	S, D, P, A	3
E.	006 Emergency Core Cooling System [006 A4.02 (4.0/3.8)] Isolate the SI Accumulators during Degraded Core Cooling	S, N, A, EN, L	2
F.	APE 061 ARM System Alarms [061 AA2.01 (3.5/3.7)] Control Room Air Intake High Radiation Alarms	S, D	7
G.	045 Main Turbine Generator System [045 A4.02 (2.7/2.6)] Synchronize the Main Turbine Generator to the Grid	S, D	4S
H.	*EPE 074 Inadequate Core Cooling [074 EA1.09 (3.7/3.8)]* *Align Alternate Makeup During Inadequate Core Cooling Conditions*	*S, M, L*	*4P*
In-Plant Systems:* 3 for RO; 3 for SRO-I; 3 or 2 for **SRO-U**			
I.	**APE 058 Loss of DC Power [APE 058 AA1.03 (3.1/3.3)]** **Swap Battery Charger EVCA Power Supply from Unit 1 to Unit 2**	**D, R, E, L**	**6**
J.	**061 Auxiliary/Emergency Feedwater System [061 A2.04 (3.4/3.8)]** **Start # 1 Turbine Driven CA Pump**	**D, R**	**4S**
K.	008 Component Cooling Water System [008 A2.02 (3.2/3.5)] Makeup to the Unit 1 KC Surge Tanks	D, R, E	8

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

JPM Summary

JPM A This is a Bank JPM. The operator will be told that Unit 1 was at 100% power when a leak developed in the KC System, that the crew has entered AP/1/A/5500/21 (Loss of KC or KC System Leakage) and has completed actions through Step 12. They will be told that MCB Annunciator 1AD-7, D1, VCT HI TEMP, has just alarmed, making Foldout Page item #5 applicable. The operator will be directed to perform the actions of Enclosure 4.6 of AP/1/A/5500/21 (Loss of KC or KC System Leakage), while the crew continues with the AOP. The operator will be expected to isolate Letdown, and attempt to start the PD Pump. When the PD Pump fails to start **(Alternate Path)**, the operator will align the suction of the NV Pumps to the FWST. This JPM appeared on the 2015 Initial License Exam and was randomly selected for the 2018 Exam.

JPM B This is a Bank JPM. The operator will be told that a High Energy Line Break has occurred inside Containment, that EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirc) has been implemented and completed through step 6, and that the FWST Level is approximately 80 inches and lowering. The operator will be directed to perform Steps 7 and 8 of EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirc). The operator will be expected to attempt to align the 1A NS Pump for operation until it is observed that 1NS-18A has failed to open **(Alternate Path)**. The operator will then be expected to align the 1B NS Train for operation, and secure the 1A NS Train operation.

JPM C This is a new JPM. The operator will be told that the plant is in Mode 6 with Core Alterations in progress, that Chemistry has just reported that a boron sample taken 30 minutes ago indicates that the RCS boron concentration is less than that required for Mode 6 indicating an NCS boron dilution may be occurring, and that MCB Annunciator 1AD-2/D3, S/R HI FLUX AT SHUTDOWN, has just alarmed. The operator will also be told that the 1B BA Transfer Pump is available, however, due to elevated vibration levels, the 1A BA Transfer Pump is preferred. The operator will be directed to perform AP/1/A/5500/38, (Emergency Boration and Response to Inadvertent Dilution). The operator will be expected to perform steps 1-12 of AP/1/A5500/38, initiate emergency boration using the 1A BA Transfer Pump, and reinitiate emergency boration using the 1B BA Transfer Pump when 1ELXA de-energizes **(Alternate Path)**.

JPM D This is a Bank JPM. The operator will be told that plant power has just been raised to 100% per OP/1/A/6100/003 (Controlling Procedure for Unit Operation). The operator will be directed to remove Pzr Heater Groups A, B and D from service per Enclosure 4.6 (Operation of Pzr Heaters) of OP/1/A/6100/003. The operator will be expected to remove the A, B and D Pzr Heater Groups from service in accordance with the Enclosure. After the Pzr Pressure Master has been placed in MANUAL and its output has been adjusted, the Pzr Variable Heaters (Group C) will fail **(Alternate Path)**. The operator will be required to respond to MCB Annunciator 1AD6/D6 (PZR HTR CONTROLLER TROUBLE), and manually control pressure using the other heater groups. The operator will be expected to place at least one Pzr Heater Group in service in accordance with Step 3.3.1 (or equivalent) of Enclosure 4.6. This JPM appeared on the 2016 Initial License Exam and was randomly selected for the 2018 Exam.

JPM E This is a new JPM. The operator will be told that a loss of coolant accident has occurred, that multiple equipment failures resulted in an ORANGE Path on CORE COOLING, and that the crew has completed Steps 1 through 16 of EP/1/A/5000/FR-C.2 (Response to Degraded Core Cooling). The operator will be directed to continue with FR-C.2 starting with Step 17. The operator will be expected to isolate Accumulator A, B and C and vent Accumulator D per Step 17 of FR-C.2 when it is determined that it cannot be isolated **(Alternate Path)**.

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

JPM G This is a Bank JPM. The operator will be told that Unit 1 is at 15% power, that a plant startup is in progress in accordance with Enclosure 4.1 (Power Increase) of OP/1/A/6100/003 (Controlling Procedure For Unit Operation), that the crew is currently at Step 3.32.17, and that all Clearances have been evaluated and will NOT impact Turbine Generator startup. The operator will also be told that the Main Turbine is operating at 1800 RPM, the crew is implementing OP/1/A/6300/001 (Turbine Generator Startup/Shutdown), and is currently at Step 3.16, and that the System Operation Center has been notified that Unit 1 will be paralleled to the grid. The operator will be given a surrogate to push and hold the SYNC pushbutton under their direction, and directed to synchronize the Main Turbine Generator with the Electrical Grid via the 1A Generator Breaker, and load it to 50 MWe per Step 3.16 of Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown), and then complete Step 3.16. The operator will be expected to adjust the controls of the Turbine Generator and synchronize it to the Electrical Grid, load it to 50 MWe in Operator Auto, and complete Step 3.16 of Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown).

JPM H This is a modified Bank JPM. The operator will be told that Unit 1 has had a LOCA, that all NV, NI and ND Pumps are either OOS, unavailable or have failed, that a Red Path exists on the Core Cooling Critical Safety Function, that the crew has entered EP/1/A/5000/FR-C.1, Response to Inadequate Core Cooling, and that they are an

available operator in the Control Room. The operator will be directed to try to establish flow from all available sources per Enclosure 3 (Alternate Makeup Sources) of FR-C.1, while the crew continues in the body of the procedure. The operator will be expected to initiate Enclosure 3 of FR-C.1 and start the Standby Makeup Pump per Enclosure 6 of FR-C.1.

JPM I This is a Bank JPM. The operator will be told that Unit 1 has just experienced a Loss of Offsite Power, that the 1A D/G will not start, and that 1ETA is de-energized. AP/1/A/5500/07, "Loss of Electrical Power," Case 1 has been implemented. The operator will be directed to swap power supplies to the EVCA Battery Charger from Unit 1 to Unit 2 in accordance with Enclosure 22 (Swapping Battery Charger Power Supplies) of AP/1/A/5500/07, (Loss of Electrical Power). The operator will be expected to place Battery Charger EVCA in service with power being supplied from Unit 2 within 15 minutes of dispatch. This is a Time Critical JPM.

JPM J This is a Bank JPM. The operator will be told that Unit 1 is at 98% power when the OAC alarm M1A1276 (U1 CA Temp at Chk Vlv 1CA-37) is received, that the temperature in the TD CA Pump discharge to the 1D S/G is 223°F, and that the CRS has determined the #1 Turbine Driven CA Pump should be started to cool the piping to the 1D S/G. The operator will be directed to locally start the Unit 1 Turbine Driven CA Pump per OP/1/A/6250/002 (Auxiliary Feedwater System), Enclosure 4.4 (Manual Operation of #1 TD CA Pump). The operator will be expected to locally start the #1 TD CA Pump and align the CA System valves to provide the required cooling.

JPM K This is a Bank JPM. The operator will be told that Unit 1 is operating at 100% power when the KC Surge Tank A and B lo level computer alarms are received, that the surge tank levels are 3.9 feet and decreasing, and that AP/1/A/5500/21 (Loss of KC or KC System Leakage) has been implemented. Since the YM System will be out of service, the operator will be directed to initiate makeup to both Unit 1 KC Surge Tanks <u>per</u> AP/1/A/5500/21 (Loss of KC or KC System Leakage), Enclosure 3 (Aligning RN Makeup to KC Surge Tank). The operator will be expected to manipulate valves and communicate with the Control Room to restore KC Surge Tank level to the allowable band in accordance with Enclosure 3 of AP/1/A/5500/21 within 10 minutes. This is a Time Critical JPM.

MNS ILT 18-1 SRO NRC Examination **QUESTION 1** 1 **C**

SYS012 K6.08 - Reactor Protection System (RPS)
Knowledge of the effect of a loss or malfunction of the following will have on the RPS: (CFR: 41.7 / 45/7)
COLSS ....

Given the following on Unit 2:

- The unit is at 100% RTP
- Pressurizer Pressure Channel 1 fails low

Based on the conditions above, the Reactor Protection System (RPS) setpoint for Channel 1 of ___(1)___ will ___(2)___.

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

LEGEND:

- OPΔT - OVERPOWER ΔT
- OTΔT - OVERTEMPERATURE ΔT

A. 1. OPΔT
2. decrease

B. 1. OPΔT
2. increase

C. 1. OTΔT
2. decrease

D. 1. OTΔT
2. increase

General Discussion

Pressurizer pressure has an input to the OT Delta-T setpoint calculation. If Pressurizer pressure decreases to less than 2235 PSIG, the OT Delta-T reactor trip and runback setpoints decreases. If Pressurizer pressure increase to greater than 2235 PSIG, the OT Delta-T reactor trip setpoint increases.

Based on the conditions given (Pressurizer pressure Channel 1 fails low), the OT Delta-T runback and reactor trip setpoints will decrease.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because if the applicant confuses OP and OT Delta-T. Licensed Operators often confuse which of the two protective features have input from Pressurizer pressure and the inherent tendency is to pick OP Delta-T.

Part 2 is correct and therefore plausible.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1is plausible because if the applicant confuses OP and OT Delta-T. Licensed Operators often confuse which of the two protective features have input from Pressurizer pressure and the inherent tendency is to pick OP Delta-T.

Part 2 is plausible if the applicant does not recall the effect of the failed pressure channel on the setpoint calculation. This is plausible as the Pressurizer pressure channel failing high would cause the setpoint to increase.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct and therefore plausible.

Part 2 is plausible if the applicant does not recall the effect of the failed pressure channel on the setpoint calculation. This is plausible as the Pressurizer pressure channel failing high would cause the setpoint to increase.

Basis for meeting the KA

MNS does not have a COLSS (Core Operating Limit Support System) per se. However, OP Delta-T and OT Delta-T are part of the Reactor Protection System (RPS) that provide protection from exceeding core operating limits. Because a malfunction has occurred that effects OT Delta-T, the RPS is affected (Runback and Reactor trip setpoints change). Therefore, the KA is matched.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant must recall from memory that Delta-Flux has an input to both Overpower and Overtemperature Delta-T setpoints for excessively postive AFDs but, only the Overpower Delta-T setpoint for excessively negative AFDs.

Next, the applicant must analyze the conditions given and determine from that analysis the effect on calculated DNBR. For example, if the detector had failed low, it would have resulted in an excessively negative AFD and the calculated DNBR would have remained the same.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
Lesson Plan OP-MC-IC-IPE (Reactor Protections System) Rev. 33

LEARNING OBJECTIVES:

Student References Provided

OP-MC-IC-IPE Objective 10

SYS012 K6.08 - Reactor Protection System (RPS)

Knowledge of the effect of a loss or malfunction of the following will have on the RPS: (CFR: 41.7 / 45/7)

COLSS ....

Remarks/Status

SYS013 K2.01 - Engineered Safety Features Actuation System (ESFAS)

Knowledge of bus power supplies to the following: (CFR: 41.7)

ESFAS/safeguards equipment control ....

Which ONE (1) of the following indicates the power supplies to the D/G Sequencers?

A. EVDA ; EVDB

B. EVDB ; EVDC

C. EVDC ; EVDD

D. EVDA ; EVDD

General Discussion

The Diesel Generator Load Sequencer System is powered from the 125 VDC Vital Instrumentation and Control System. (Train 1A - 1EVDA, Train 1B - 1EVDD).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because 1EVDA is correct for "A" Train and 1EVDB is another 125VDC Vital Instrument and Control Panelboard.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because 1EVDB and 1EVDC are both 125VDC Vital Instrument and Control Panelboards but do not supply the D/G Sequencers.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because 1EVDD is correct for "B" Train and 1EVDC is another 125VDC Vital Instrument and Control Panelboard.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the DG Load Sequencers function to energize and control the loading of Blackout and/or Safety Injection (ESFAS) loads.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2014 MNS NRC Q10 (Bank 5161)

Development References

REFERENCES:
Lesson Plan OP-MC-DG-EQB Rev. 23 Section 2.4

LEARNING OBJECTIVES:
NONE

Student References Provided

SYS013 K2.01 - Engineered Safety Features Actuation System (ESFAS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
ESFAS/safeguards equipment control ....

Remarks/Status

Rearranged answers form original bank question, correct answer is now "D". SLM 02/20/17.

SYS022 A3.01 - Containment Cooling System (CCS)
Ability to monitor automatic operation of the CCS, including: (CFR: 41.7 / 45.5)
Initiation of safeguards mode of operation ....

Given the following on Unit 2:

- A SBLOCA has occurred
- Containment pressure peaked at 1.3 PSIG and now is 0.9 PSIG and stable

Which ONE (1) of the following describes the operation of the Containment Cooling system fans based on these conditions?

COMPONENT LEGEND:

PTBF - PIPE TUNNEL BOOSTER FAN
VL AHU - LOWER CONTAINMENT VENTILATION AIR HANDLING UNIT

A. VL AHUs start and run in LOW speed; PTBFs start and run in LOW speed.

B. VL AHUs start and run in LOW speed; PTBFs are shunt tripped OFF.

C. VL AHUs start and run in HIGH speed; PTBFs start and run in LOW speed.

D. VL AHUs start and run in HIGH speed; PTBFs are shunt tripped OFF.

General Discussion

The VL units, VR units and VT units shunt trip off, swap to emergency power and start on an SS signal. The VL units start in HIGH speed. The VU units, Return Air Fans, and the Pipe Tunnel Booster Fans are shunt tripped off on the SS signal.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible since the VL units and the PTBFs both start in LOW speed on a blackout signal.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible since the VL units start in LOW speed on a blackout signal. PTBFs shunt tripping off is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible since the VL units starting in HIGH speed is correct and the PTBFs start in LOW speed on a blackout signal.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate the ability to monitor automatic operation of the Containment Cooling system by determining the status of the VL fans and the PTBFs after initiation of a safety injection.

Basis for Hi Cog

This question is a higher cognitive question because the applicant must analyze the conditions in the stem to determine which safeguards actuations have occurred due to containment pressure and then determine the status of the containment cooling system fans.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2015 MNS NRC Q13 (Bank 5923)

Development References

REFERENCES:
Lesson Plan OP-MC-CNT-VUL Rev 32, Section 3.2.2. (Safety Injection)

LEARNING OBJECTIVES:
OP-MC-CNT-VUL Objective 5

Student References Provided

SYS022 A3.01 - Containment Cooling System (CCS)
Ability to monitor automatic operation of the CCS, including: (CFR: 41.7 / 45.5)
Initiation of safeguards mode of operation ....

Remarks/Status

SYS025 A2.06 - Ice Condenser System

Ability to (a) predict the impacts of the following malfunctions or operations on the ice condenser system; correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Decreasing ice condenser temperature ....

Given the following on Unit 1:

- Unit is at 100% RTP
- The Control Room has received annunciator alarm 1AD-9 / E6 (FLOOR COOLING GLYCOL LO TEMP)
- Five Glycol Chillers and Two Floor Cooling Pumps are in service
- An AO has been dispatched per the annunciator response procedure
- Floor Cooling Glycol Temperature is 6°F
- Ice bed temperature is 7°F

Based on the conditions above,

1) the required IMMEDIATE action in accordance with the annunciator response for Floor Cooling Glycol temperature, is to stop one _______.

2) the primary concern is increased _______.

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

A. 1. Floor Cooling pump
   2. floor slab buckling

B. 1. Floor Cooling pump
   2. ice bed sublimation

C. 1. Glycol Chiller
   2. floor slab buckling

D. 1. Glycol Chiller
   2. ice bed sublimation

General Discussion

In the conditions presented, floor glycol temperature is low enough to cause 1AD-9/ E-6 (Floor Cooling Glycol Lo Temperature) . The immediate actions of the annunciator response require stopping one floor cooling glycol pump if both are running.

Per lesson plan, OP-MC-CNT-NF, section 3.1.2, operation of the NF system with lowered ice condenser temperatures causes the frost line to move lower and thus the ice to expand pushing the floor upward.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant confuses ice bed sublimation and floor slab buckling.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because stopping one Glycol Chiller would have a similar effect on Floor Glycol temperature as stopping one Floor Cooling pump. However, stopping one Floor Cooling Pump is the immediate action specified in the ARP.

Part 2 is correct

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because stopping one Glycol Chiller would have a similar effect on Floor Glycol temperature as stopping one Floor Cooling pump. However, stopping one Floor Cooling Pump is the immediate action specified in the ARP.

Part 2 is plausible if the applicant confuses ice bed sublimation and floor slab buckling.

Basis for meeting the KA

K/A is matched because the applicant is given a set of conditions and must determine whether the potential impact of the glycol low temperature and the action required by the ARP to mitigate the event.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2015 MNS NRC Q14 (Bank 5924)

Development References

REFERENCES:
Lesson Plan OP-MC-CNT-NF Section 3.1.2
OP/1/A/6100/010 J pg 46 of 57

LEARNING OBJECTIVES:
OP-MC-CNT-NF Objective 21

Student References Provided

SYS025 A2.06 - Ice Condenser System

Ability to (a) predict the impacts of the following malfunctions or operations on the ice condenser system; correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Decreasing ice condenser temperature ....

Remarks/Status

SYS026 K1.01 - Containment Spray System (CSS)

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

ECCS ....

Given the following on Unit 2:

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

If Containment pressure lowers to less than 0.35 PSIG, the NS Pump ___(1)___ stop automatically.

Subsequently, if Containment pressure rises to greater than 0.35 PSIG, the NS Pump ___(2)___.

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

A. 1. will
   2. will start automatically

B. 1. will
   2. can be started manually

C. 1. will NOT
   2. will start automatically

D. 1. will NOT
   2. can be started manually

General Discussion

The Containment Spray System will be started manually from the Control Room. For the manual start, CPCS must be at least 0.35 psig for the discharge valves to be manually opened or for the pumps to be manually started. Either of the train related discharge valves must also be open to allow a pump start. If the containment pressure decreases to < .35 psig (after the initial pump start) containment spray pumps are automatically turned off and the discharge valves are automatically closed. If the pressure increases above .35 psig after the NS pumps have stopped, the pump discharge valves must be manually opened. The NS Pump(s) will then need to be manually restarted.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant concludes that since the NS pump was running with CPCS >.35 PSIG and it was automatically stopped that it should automatically restart when pressure increases to greater than 0.35 PSIG.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the NS pump is only manually started in ES-1.3 if Containment pressure is greater than 3 PSIG. It would be logical for the applicant to conclude that since the pump must be manually started that it must likewise be manually stopped.

Part 2 is plausible if the applicant concludes that since the NS pump was running with CPCS >.35 PSIG and it was automatically stopped that it should automatically restart when pressure increases to greater than 0.35 PSIG.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the NS pump is only manually started in ES-1.3 if Containment pressure is greater than 3 PSIG. It would be logical for the applicant to conclude that since the pump must be manually started that it must likewise be manually stopped.

Part 2 is correct and therefore plausible.

Basis for meeting the KA

The K/A is matched because the question tests the applicants knowledge of the cause-effect relationship between Containment pressure (an input to the ESF/ECCS system protective features) and the Containment Spray System (NS).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	

Development References

REFERENCES:
Lesson Plan OP-MC-ECC-NS Rev. 34
Lesson Plan OP-MC-ECC-ISE Rev. 37

LEARNING OBJECTIVES:
OP-MC-ECC-NS Objectives 6 & 8

Student References Provided

SYS026 K1.01 - Containment Spray System (CSS)

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

ECCS ....

Remarks/Status

SYS039 K4.06 - Main and Reheat Steam System (MRSS)

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

Prevent reverse steam flow on steam line break ....

Given the following on Unit 1:

- Unit is in Mode 3
- A plant cooldown and depressurization is in progress
- NC System pressure is 1900 PSIG
- All S/G pressures are 1050 PSIG
- Low Pressure SI and Low Pressure Steamline Isolation have been blocked

Based on the conditions above,

1) a Main Steam Isolation signal _______ be generated if ANY 1 S/G's pressure drops to 850 PSIG in 2 seconds.

2) if a Main Steam Isolation occurs, the SM PORVs, _______ receive a close signal.

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

A. 1. will NOT
   2. will

B. 1. will NOT
   2. will NOT

C. 1. will
   2. will NOT

D. 1. will
   2. will

General Discussion

Per ECC-ISE, a Main Steam Isolation signal closes the MSIVs, MSIV bypasses and the SM PORVs.

MSI is actuated by one of the following:

Hi Hi Containment Press (3 psig),
Low Steam Pressure (< 775 psig) >P-11
Steamline negative rate (-100 psig/sec) <P-11 with Lo Press Steam Line Isol BLOCKED

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because if NC system pressure were greater than the P-11 setpoint, a MSI would not occur.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because if NC system pressure were greater than the P-11 setpoint, a MSI would not occur.

Part 2 is plausible because both licensed operators and license candidates normally associate the need for a Main Steam Isolation with a steam break or steam leak that is associated with the line rupture, separation of a line, or faulted SG, and not the failing open of a valve. As such, an applicant could conclude that a MSI need only close the MSIVs and MSIVs Bypass valves to isolate a leak downstream of the MSIVs, or in the case of a faulted SG, to isolate a faulted SG from the non-faulted SGs. If so, they would not include the SM PORVs in the list of components that receive a MSI signal.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because both licensed operators and license candidates normally associate the need for a Main Steam Isolation with a steam break or steam leak that is associated with the line rupture, separation of a line, or faulted SG, and not the failing open of a valve. As such, an applicant could conclude that a MSI need only close the MSIVs and MSIVs Bypass valves to isolate a leak downstream of the MSIVs, or in the case of a faulted SG, to isolate a faulted SG from the non-faulted SGs. If so, they would not include the SM PORVs in the list of components that receive a MSI signal.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate a knowledge of the signals that will result in an Automatic Main Steam Line Isolation signal and thus prevent reverse steam flow on a steam line break.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. The applicant must first recall from memory specific MSI signals, their setpoints and specific valve that will receive a close signal. The applicant must then analyze the conditions given and apply them to the recalled knowledge to determine which response meets the criteria for a MSI.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2008 MNS NRC Q18 (Bank 3236)

Development References

REFERENCES:
Lesson Plan OP-MC-ECC-ISE Rev 37, Section 3.1

Student References Provided

LEARNING OBJECTIVES:
OP-MC-ECC-ISE Objective 13

SYS039 K4.06 - Main and Reheat Steam System (MRSS)
Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Prevent reverse steam flow on steam line break ....

Remarks/Status

This question has been selected to send to Chief Examiner for early 401-9 review for KA match. SLM 05/17/17

As far as reverse flow protection on a steam line break, MNS does NOT have check valves in the Main Steam Lines like some Westinghouse plants. So, we must rely on the Main Steam Isolation signal or a manually initiated Main Steam Isolation for reverse flow protection.

Early 401-9 Review Comments - ENHANCEMENT

SYS039K4.06

-Remove containment pressure from the stem

Reword question

1) a Main Steam Isolation signal WILL/ WILL NOT be generated if any 1 S/G's pressure drops to 850 psig in 2 seconds

2) if a Main Steam Isolation occurs, the SM PORVs WILL/ WILL NOT receive a close signal

Q6 will be S with the above enhancements

K/A is matched due to T.S. bases for the MSI

FACILITY RESPONSE:
Made changes as requested by the CE. SLM 8/17/17

SYS059 K3.02 - Main Feedwater (MFW) System

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

AFW system ....

Given the following **initial** conditions on Unit 1:

- Unit is in Mode 3
- The crew is performing a unit heatup and pressurization
- NC pressure is 1900 PSIG and rising slowly
- 1A Main Feed pump is running, 1B Main Feed pump is tripped
- CA Auto Start is DEFEATED

Currently,

- NC pressure is 1980 PSIG and rising slowly

Based on CURRENT conditions, if the 1A Main Feedwater pump trips, the MD CA pumps ____(1)____ auto start.

Independent of the conditions above, the CA Auto-Start Defeat feature ____(2)____ block the Auto-Start of the MD CA pumps from a Blackout signal.

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

A. 1. will
 2. does

B. 1. will
 2. does NOT

C. 1. will NOT
 2. does

D. 1. will NOT
 2. does NOT

General Discussion

The auto-start signals for the CA Motor Driven pumps are:
2/4 detectors low-low level in any one SG (17%)
Trip of both Main Feedwater pumps
SS signal
Blackout signal
AMSAC
1.Both Feedwater pumps tripped
2.Loss of flow to 3/4 SGs

NC System pressure must be below the P-11 setpoint (1955 psig) to enable the Auto-Start Defeat feature. The Auto-Start Defeat feature will auto unblock when pressure returns above the P-11 setpoint. Auto-Start can also be restored using the "RESET" pushbutton when the Auto-Start is defeated with NC system pressure below P-11.

With CA PUMP AUTO START DEFEATED , the following MD CA pump auto start signals are defeated:
- Low-Low Level in any one S/G
- Trip of both Main Feedwater pumps
- AMSAC (Loss of Both Main Feedwater pumps ONLY)

When the auto-start of the Motor Driven CA pumps is defeated using the pushbutton, the Motor Driven CA pumps will still auto-start on an SI signal, Blackout signal, and AMSAC Loss of Flow is unaffected.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the CA Auto Start Defeat feature does block the auto start of the MDCA pumps due to AMSAC (Loss of Both Feed pumps), trip of both feed pumps and low-low level in any one S/G.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that NC system pressure has remained below the setpoint for auto un-blocking of the CA auto start defeat. (P-11, 1955 psig)

Part 2 is plausible because the CA Auto Start Defeat feature does block the auto start of the MDCA pumps due to AMSAC (Loss of Both Feed pumps), trip of both feed pumps and low-low level in any one S/G.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that NC system pressure has remained below the setpoint for auto un-blocking of the CA auto start defeat. (P-11, 1955 psig)

Part 2 is correct.

Basis for meeting the KA

K/A is matched since the applicant must know how the loss of the MFW (both CF pumps tripped or AMSAC actuation due to loss of CF flow path) will affect the auto start capabilities of the motor driven AFW pumps.

Basis for Hi Cog

This question is a higher cognitive level question since more than one mental step is involved. The applicant must recall from memory the MDCA pump trip signals and which signals are blocked by the auto start defeat switch. Then analyze changing plant conditions to determine that NC system pressure is greater than the P-11 signal, thus auto un-blocking the CA auto start defeat and causing an auto start of the MDCA pumps.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2013 MNS NRC Q17 (Bank 5247)

Development References
REFERENCES: Lesson Plan OP-MC-CF-CA Section 2.9 LEARNING OBJECTIVES: OP-MC-CF-CA Objectives 11

Student References Provided

SYS059 K3.02 - Main Feedwater (MFW) System

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

AFW system ....

Remarks/Status

SYS061 K6.02 - Auxiliary / Emergency Feedwater (AFW) System

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

Pumps ....

Given the following on Unit 2:

- A small break LOCA has occurred
- Safety Injection has been initiated

Subsequently,

- Prior to re-setting SI, A Blackout occurs on Bus 2ETA due to failure of the Normal Incoming breaker

Which ONE (1) of the following indicates the CA system alignment **one minute** after the Blackout signal? (ASSUME NO OPERATOR ACTIONS)

A. S/Gs 2A and 2B are NOT being fed.

B. S/Gs 2A and 2B are being fed by the 2A MD CA pump ONLY.

C. S/Gs 2A and 2B are being fed by the U2 TD CA pump ONLY.

D. S/Gs 2A and 2B are being fed by the 2A MD CA Pump and the U2 TD CA pump.

General Discussion

The 2A MDCA pump will start on a Safety Injection signal. Since the Safety Injection occurs before the Blackout signal, the TDCA pump does NOT get an automatic signal to start from the Blackout signal (even though a Blackout signal is an auto start of the TDCA pump). Power has been momentarily lost to the 2A MD CA pump due to the loss of power to 2ETA. After 8.5 seconds, the sequencer will load the priority loads and the 2A MDCA pump will be running.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible since the Safety Injection occurring prior to the Blackout signal prevents the U2 TDCA pump from auto starting as a result of the Blackout signal and the MDCA pump would be off if the blackout on 2ETA had been due to a fault resulting in a lockout.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible since a Blackout signal is an auto start signal for the TDCA pump and the 2A MDCA pump would be off if the Blackout signal had been due to a fault, resulting in a lockout.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible since 2A MDCA pump feeding the 2A and 2B S/Gs is correct and a Blackout signal is an auto start signal for the TDCA pump. Since the Safety Injection signal occurred prior to the Blackout signal the U2 TDCA pump is blocked from auto starting as a result of the Blackout signal.

Basis for meeting the KA

K/A is matched because the applicant must have knowledge of the effect of the loss of an AFW pump on the AFW components (i.e. the S/Gs being fed by AFW).

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First the applicant must recall from memory the auto start signals for the MD CA pumps.

Next, the applicant must analyze the conditions given to determine that because the Blackout signal occurred after the SI signal, the U2 TDCA pump did NOT auto-start.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2014 MNS NRC Q18 (Bank 5853)

Development References

REFERENCES:
Lesson Plan OP-MC-CF-CA Rev 54, Section 2.9

LEARNING OBJECTIVES:
OP-MC-CF-CA Objective 9

Student References Provided

SYS061 K6.02 - Auxiliary / Emergency Feedwater (AFW) System

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

Pumps ....

Remarks/Status

SYS062 A1.01 - AC Electrical Distribution System

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

Significance of D/G load limits ....

Given the following on Unit 2:

- Unit 2 is at 100% RTP
- 2A D/G has been started per PT/2/A/4350/002 A (DIESEL GENERATOR 2A OPERABILITY TEST)
- 2A D/G has been running idle for 45 minutes

Based on the conditions above, the 2A D/G should be loaded to a MINIMUM of 3000 kW AND run for one hour to ensure ___(1)___.

The 2A D/G load limit for **continuous operation** is ___(2)___ kW.

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

A. 1. burnout of excess fuel in cylinders
   2. 4000

B. 1. injector tips are clean
   2. 4000

C. 1. burnout of excess fuel in cylinders
   2. 4400

D. 1. injector tips are clean
   2. 4400

General Discussion

Per PT/2/A/4350/002 A (D/G 2A Operability Test) Limits and Precautions, if D/G is idled for greater than 30 minutes, D/G should be loaded to at least 3000 kW AND run for one hour or greater to clean injector tips.

The maximum CONTINUOUS load limit for the DG is 4000 MW. The DG can be loaded to a maximum of 4400 MW for 2 hrs out of a 24 hour period.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible since it is a requirement to run the D/G for a minimum of one minute following any start to ensure burnout of any excess fuel admitted to the cylinders during start.

Part 2 is correct..

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible since it is a requirement to run the D/G for a minimum of one minute following any start to ensure burnout of any excess fuel admitted to the cylinders during start.

Part 2 is plausible because the DG is allowed to be loaded to a maximum of 4400 KW for 2 hrs. out of a 24 hour period.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the DG is allowed to be loaded to a maximum of 4400 KW for 2 hrs. out of a 24 hour period.

Basis for meeting the KA

K/A is matched since the applicant is required to predict the change in a parameter (kW) that the D/G must be loaded to (operation of the D/G controls) in order to prevent exceeding design limits of the D/G.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2015 MNS NRC Q19 (Bank 5929)

Development References

REFERENCES:
PT/2/A/4350/002 A (Diesel Generator 2A Operability Test) pg 4 of 8
Lesson Plan OP-MC-DG-DG Section 2.1

LEARNING OBJECTIVES:
OP-MC-DG-DG Objective 8

Student References Provided

SYS062 A1.01 - AC Electrical Distribution System

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

Significance of D/G load limits ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "B". SLM 02/22/17.

SYS062 A2.05 - AC Electrical Distribution System

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

Methods for energizing a dead bus ....

Given the following on Unit 1:

- A zone fault has resulted in a 6900V auto fast transfer
- The zone fault has been cleared
- Auxiliary busses 1ATA and 1ATB are synchronized

The auto fast transfer to the alternate source was a ___(1)___ bus transfer.

When voltage is restored to the incoming side of the normal feeder breaker, in accordance with OP/1/A/6350/005 (AC ELECTRICAL OPERATON OTHER THAN NORMAL LINEUP) a(an) ___(2)___.

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

A. 1. hot
   2. automatic slow transfer will occur

B. 1. hot
   2. manual hot bus transfer must be performed

C. 1. dead
   2. automatic slow transfer will occur

D. 1. dead
   2. manual hot bus transfer must be performed

General Discussion

OPS should be aware that the 7KV fast transfer is a dead bus transfer occurring within 7.5 cycles. It is not a hot bus transfer. During the 7.5 cycles that the bus does not have a source, the voltage is decaying due to the short term effect of motors acting as generators (due to residual EMF). Hence the limits and precautions about various components which may trip can be expected.
Automatic Bus Transfer (Slow or Fast) will only transfer from the normal power source to the alternate power source. There is no Automatic Transfer from alternate to normal. To restore power from the normal source a manual hot bus transfer will be performed in accordance with OP/1/A/6350/005 (AC Electrical Operation Other Than Normal Lineup).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the transfer occurs in 7.5 cycles and the NCP pump flywheel is minimizing the decay of bus voltage and frequency. However, the bus does not have a source.

Part 2 is plausible because the 6900V busses will auto slow transfer to the alternate power supply if all the conditions are not met for an auto fast transfer. Also plausible in that other electrical busses are normal seeking an will auto transfer from alternate to normal when the normal power supply is restored.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the transfer occurs in 7.5 cycles and the NCP pump flywheel is minimizing the decay of bus voltage and frequency. However, the bus does not have a source.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the 6900V busses will auto slow transfer to the alternate power supply if all the conditions are not met for an auto fast transfer. Also plausible in that other electrical busses are normal seeking an will auto transfer from alternate to normal when the normal power supply is restored.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant is required to predict the impacts of a zone fault on the 6900V busses (i.e. what kind of bus transfer will occur to energize the bus) and use an operating procedure to restore normal power to the bus when normal power is available.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

REFERENCES:
OP-MC-EL-EP Rev 49
OP/1/A/6350/005 Encl. 4.1, Section 3.10

LEARNING OBJECTIVES:
OP-MC-EL-EP Obj 24

Student References Provided

SYS062 A2.05 - AC Electrical Distribution System

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

Methods for energizing a dead bus ....

Remarks/Status

SYS063 K3.02 - DC Electrical Distribution System
Knowledge of the effect that a loss or malfunction of the DC electrical system will have on the following: (CFR: 41.7 / 45.6)
Components using DC control power ....

Given the following on Unit 1:

- Annunciator 1AD-11/A-8 (D/G A 125 VDC DC CNTRL PWR TRBL) is in alarm
- AO reports the 125 VDC D/G Control Power breaker for 1A D/G has tripped and will NOT reset

Based on the conditions above,

1) the _______ will no longer have power.

2) the 1A D/G _______ automatically start.

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

A. 1. Electronic Governor AND Starting Air Solenoids
   2. will

B. 1. DG Sump Pump AND Diesel Building dampers
   2. will

C. 1. Electronic Governor AND Starting Air Solenoids
   2. will NOT

D. 1. DG Sump Pump AND Diesel Building dampers
   2. will NOT

General Discussion

A list of the 125 VDC Control Power loads are as follows:

* Electronic governor
* Voltage regulator for field flashing
* Speed switches
* Starting solenoid valves
* D/G Starting Circuit Control Power
* Fuel Oil Booster Pump

Each of the items listed above share a common supply breaker except the Fuel Oil Booster Pump. It has a separate supply breaker. An open breaker will constitute a loss of power to the motor and control circuit.
If the common supply breaker to all other components listed is opened, a loss of DC control power to the diesel occurs. The diesel is then inoperable and is also unable to start.

A list of the loads off the 120 VAC Control Power loads are as follows:

* D/G Pit Sump Pump
* D/G Control Panel
* D/G Sump Pump Control Power
* Hydrogen Analyzer
* Diesel Bldg dampers

Answer A Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible since the D/Gs can sustain a loss of 120 VAC control power and start on an automatic start signal.

Answer B Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because the DG Sump Pump and Diesel Building Dampers are loads powered from the 120 VAC DG Control Power system.

Part 2 is plausible since the D/Gs can sustain a loss of 120 VAC control power and start on an automatic start signal.

Answer C Discussion

CORRECT. See explanation above.

Answer D Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because the DG Sump Pump and Diesel Building Dampers are loads powered from the 120 VAC DG Control Power system.

Part 2 is correct.

Basis for meeting the KA

K/A is matched because the applicant must have knowledge of what components associated with the DG no longer have power if the 125 VDC Control power system is lost and what effect the loss of control power has on the D/Gs ability to perform an automatic start if required.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2011 MNS NRC Q22 (Bank 4373)

MNS ILT 18-1 SRO NRC Examination QUESTION **11** 11 **C**

Development References
REFERENCES: Lesson Plan OP-MC-DG-DG Rev 32, Section 2.2 LEARNING OBJECTIVES: OP-MC-DG-EPQ Objective 3

Student References Provided

SYS063 K3.02 - DC Electrical Distribution System

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

Components using DC control power ....

Remarks/Status

SYS003 2.4.11 - Reactor Coolant Pump System (RCPS)
SYS003 GENERIC
Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)

Given the following on Unit 1:

- Unit 1 is at 50% RTP
- The following timeline occurs for 1C NCP:

Time	1400	1401	1402	1403
#1 Seal Outlet Temperature	220°F	226°F	230°F	236°F

In accordance with AP-08 (MALFUNCTION OF NC PUMP),

1) the EARLIEST time 1C NCP exceeds operating limits is _______.

2) after the reactor is tripped, 1C NC pump must be secured _______.

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

A. 1. 1401
2. immediately

B. 1. 1403
2. immediately

C. 1. 1401
2. when reactor power is <5%

D. 1. 1403
2. when reactor power is <5%

General Discussion

NC Pump trip criteria are:
-Lower pump bearing temperature exceeds 225 degrees F.
-No. 1 seal outlet temperature exceeds 235degres F.

Per AP-08, Check the following NC Pump parameters within operating limits:
-All NC Pump lower radial bearing temperatures - LESS THAN 225°F
-All NC Pump number one seal outlet temperatures - LESS THAN 235°F
-All NC Pump number one seal delta Ps - GREATER THAN 200 PSID.

If any of the parameters are outside their limit, AP-08 directs tripping the reactor and securing the NCP when reactor power is less than 5 %.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the time that the NCP lower bearing temperature limit is exceeded.

Part 2 is plausible because the HI-HI temperature alarm is exceeded and immediately securing the pump would prevent further damage but is not required per AP-08.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the HI-HI temperature alarm is exceeded and immediately securing the pump would prevent further damage but is not required per AP-08.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the time that the NCP lower bearing temperature limit is exceeded.

Part 2 is correct.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate knowledge of AP-08 (Malfunction of NC Pump) to determine when an NCP limit is exceeded and the correct sequence for securing the NCP.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2009 CNS AUDIT Q45 (Bank 4552)

Development References

REFERENCES
AP/1/A/5500/008
Lesson Plan OP-MC-PS-NCP Rev 31, Section 3.1

LEARNING OBJECTIVES:
OP-MC-PS-NCP Objective 15

Student References Provided

SYS003 2.4.11 - Reactor Coolant Pump System (RCPS)

SYS003 GENERIC

Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

SYS003 K5.03 - Reactor Coolant Pump System (RCPS)

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

Effects of RCP shutdown on T-ave., including the reason for the unreliability of T-ave. in the shutdown loop ....

Given the following on Unit 1:

- Unit is at 30% RTP, holding for chemistry
- The 1A NC pump trips

Based on the conditions above, indicated Loop "A" Tavg will **stabilize** at a ___(1)___ value than prior to the 1A NC pump trip.

The reason that indicated Loop "A" Tavg changes is due to ___(2)___.

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

A. 1. higher
   2. reverse flow in Loop 1A

B. 1. lower
   2. reverse flow in Loop 1A

C. 1. higher
   2. core bypass flow into Loop 1A

D. 1. lower
   2. core bypass flow into Loop 1A

General Discussion

P-8 (2/4 PR instruments > 48% power) - enables Single Loop Loss of Flow and Reactor Trip upon Turbine Trip.

Thot in the affected loop will increase initially as the pump coasts down, but reverse flow will cause Thot to decrease to a value equal to or slightly less than Tcold.
Th + Tc/2 = Tavg, if Th decreases, then Tavg will decrease.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant correctly recalls that the cause of the change in Tavg in the effected loop is due to reverse flow from the uneffected loops but incorrectly interprets the effect of the reverse flow on Thot and Tcold.

Part 2 is correct and therefore plausible.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that core bypass flow from the reactor head area is sufficent to cause both T-hot and T-cold to increase causing T-ave to increase.

Part 2 is plausible because there would still be bypass flow from the reactor head into the NC loops. However, it would be insignificant compared to the reverse flow from the uneffected NC loops.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct and is therefore plausible.

Part 2 is plausible because core bypass flow into the 1A Loop is still occurring. However, it is insignificant compared to the reverse flow from the uneffected loops.

Basis for meeting the KA

K/A is matched because the applicant is required to have knowledge of the effects of an NCP trip on Tavg in the affected loop and the reason for that change.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to analyze conditions in the stem and determine if an automatic reactor trip has occurred and also analyze the flow conditions in a loop with no NCP and determine what effect this has on Tavg in the affected loop.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2009 CNS AUDIT Q47 (Bank 4859)

Development References

REFERENCES:
Lesson Plan:
MC-OP-IC-IPE Rev 33, Section 3.1.3
OP-MC-PS-NCP Rev 31, Section 3.2.1

LEARNING OBJECTIVES:
MC-OP-IC-IPE Obj 11

Student References Provided

SYS003 K5.03 - Reactor Coolant Pump System (RCPS)
Knowledge of the operational implications of the following concepts as they apply to the RCPS: (CFR: 41.5 / 45.7)

Effects of RCP shutdown on T-ave., including the reason for the unreliability of T-ave. in the shutdown loop ....

Remarks/Status

SYS004 A1.06 - Chemical and Volume Control System

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

VCT level ....

Regarding the operation of 1NV-137A (NC FILTERS OUTLET 3-WAY CNTRL),

1) as VCT level rises, 1NV-137A will modulate OPEN from _______VCT level.

2) the modulating signal for 1NV-137A is provided by Selected VCT Level _______.

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

A. 1. 54% to 66%
   2. One

B. 1. 54% to 66%
   2. Two

C. 1. 66% to 96%
   2. One

D. 1. 66% to 96%
   2. Two

General Discussion

Two (2) level channels monitor the VCT level. If a high level exists in the VCT, letdown may be automatically or manually diverted to RHT. Each Level channel inputs to two (2) 2X Select algorithms. Selected VCT Level signal uses the signal from NVLT-5760 as its normal output. Selected VCT Level 1 signal is the process variable that inputs to the controller for NV-137A. The NV-137A controller setpoint is 66%, and upon Selected VCT level 1 reaching 66% level, NV-137A will begin to modulate to divert letdown flow to the RHT. NV-137A will continue to modulate open until the Selected VCT Level 1 signal reaches 96% at which time the valve should be in the full divert position. The second VCT Level signal (Selected VCT Level 2) which uses the signal from NVLT-5761 as its normal output will send a signal to align NV-137A to full divert on high level (96%)

Auto makeup is initiated at 41% and is secured at 54% as sensed by Selected VCT Level 1 (the same signal that controls NV-137A modulation).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 54% is the setpoint for securing auto makeup to the VCT and 66% is the setpoint for NV-137A to begin modulating open.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 54% is the setpoint for securing auto makeup to the VCT and 66% is the setpoint for NV-137A to begin modulating open.

Part 2 is plausible because Selected VCT Level 2 sends a signal to NV-137A to fully open the valve at 96%.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct..

Part 2 is plausible because Selected VCT Level 2 sends a signal to NV-137A to fully open the valve at 96%.

Basis for meeting the KA

K/A is matched because the applicant is required to predict the VCT levels that will operate the VCT divert valve to prevent a VCT overfill.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2010 MNS AUDIT Q2 (Bank 2902)

Development References

REFERENCES:
OP-MC-PS-NV-DCS, Rev 12, Section 2.13

LEARNING OBJECTIVES:
OP-MC-PS-NV-DCS, Obj. 9

Student References Provided

SYS004 A1.06 - Chemical and Volume Control System
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CVCS controls

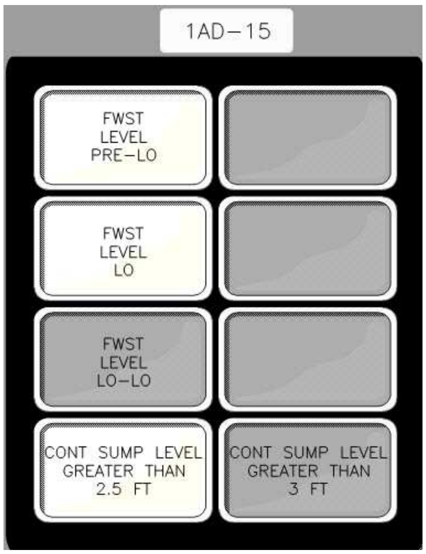
including: (CFR: 41.5 / 45.5)
VCT level ....

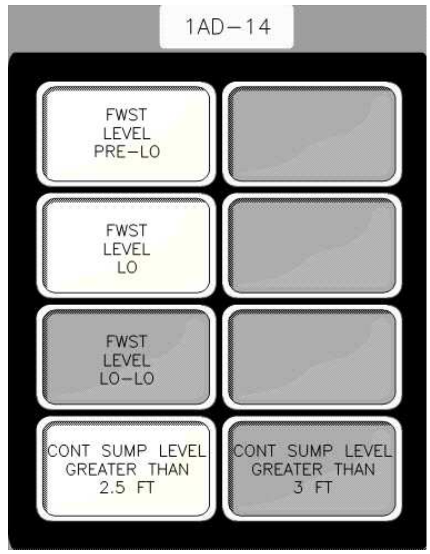
Remarks/Status
Rearranged answers form original bank question, correct answer is now "C". SLM 02/27/17.

SYS005 A4.01 - Residual Heat Removal System (RHRS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
Controls and indication for RHR pumps ....

Given the following on Unit 1:

- A Large-Break LOCA has occurred





Based on the conditions above, the requirements for aligning ND to Cold Leg Recirc in accordance with ES-1.3 (TRANSFER TO COLD LEG RECIRC) ___(1)___ met.

If conditions require aligning the NC system for Hot Leg Recirc, ND can be aligned to inject to ___(2)___.

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

A. 1. are
2. all 4 Hot Legs

B. 1. are NOT
2. all 4 Hot Legs

C. 1. are
2. B and C NC Hot Legs ONLY

D. 1. are NOT
2. B and C NC Hot Legs ONLY

General Discussion

Per ES-1.3, when the FWST reaches low level and the auto-swap to containment sump occurs, only the ND pump suction is aligned to the containment sump. The ND system is aligned for CLR if adequate volume is available in the containment sump (Cont Sump Lvl greater than 2.5 ft on 1AD-14 or 1AD-15).
ND injects to all four cold legs on CLR, however, during HLR, ND only injects into B and C hot legs.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because if NI is aligned for hot leg recirc, it will discharge to all 4 hot legs, and when in cold leg recirc ND is aligned to all 4 cold legs.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because aligning NS for Cold Leg Recirc in accordance with ES-1.3 requires containment sump level greater than 3 feet as observed on 1AD-14 or 1AD-15.

Part 2 is plausible because if NI is aligned for hot leg recirc, it will discharge to all 4 hot legs, and when in cold leg recirc ND is aligned to all 4 cold legs.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because aligning NS for Cold Leg Recirc in accordance with ES-1.3 requires containment sump level greater than 3 feet as observed on 1AD-14 or 1AD-15.

Part 2 is correct.

Basis for meeting the KA

K/A is matched because the applicant demonstrates the ability to monitor and interpret indications required to allow aligning the ND pumps and system for cold leg recirc mode of operation. Although not directly an ND pump indication it is an indication required to allow operation of the ND pumps and make system alignments.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to analyze the conditions given in the stem and then determine the correct system configuration allowed by those conditions.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2015 MNS AUDIT Q4 (Bank 4450)

Development References

REFERENCES:
ES-1.3, Rev 27
Lesson Plan OP-MC-PS-ND Rev 51, Figure 7.6

LEARNING OBJECTIVES:
OP-MC-PS-ND Objective 8

Student References Provided

SYS005 A4.01 - Residual Heat Removal System (RHRS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
Controls and indication for RHR pumps ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "C". SLM 02/27/17.

SYS005 K5.01 - Residual Heat Removal System (RHRS)

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

Nil ductility transition temperature (brittle fracture) ....

Given the following on Unit 1:

- Unit is in MODE 5
- NC System temperature is 145°F and stable
- ND Train 1A is aligned for decay heat removal

Subsequently,

- NC System pressure begins to rise

PZR PORVs will lift when NC system pressures rises to a MINIMUM of ___(1)___ (±2) PSIG, and this is to prevent ___(2)___.

Which ONE of the following completes the statement above?

A. 1. 380
   2. over-pressurization of the ND system piping

B. 1. 380
   2. brittle fracture of the reactor vessel

C. 1. 325
   2. over-pressurization of the ND system piping

D. 1. 325
   2. brittle fracture of the reactor vessel

General Discussion

Two of the PORVs have low temperature-overpressure protection (LTOP), NC-34A (TR "A") and NC-32B (TR "B"). When NC temperature gets less than 320°F, a train related bistable, (Loop D WR Th for TR "A" and Loop C WR Tc for TR "B") energizes. The signal generated by this bistable performs two functions. One, it annunciates to alert the Operator to select the low pressure mode of operation on the MCB key lock switch. Two, it satisfies the temperature permissive part of the "Low Pressure" mode OPEN circuitry. With the PORV selector switch in "AUTO" (at either the MCB or ASP), "Low Pressure" mode selected, and temperature less than 320°F, the PORV will open when NC pressure increases above 380 (±2 psig).

Per T.S. 3.4.12 bases, exceeding the RCS P/T limits by a significant amount could cause brittle cracking (brittle fracture) of the reactor vessel.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible since decay heat removal mode uses ND piping, at some point, increasing pressure would over pressurize ND piping (true but incorrect bases).

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the pressure at which the operating procedure directs placing LTOP in service.

Part 2 is plausible since decay heat removal mode uses ND piping, at some point, increasing pressure would over pressurize ND piping (true but incorrect bases).

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the pressure at which the operating procedure directs placing LTOP in service.

Part 2 is correct.

Basis for meeting the KA

When the ND system is aligned for decay heat removal, the NC system is technically part of the Residual Heat Removal system and vice versa. Mis-operation of the RHR system while solid could result in a heatup and rapid overpressure condition which would require operation of the LTOP system to prevent a brittle fracture concern. So, by asking the question related to brittle fracture of the reactor vessel, the K/A as it relates to the Residual Heat Removal system is matched.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	ILT42 ONS NRC Q32 (Bank 5534)

Development References

REFERENCES:
Lesson Plan OP-MC-PS-IPE Rev 05, Section 2.7.1

OBJECTIVES:
OP-MC-PS-IPE Obj. 4

Student References Provided

SYS005 K5.01 - Residual Heat Removal System (RHRS)

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

MNS ILT 18-1 SRO NRC Examination **QUESTION 16** 16 **B**

Nil ductility transition temperature (brittle fracture) ....

Remarks/Status
This question has been selected to send to Chief Examiner for early 401-9 review for KA match. SLM 05/17/17 Rearranged answers form original bank question, correct answer is now "B". SLM 03/13/17. Early 401-9 Review Comments - SAT Conditionally SAT based on changes to Question 44, such that no answer choices overlap question 16 K/A match is fine given loss of RHR cooling is a reason for LTOP to prevent vessel brittle failure FACILITY RESPONSE: NONE

SYS006 K4.30 - Emergency Core Cooling System (ECCS)

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

Containment isolation ....

Given the following on Unit 1:

- A LOCA has occurred inside Containment
- NC pressure is 1700 PSIG and lowering slowly
- Containment pressure is 2.1 PSIG and rising slowly

Based on the conditions above,

1) the ESF actuation(s) that has/have occurred is/are ________.

2) cooling water (RV) ________ being supplied to the Containment ventilation units.

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

A. 1. Phase A ONLY
   2. is

B. 1. Phase A ONLY
   2. is NOT

C. 1. Phase A and Containment Ventilation Isolation
   2. is

D. 1. Phase A and Containment Ventilation Isolation
   2. is NOT

General Discussion

Since Containment pressure has increased greater than 1.0 PSIG, an AUTOMATIC Safety Injection signal has occurred. Any safety injection signal will initiate a containment ventilation isolation (Sh). Phase A isolation (St) also occurs due to SI signal at 1.0 PSIG.

Containment cooling (RV) isolation valves will auto close on a Phase "B" (Sp) signal when containment pressure is greater than 3.0 PSIG.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because it contains correct but incomplete information.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because it contains correct but incomplete information.

Part 2 is plausible since a containment phase "A" isolation has occurred and most containment ventilation penetrations isolate on a Phase "A" signal.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible since a containment phase "A" isolation has occurred and most containment ventilation penetrations isolate on a Phase "A" signal.

Basis for meeting the KA

K/A is matched because the applicant, given a set of conditions, must determine what automatic actions have occurred relative to Containment Isolation. In doing so, the applicant demonstrates knowledge of the design features of the system.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. The applicant must analyze the given conditions and determine what automatic actions have already occurred as a result of the plant conditions.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2010 CNS RO AUDIT Q27 (Bank 4377)

Development References

REFERENCES:
Lesson Plan OP-MC-ECC-ISE, Section 3.1
Lesson Plan OP-MC-CNT-RV, Rev 21, Section 2.1

LEARNING OBJECTIVES:
OP-MC-ECC-ISE, Objectives 5, 13
OP-MC-CNT-RV Objective 8

Student References Provided

SYS006 K4.30 - Emergency Core Cooling System (ECCS)
Knowledge of ECCS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Containment isolation ....

Remarks/Status

SYS007 K1.01 - Pressurizer Relief Tank/Quench Tank System (PRTS)

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

Containment system ....

Given the following on Unit 2:

- A reactor trip has occurred
- The crew has implemented E-0 (REACTOR TRIP OR SAFETY INJECTION)
- Containment pressure is 0.1 PSIG and stable

Subsequently,

- ONE (1) PZR PORV fails partially open
- PRT pressure rises to approximately 100 PSIG, and then suddenly drops and stabilizes at 2 PSIG
- Containment pressure starts to rise at 0.1 PSIG per minute

Based on the conditions above,

1) the PRT rupture discs operated ________.

2) if Containment pressure continues to rise, the LCO for Tech Spec 3.6.4 (CONTAINMENT PRESSURE) will be exceeded when Containment pressure reaches a MAXIMUM of ________ PSIG.

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

A. 1. as designed
2. 0.3

B. 1. as designed
2. 0.5

C. 1. earlier than designed
2. 0.3

D. 1. earlier than designed
2. 0.5

General Discussion

According to Lesson Plan OP-MC-PS-NC, the PRT Rupture Discs will lift at 100 PSIG to protect the PRT.

According to Technical Specification LCO 3.6.4, the Technical Specification Containment Pressure upper limit is 0.3 PSIG.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 0.5 PSIG is the setpoint for the Containment Hi Pressure Alert annunciator alarm.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 plausible if the applicant uses PSIA instead of PSIG for the setpoint. If so, they would conclude that the rupture discs had operated at 85 psi, earlier than designed.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 plausible if the applicant uses PSIA instead of PSIG for the setpoint. If so, they would conclude that the rupture discs had operated at 85 psi, earlier than designed.

Part 2 is plausible because 0.5 PSIG is the setpoint for the Containment Hi Pressure Alert annunciator alarm.

Basis for meeting the KA

K/A is matched because the applicant must have knowledge of the cause-effect relationship between PRT rupture disk operation and containment pressure.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2014 MNS NRC Q70 (BANK 5980)

Development References

REFERENCES:
Lesson Plan OP-MC-PS-NC
TS 3.6.4 (Containment Pressure)

LEARNING OBJECTIVES:
OP-MC-PS-NC Objective 19

Student References Provided

SYS007 K1.01 - Pressurizer Relief Tank/Quench Tank System (PRTS)

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

Containment system ....

Remarks/Status

SYS008 K2.02 - Component Cooling Water System (CCWS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
CCW pump, including emergency backup ....

Given the following on Unit 2:

- The unit is at 100% RTP
- "B" Train components are in service

Subsequently,

- A Blackout occurs on "B" Train

Based on the conditions above, the 2A1 and 2A2 KC pumps ___(1)___ auto start.

If a Safety Injection actuation occurs after the 2B1 and 2B2 KC Pumps have been started by the Blackout sequencer, the 2B1 and 2B2 KC pumps will ___(2)___.

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

A. 1. will
 2. remain running

B. 1. will
 2. be load-shed and then be restarted by the SI sequencer

C. 1. will NOT
 2. remain running

D. 1. will NOT
 2. be load-shed and then be restarted by the SI sequencer

General Discussion

Regarding KC pump starts:
Safety Injection Signal (Ss) - KC pumps auto start (Train related).
Blackout Signal (BO) - KC pumps auto start (Train related).

For a Safety Injection Actuation during a Blackout:
Initial conditions - Blackout has occurred with subsequent load sequencing in progress or the sequence is complete and the diesel generator loaded with blackout loads.

The 4160V bus is cleared of all non-SI loads, SI logic actuated. SI loads previously running continue to operate. KC is an SI and Blackout load.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because some safety equipment will start due to a B/O signal from either unit or either train.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because some safety equipment will start due to a B/O signal from either unit or either train.

Part 2 is plausible because some 4160V loads are SI loads only and not Blackout loads. Therefore, with an SI following a Blackout, the B/O only loads will be load shed and the SI only loads will be reloaded on the bus.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because some 4160V loads are SI loads only and not Blackout loads. Therefore, with an SI following a Blackout, the B/O only loads will be load shed and the SI only loads will be reloaded on the bus.

Basis for meeting the KA

K/A is matched because the applicant must have knowledge of the emergency backup power supply (Emergency D/Gs) to the CCW pumps.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must analyze the given conditions to determine if the the KC pumps would be re-loaded onto the bus if an SI occurred during the blackout sequencing. The applicant must also recall from memory that the auto-start for a B/O signal is train related.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
OP-MC-DG-EQB Rev 23

LEARNING OBJECTIVES:
OP-MC-PSS-KC Objective 4

Student References Provided

SYS008 K2.02 - Component Cooling Water System (CCWS)
Knowledge of bus power supplies to the following: (CFR: 41.7)

CCW pump, including emergency backup ....

Remarks/Status

SYS008 K3.03 - Component Cooling Water System (CCWS)
Knowledge of the effect that a loss or malfunction of the CCWS will have on the following:
RCP ....

Given the following on Unit 1:

- Unit is at 75% RTP
- 1D NCP Thermal Barrier KC Outlet Flow is in alarm on the OAC

When KC Thermal Barrier Outlet flow exceeds a MINIMUM of ___(1)___ gpm, 1KC-413B (1D NCP THERM BAR OTLT) will automatically CLOSE.

With 1KC-413B CLOSED, 1D NCP operational limits ___(2)___ be exceeded.

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

A. 1. 60
 2. will

B. 1. 60
 2. will NOT

C. 1. 75
 2. will

D. 1. 75
 2. will NOT

General Discussion

The normal flow to the KC thermal barrier is 40-45 gpm per NCP. The high flow alarm on the OAC is set at 60 gpm.
The NCP thermal barrier isolation valve(s) automatically close if flow increases to 75±5 gpm.
KC cooling to the thermal barrier Hx would be lost upon closure of the isolation valve. However, a loss of KC flow to the heat exchanger while maintaining seal injection results in a slight increase in pump lower bearing and seal temperatures, but temperatures are expected to remain below pump operational limitations.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 60 gpm is the Hi alarm for flow on the OAC. Also plausible because until a recent mod, 60 gpm would close the thermal barrier outlet isolations.

Part 2 is plausible because all KC cooling to the thermal barrier Hx is lost. Some seal cooling is still being supplied from NV seal injection.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 60 gpm is the Hi alarm for flow on the OAC. Also plausible because until a recent mod, 60 gpm would close the thermal barrier outlet isolations.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because all KC cooling to the thermal barrier Hx is lost. Some seal cooling is still being supplied from NV seal injection.

Answer D Discussion

CORRECT: See explanation above:

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate how the closure of the thermal barrier Hx isolation would effect seal cooling to the affected reactor coolant pump.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is required. The applicant must recall from memory the setpoint at which the thermal barrier Hx isolation valve auto closes and then determine the effect this would have on the seal package of the reactor coolant pump.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2008 CNS NRC Q34 (Bank 4763)

Development References

REFERENCES:
Lesson Plan OP-MC-PSS-KC Rev 31 Section 3.2.5
Lesson Plan OP-MC-PS-NCP Rev 31 Section 2.2

LEARNING OBJECTIVES:
OP-MC-PSS-KC Objective 9
OP-MC-PS-NCP Objective 4

Student References Provided

SYS008 K3.03 - Component Cooling Water System (CCWS)
Knowledge of the effect that a loss or malfunction of the CCWS will have on the following:
RCP ....

Remarks/Status

SYS010 A4.01 - Pressurizer Pressure Control System (PZR PCS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
PZR spray valve ....

Given the following on Unit 1:

- Unit is at 80% RTP
- Pzr Pressure Master Controller is in AUTO
- Pzr Pressure Master has an error signal of +17 PSIG
- 1NC-27 (PZR SPRAY CONTROL) RED and GREEN position indicator lights are BOTH LIT on the PZR and PRT DCS graphic

The position of 1NC-27 ___(1)___ expected for the conditions above.

If 1NC-27 requires manual operation, it can be positioned using the ___(2)___.

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

A. 1. is
2. Ovation Soft Controls <u>OR</u> the MCB SLIM

B. 1. is
2. Ovation Soft Controls ONLY

C. 1. is NOT
2. Ovation Soft Controls <u>OR</u> the MCB SLIM

D. 1. is NOT
2. Ovation Soft Controls ONLY

General Discussion

Pzr spray valves begin to open at +25 psig error and will be full open at +75 psig error. The setpoint for de-energizing "C" heaters is +15PSIG. In the case given, the Pzr spray valve should be closed but the Pzr and PRT DCS graphic indicates 1NC-27 is throttled open. 1NC-27 position is NOT expected for the conditions in the stem.
Pzr spray valve can be operated by using the "pop-up" soft control on the ovation graphic for Pzr and PRT and by the MCB SLIM.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude the Spray Valve setpoint to begin opening is +15 psig. The Spray Valve begins opening at +25 psig. +15 psig is the error signal used by the Pzr Pressure Master to de-energize "C" Pzr htrs.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude the Spray Valve setpoint to begin opening is +15 psig. The Spray Valve begins opening at +25 psig. +15 psig is the error signal used by the Pzr Pressure Master to de-energize "C" Pzr htrs.

Part 2 is plausible because the PZR Pressure Master Controller is ONLY available as a "soft controller" on the Ovation Graphics.

Answer C Discussion

CORRECT: See explanation above

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the PZR Pressure Master Controller is ONLY available as a "soft controller" on the Ovation Graphics.

Basis for meeting the KA

K/A is matched because the applicant is required to determine if spray valve position is correct by monitoring current plant conditions and the ability to manually operate the spray valve if required..

Basis for Hi Cog

This is a higher cognitive question because the applicant must analyze the indications given in the stem and then determine if those indications are correct for current plant conditions.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
OP-MC-PS-IPE, Rev. 6, Section 2.6

LEARNING OBJECTIVES:
OP-MC-PS-IPE, Objective 5

Student References Provided

SYS010 A4.01 - Pressurizer Pressure Control System (PZR PCS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
PZR spray valve ....

Remarks/Status

SYS012 K4 05 - Reactor Protection System (RPS)
Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Spurious trip protection ....

Given the following on Unit 2:

- Reactor power is stable at 50% RTP
- PR Channel N-42 fails LOW

Based on the conditions above, the trip logic required to generate a POWER RANGE NIS HIGH SETPOINT reactor trip is ___(1)___ remaining channels.

AFTER I&E has tripped the bistables for PR Channel N-42, the trip logic required to generate a POWER RANGE NIS HIGH SETPOINT reactor trip is ___(2)___ remaining channels.

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

A. 1. 2/3
2. 2/3

B. 1. 2/3
2. 1/3

C. 1. 1/3
2. 2/3

D. 1. 1/3
2. 1/3

General Discussion

Since N-42 has failed low, the Hi Neutron Flux Trip Logic will never receive a trip signal from that channel. Since two high flux signals are required to initiate a trip signal and there are only three channels remaining which could potential generate a high flux trip signal, the logic for a Power Range Hi Flux trip is 2/3 channels.

When the I&E actions for removing N-42 have been completed the High Flux Trip Bistable is placed in the tripped position. Since only one more (of the remaining 3) High Flux Trip Bistable signals is required to intiate a Hi Flux Trip, the logic now becomes 1/3 channels.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible if the candidate does not understand that the failed channel Hi Flux Trip Bistable is placed in the tripped position when I&E actions are complete for removing the channel from service.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible if the candidate confuses the channel failing low with the channel failing high AND believes that the I&E actions for removing N-42 from service will de-energize the Hi Flux Trip Bistable for that channel.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible if the applicant confuses the channel failing low with the channel failing high in which case this answer would be correct.

Basis for meeting the KA

The KA is matched because the question requires the applicant to know how the loss of a channel will effect the RPS trip logic before and after a channel is removed from service. One of the reasons for having a trip logic is to prevent spurious trips.

Basis for Hi Cog

This is a comprehension level question because the applicant must recall the normal trip logic from memory, must understand that with the channel failed low the trip logic is unaffected, must understand that when the channel is removed from service the high flux trip bistable is placed in the trip condition, and must associate all of those pieces of information to determine the correct answer.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2009 MNS RO NRC Retake Examination NRC Q10 (Bank 2210)

Development References

REFERENCES:
Lesson Plan OP-MC-IC-IPE (Reactor Protection System) Rev. 34

LEARNING OBJECTIVES:
OP-MC-IC-IPE Objective 10

Student References Provided

SYS012 K4 05 - Reactor Protection System (RPS)
Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Spurious trip protection ....

Remarks/Status

Rearranged answers from previous bank version of the question so as to not appear the same.

SYS064 2.2.12 - Emergency Diesel Generator (ED/G) System
SYS064 GENERIC
Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)

Given the following on Unit 1:

- Preparations are in progress to perform PT/1/A/4350/002 A (D/G 1A OPERABLITY TEST), Enclosure 13.1 (1A D/G SLOW START)
- The 1A D/G MODE SELECT switch has been placed in LOCAL
- In accordance with the procedure, the Woodward Governor LOAD LIMIT control knob has been rotated to the **SLOW START** position

Based on the conditions above,

1) declaring the 1A D/G INOPERABLE _______ required.

2) if a Blackout occurs on 1ETA, the 1A D/G _______ automatically start.

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

A. 1. is
 2. will

B. 1. is
 2. will NOT

C. 1. is NOT
 2. will

D. 1. is NOT
 2. will NOT

General Discussion

In accordance with PT/1/A/4350/002 A (D/G 1A Operability Test), the CRS will declare the D/G inoperable prior to rotating the load limit control knob on the governor actuator to the slow start position.

If an automatic start signal occurs while the 1A D/G MODE SELECT switch is in the LOCAL position, the 1A D/G will still start.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant concludes that the MODE SELECT switch being in LOCAL will prevent the D/G from auto starting.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses a FAST START with a SLOW START. The D/G is NOT required to be declared INOPERABLE during a FAST START.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses a FAST START with a SLOW START. The D/G is NOT required to be declared INOPERABLE during a FAST START.

Part 2 is plausible if the applicant concludes that the MODE SELECT switch being in LOCAL will prevent the D/G from auto starting.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate knowledge of specific requirements contained in the D/G Operability PT (Surveillance Test).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

REFERENCES:
PT/1/A/4350/002 A (DG 1A Operability Test) Rev. 103

LEARNING OBJECTIVES:
NONE

Student References Provided

SYS064 2.2.12 - Emergency Diesel Generator (ED/G) System
SYS064 GENERIC
Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)

Remarks/Status

SYS064 K1.02 - Emergency Diesel Generator (ED/G) System

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

D/G cooling water system ....

Which ONE (1) of the following will cause a Standby Diesel Generator (DG) trip?

A. Turbocharger Overspeed during a Manual Start

B. Low KD Surge Tank Level during a Manual Start

C. Low Crankcase Vacuum during an Automatic Start

D. High Lube Oil Temperature during an Automatic Start

General Discussion

The following is a list of the signals which will trip the diesel after a start in the Manual Mode of Operation:
1.Remote Stop Pushbutton depressed when selected to the Control Room Mode of Operation.
2.Local Stop Pushbutton depressed whether selected to Control Room, Local, or Control Room Emergency Mode of Operation.
3.Lube Oil Temperature High (>190 °F).
4.Jacket Water Temperature High (>200 °F).
5.Jacket Water Level Low (<11.5"). NOTE: This is KD Surge Tank Level.
6.Engine Overspeed (>112% on 2/3 speed switches).
7.Turning Gear Engaged (1/2 Limit switches made).
8.Emergency Stop (Emergency Stop Pushbutton Depressed).
9.Low Lube Oil Pressure (<28 psig on 2/2 switches). This trip is reset only if oil pressure exceeds 33 psig on an initial diesel start.
10.86D Lockout Relay Tripped (87G Differential or 51V Voltage Controlled Overcurrent relay actuated).
11.Fire Shutdown (Halon Actuation or Fire Relay Actuated).
12.Low Crankcase Vacuum (< .5" H2O Vacuum).
13.Jacket Water Pressure Low (< 15 psig).

The following is a list of the signals which will trip the Diesel Generator after an Automatic Start:
1.Low Lube Oil Pressure (<28 psig on 2/2 switches). This trip resets when lube oil pressure exceeds 33 psig on an initial diesel start.
2.Overspeed (>112% on 2/3 speed switches).
3.Emergency Stop.
4.86D Lockout Relay actuated (87G or 51V).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This is plausible because "Turbocharger Overspeed" is one of the annunciator alarms on the DG Alarm panel.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This is plausible because Low Crankcase Vacuum is a Manual Mode trip.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This is plausible because High Lube Oil Temperature is a Manual Mode trip.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate knowledge of the cause-effect relationship between the D/G cooling Water system (KD) and the Standby DG system.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	MNS Ops Vision Exam Bank Q24639

Development References

REFERENCES:
Lesson Plan OP-MC-DG-DGA Rev 39, Section 2.4

LEARNING OBJECTIVES:

Student References Provided

OP-MC-DG-DGA Objective 26

SYS064 K1.02 - Emergency Diesel Generator (ED/G) System

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

D/G cooling water system ....

Remarks/Status

SYS073 A2.02 - Process Radiation Monitoring (PRM) System

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

Detector failure ....

Given the following initial conditions on Unit 1:

- Unit is at 100% RTP
- A leak on the RC piping in the turbine building basement has occurred
- All TB Sump pumps are in Manual and ON, maintaining sump level stable

Subsequently:

- A detector failure occurs due to a failed power supply on 1EMF-31 (TURBINE BUILDING SUMP MONITOR)

Based on the conditions above,

1) the Unit 1TB Sump pumps ________ trip automatically.

2) to continue with the leak mitigation, OP/1/B/6400/001D (TURBINE BUILDING SUMP OPERATION) will allow the crew to ________.

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

A. 1. will NOT
   2. open 1WP-6 (U1 TB SUMP PUMPS DISCH TO WC ISOL)

B. 1. will NOT
   2. open 1WP-35 (WMT & VUCDT TO RC CONTROL)

C. 1. will
   2. place the HI RAD INH/BYP switch in BYP and restart the TB sump pumps

D. 1. will
   2. depress the clear button on EMF-31 and restart the TB sump pumps

---

General Discussion

1(2) EMF-31 (Turbine Building Sump Monitor) has a "High Rad Inhibit/Bypass" key operated switch located on the TB Sump Control Panel. During normal operation, the switch is In the "INH" position. If during a WP pumping operation an EMF-31 Trip II alarm is actuated, the WP pumps will trip off and the High Radiation light on the TB Sump pump Control Panel will light. This interlock will secure both WP pumps regardless of their control switch position. Placing the key switch to "Bypass" allows the TB sump pumps to run with an EMF-31 trip II signal present.

To continue with leak mitigation, the crew will need to make an "Urgent Release to the RC Discharge". As the cause of the WZ Pump failure to run is due to a failed EMF detector, RP will authorize a release of the Turbine Building Sump to the RC Discharge prior to sampling and LWR Document prepartion. The procedure will then direct the crew to place the Hi Rad INH/BYP switch in BYP to start the TB sump pumps.

The RP-86A (Control Room EMF) modules are fail-safe and actuate Trip 1 and Trip 2 during a loss of power. The High Rad alarm will sound and lock in until reset (once power comes back). When power is restored, it takes operator action to depress clear "CLR" to reset the loss of power failure screen, and then depress "CLR" again to reset the trips.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if applicant concludes that the TB sump pumps will not trip due to the control switch being in the manual and ON position.

Second part is plausible if applicant concludes that the compensatory action that occurred due to the failed power supply on EMF-31closed the pump discharge to WC as the case on various other monitored streams.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is plausible if applicant concludes that the TB sump pumps will not trip due to the control switch being in the manual and ON position.

Second part is plausible if applicant concludes that the compensatory action that occurred due to the failed power supply on EMF-31closed 1WP-35 which does close as a compensatory action for EMF-44 and 49. Also plausible since TB sump discharge is aligned to discharge through this path if any activity is detected in the sump.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
First part is correct and therefore plausible.

Second part is plausible if the applicant concludes that the EMF-31 trip 2 signal must be cleared before a reset can occur, allowing a restart of TB sump pumps.

Basis for meeting the KA

The K/A is matched because the applicant is required to predict the impacts of a failed detector (loss of power supply) and then use procedural knowledge to determine the correct actions to control the consequences of the failure.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to analyze the failure method of the detector and then determine which compensatory actions (if any) have occurred and what procedural actions are required to regain control of the system to continue leak mitigation.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2015 MNS NRC Exam Q24 (Bank 5933)

MNS ILT 18-1 SRO NRC Examination QUESTION **25** 25 **C**

Development References
REFERENCES: Lesson Plan OP-MC-SS-WPU Section 2.1.1 (Motor Driven Sump Pumps) & Section 2.1.4 (EMF-31 Controls) LEARNING OBJECTIVES: OP-MC-SS-WPU Objectives 3 & 5

Student References Provided

SYS073 A2.02 - Process Radiation Monitoring (PRM) System

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

Detector failure ....

Remarks/Status
Rearranged answers from bank version of the question so as not to appear as the same question. HCF 08/10/2017

SYS076 K2.01 - Service Water System (SWS)

Knowledge of bus power supplies to the following: (CFR: 41.7)

Service water ....

Given the following on Unit 1:

- I&E has requested that the 1B Nuclear Service Water Pump breaker be racked out for lubrication

To which ONE (1) of the following locations should an Operator be dispatched to rack out the breaker?

A. 1TA

B. 1TD

C. 1ETA

D. 1ETB

General Discussion

The 1B Nuclear Service Water Pump is powered from emergency bus 1ETB.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because 1TA normally supplies buss 1ETA which supplies the 1A RN pump.

Answer B Discussion

NCORRECT: See explanation above.

PLAUSIBLE:
Plausible because 1TD normally supplies buss 1ETB which supplies the 1B RN pump.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because it is the correct unit and 1ETA is the supply to the 1A RN pump.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant must know the power supply for the Nuclear Service Water pumps.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2015 MNS NRC Q25 (Bank 5934) (ILT-31)

Development References

REFERENCES:
Lesson Plan OP-MC-PSS-RN Section 2.2 (RN Pumps, Strainers, Mini-Flow)

LEARNING OBJECTIVES:
OP-MC-PSS-RN Objective 3

Student References Provided

SYS076 K2.01 - Service Water System (SWS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
Service water ....

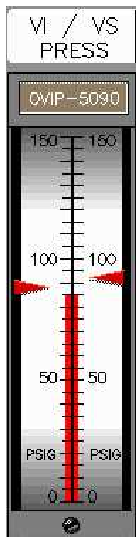
Remarks/Status

SYS078 A4.01 - Instrument Air System (IAS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
Pressure gauges ....

Given the following plant conditions:

- Both units are operating at 100% RTP
- An instrument air system leak develops in the Unit 1 Turbine Building
- The Diesel VI Compressors (G & H) “AUTO/OFF-RESET” selector switches are in “AUTO”

The following indications are observed in the Control Room:



Based on the indications above,

1) the Diesel VI Compressors (G & H) ___(1)___ received a start signal.
2) VI-1812 (VI Air Dryer Bypass Filter Isol) is ___(2)___.

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

A. 1. have
   2. CLOSED

B. 1. have NOT
   2. CLOSED

C. 1. have
   2. OPEN

D. 1. have NOT
   2. OPEN

General Discussion

The Diesel VI Compressors (G & H) are normally aligned for automatic start and will start if VI header pressure decreases to 90 PSIG.

If VI Header pressure decreases to 85 PSIG, 1VI-1812 (VI Dryer Bypass Filter Isol) will open to bypass the dryers.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible because on decreasing VI system pressure several automatic actions occur at 90 psig and at other lower pressures (85 psig, 82 psig).

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is correct.

Part 2 is plausible because on decreasing VI system pressure several automatic actions occur at 90 psig and at other lower pressures (85 psig, 82 psig).

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 and 2 are plausible because on decreasing VI system pressure several automatic actions occur at 90 psig and at other lower pressures (85 psig, 82 psig).

Basis for meeting the KA

K/A is matched because the applicant must be able to determine the status of the VI system by monitoring the Control Room VI Header pressure indication provided.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must read the meter indication provided to determine the current VI header pressure. Second, the applicant must recall from memory all of the automatic actions and setpoints associated with the VI system. Finally, the applicant must associate the two pieces of information (given and recalled) to identify the correct response.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2012 MNS NRC Q27 (Bank 4622)

Development References

REFERENCES:
Lesson Plan OP-MC-SS-VI Rev 38, Sections, 1.2.10, 12,13, and 1.3.1.1

LEARNING OBJECTIVES:
OP-MC-SS-VI Objectives 7 & 15

Student References Provided

SYS078 A4.01 - Instrument Air System (IAS)

Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)

Pressure gauges ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "A". SLM 03/01/17.

SYS103 A3.01 - Containment System

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

Containment isolation ....

Regarding Containment isolation signals,

1) the S/G CF Containment Isolation valves (CF-35, 30, 28, & 26) will close if Containment pressure increases to a MINIMUM of ________ PSIG.

2) a Containment Phase A isolation will occur if NC system pressure decreases to less than a MAXIMUM of ________ PSIG.

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

A. 1. 3.0
   2. 1845

B. 1. 3.0
   2. 1945

C. 1. 1.0
   2. 1845

D. 1. 1.0
   2. 1945

General Discussion

Phase A containment isolation (St) is generated by:

- any Safety Injection signal (SI signal on Low Pzr Pressure less than 1845 PSIG)
- Manual pushbutton

A Feedwater Isolation (FWI) will occur on ANY Ss (Safety Injection) signal (including a Hi Containment Pressure SI at 1.0 PSIG). The S/G CF Containment Isolation valves go closed on a Feedwater Isolation signal.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the Phase B Containment isolation setpoint.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the Phase B Containment isolation setpoint.

Part 2 is plausible because this is the Reactor Trip setpoint on low pressurizer pressure.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because this is the Reactor Trip setpoint on low pressurizer pressure.

Basis for meeting the KA

K/A is matched because the applicant demonstrates the ability to monitor automatic operation of the containment system relative to containment isolations by demonstrating the ability to evaluate a given set of conditions and determine what automatic containment isolation should have occurred.

Basis for Hi Cog

First, the applicant must evaluate what happens if Containment pressure increases to 1.0 PSIG and 3.0 PSIG. They will determine that at 1.0 PSIG a Safety Injection signal is generated which in turn generates a FWI signal.

Second, the applicant must determine what happens if NC system pressure decreases to less than 1945 PSIG or 1845 PSIG. At 1845 PSIG a Safety Injection signal is generated and a Phase A signal is generated.

Since this question involves more than one mental step, it is higher cognitive level.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2015 MNS NRC Q28 (BANK 5937)

Development References

REFERENCES:
OP-MC-ECC-ISE Section 2.0 (Detailed Description)

LEARNING OBJECTIVES:
OP-MC-ECC-ISE Objective 5

Student References Provided

MNS ILT 18-1 SRO NRC Examination **QUESTION 28** 28 **C**

SYS103 A3.01 - Containment System

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

Containment isolation ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "C". SLM 04/24/17.

SYS002 K5.11 - Reactor Coolant System (RCS)

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

Relationship between effects of the primary coolant system and the secondary coolant system ....

Unit 2 is performing a MOL plant startup with the following conditions:

- Reactor Power is at 55% and stable
- A S/G Safety valve drifts OPEN approximately 20% from its closed position

Assuming no action by the crew, which ONE (1) of the following describes the initial effect of the valve failure?

	Pressurizer Level	T-ave	Reactor Power
A.	Increase	Increase	Decrease
B.	Increase	Decrease	Increase
C.	Decrease	Decrease	Increase
D.	Decrease	Increase	Decrease

General Discussion

As a S/G Safety valve opens, total steam flow increases causing main steam pressure to decrease (assuming no action to raise NC temperature, such as Control Rod Withdrawal). If steam pressure decreases, because the secondary side of the SG is a saturated system, Tstm will also decrease. According to THF-CY , this will cause the NC System water leaving the primary side of the SG (Tcold) to decrease. According to PS-NC the Tc and Th instruments are used by the 7300 PCS system to develop loop Tave (Th + Tc)/2, and Tave will decrease. The average NCS coolant temperature decrease will result in an outsurge from the pressurizer. According to RT-RCO, the Moderator Temperature Coefficient (MTC) becomes more negative over core life. Typical values for MTC are -5 pcm/°F (BOL) and -35 pcm/°F (EOL). With Tc colder, MTC will add positive reactivity to the core, and increase reactor power.

Answer A Discussion

INCORRECT:

PLAUSIBLE:
Plausible if the applicant incorrectly believes that opening a S/G Safety Valve causes Steam Pressure to increase. If so, Tstm would increase, causing Tc to increase, causing an insurge to the Pzr and causing MTC to add negative reactivity decreasing power.

Answer B Discussion

INCORRECT:

PLAUSIBLE:
Plausible if the applicant understands the Cause and Effect relationships between the Secondary and Primary Systems (i.e. Tstm decreasing causes Tc to decrease causing MTC to add positive reactivity, causing power to increase) but does NOT understand how TC decreasing affects the volume in the Pressurizer.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT:

PLAUSIBLE:
Plausible if the applicant does NOT understand the Cause and Effect relationships between the Secondary and Primary Systems (i.e. Tstm increasing causes Tc to increase causing MTC to add negative reactivity, causing power to decrease).

Basis for meeting the KA

K/A is matched because the applicant must demonstrate knowledge of the operational impact on various reactor coolant system parameters due to a change in secondary side steam flow.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. It requires the applicant to analyze the conditions given and based on that analysis determine the effect on three separate plant parameters.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2014 MNS NRC Q34 (BANK 5862)

Development References

REFERENCES:
Lesson Plan OP-MC-TA-AT (Abnormal Transients) Section 2.5

LEARNING OBJECTIVES:
OP-MC-TA-AT Objectives 4, 5. and 6

Student References Provided

SYS002 K5.11 - Reactor Coolant System (RCS)
Knowledge of the operational implications of the following concepts as they apply to the RCS: (CFR: 41.5 / 45.7)
Relationship between effects of the primary coolant system and the secondary coolant system ....

Remarks/Status

Rearranged answers form original bank question, correct answer is now "C". SLM 04/17/17.

SYS014 A1.04 - Rod Position Indication System (RPIS)

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

Axial and radial power distribution ....

Given the following initial conditions on Unit 1:

- Unit is at 100% RTP
- Control Bank "D" rods are reading 222 steps on DRPI
- Axial Flux Difference (AFD) on all four NI channels is -3%

Subsequently,

- Control Bank "D" rod M-6 indicates 192 steps on DRPI
- Annunciator 1AD-2 D/10 (RPI URGENT FAILURE) alarms

To determine that rod M-6 is actually misaligned, the operator would expect to see AFD in that quadrant to become ___(1)___ negative.

In accordance with the Annunciator Response for 1AD-2 D/10, a rod with greater than ___(2)___ steps deviation within a bank is a probable cause for this alarm.

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

A. 1. less
2. 12

B. 1. less
2. 24

C. 1. more
2. 12

D. 1. more
2. 24

General Discussion

Axial Flux Difference (AFD) for the quadrant with a misaligned rod (lower than the rest of its bank) would become more negative. This can be seen with the equation AFD = Normalized flux at top of the core - Normalized flux at bottom of the core. The misaligned rod will push more of the flux to the bottom half of the core, making AFD in that quadrant more negative.
Per OP-MC-IC-EDA, a rod deviation of 12 steps from the associated group will result in the background color for the Control Bank will turn ORANGE.
Rod deviation of 24 steps is the value used in the safety analysis and is also the value of deviation that AP-14 (Misaligned Rod) uses as a limit for reactor trip criteria.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that AFD is the difference between normalized flux in the bottom of the core minus normalized flux in the top of the core. If this were true then AFD would become less negative for a misaligned rod.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes that AFD is the difference between normalized flux in the bottom of the core minus normalized flux in the top of the core. If this were true then AFD would become less negative for a misaligned rod.

Part 2 is plausible because 24 steps is the amount of rod deviation used in the safety analysis and is also used in AP-14 for the amount of deviation that requires a reactor trip.

Answer C Discussion

CORRECT: See discussion above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 24 steps is the amount of rod deviation used in the safety analysis and is also used in AP-14 for the amount of deviation that requires a reactor trip.

Basis for meeting the KA

K/A is matched because applicants are tested on their ability to monitor changes in parameters for axial flux deviation and indications on the Rod Position Indication System for a misaligned rod.

Basis for Hi Cog

This question is of a higher cognitive order due to requiring the applicant to perform more than one mental step in order to answer the question correctly. The applicants must recall from memory the equation for Axial Flux Difference (AFD), and then apply that knowledge to the conditions given in the stem, to determine that AFD will become more negative.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2016 CNS NRC (BANK 6360)

Development References

REFERENCES:
1AD-2 D/10 ARP Rev 68
OP-MC-IC-EDA (Digital Rod Position Indication System) Rev 15
OP-MC-CTH-CP (Core Performance) Rev 13
AP/1/A/5500/014 (Rod Control Malfunction) step 1 Rev 16

Student References Provided

MNS ILT 18-1 SRO NRC Examination **QUESTION 30** 30 **C**

SYS014 A1.04 - Rod Position Indication System (RPIS)

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

Axial and radial power distribution ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "C". SLM 04/06/17.

SYS017 K6.01 - In-Core Temperature Monitor (ITM) System
Knowledge of the effect of a loss or malfunction of the following ITM system components: (CFR: 41.7 / 45.7)
Sensors and detectors ....

Given the following on Unit 1:

- Unit is at 100% RTP
- I&E reports that ONLY three (3) Core Exit Thermocouples (CETs) total are OPERABLE in Quadrant 2

Based on the conditions above, the CET OPERABILITY requirements of Tech Spec 3.3.3 (PAM INSTRUMENTATION), ___(1)___ met.

There are a total of ___(2)___ thermocouples used exclusively by the Core Exit Thermocouple Monitor (CETM).

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

REFERENCE PROVIDED

A. 1. are NOT
2. 40

B. 1. are NOT
2. 65

C. 1. are
2. 40

D. 1. are
2. 65

General Discussion

Tech Spec 3.3.3, PAM Instrumentation (Table 3.3.3-1) requires two channels per core quadrant be operable in MODES 1, 2, and 3 with two operable detectors per channel. Therefore, with only three operable detectors in Quadrant 2, the minimum number of operable channels in that quadrant cannot be met. It would require a MINIMUM of four operable detectors.

There are 40 chromel alumel thermocouples (5 per quadrant per train) used exclusively for the ICCM. The wiring for these thermocouples run directly to the ICCM cabinets in the cable spreading room. The remaining 25 non-safety related T/Cs, of the total of 65 in the core, are routed to the incore instrument panel and OAC via reference junction boxes in containment.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because there are a total of 65 thermocouples in the core but only 40 are used exclusively for CETM..

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses the minimum number of operable channels (2) with the number of operable detectors. If that were the case, they could conclude that the operability requirements of TS 3.3.3 are met.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses the minimum number of operable channels (2) with the number of operable detectors. If that were the case, they could conclude that the operability requirements of TS 3.3.3 are met.

Part 2 is plausible because there are a total of 65 thermocouples in the core but only 40 are used exclusively for CETM.

Basis for meeting the KA

K/A is matched because the applicant must apply technical specifications (due to the loss of CETs) to determine the operability of the system. In doing so, the applicant must demonstrate that they know the difference between an operable detector and an operable channel.

Basis for Hi Cog

This is a higher cognitive level question because it requires the applicant to apply the information given in the stem to a table in Tech Specs to determine the number of operable/inoperable thermocouples.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2009 MNS NRC RO Retake Q31 (Bank 2231)

Development References

REFERENCES:
Lesson Plan OP-MC-IC-ICM Rev 17, Section 2.2
Tech Spec 3.3.3, PAM Instrumentation

LEARNING OBJECTIVES:
OP-MC-IC-ICM Objective 19

Student References Provided

Tech Spec 3.3.3 (PAM Intrumentation)

SYS017 K6.01 - In-Core Temperature Monitor (ITM) System

Knowledge of the effect of a loss or malfunction of the following ITM system components: (CFR: 41.7 / 45.7)

Sensors and detectors ....

Remarks/Status

SYS027 K2.01 - Containment Iodine Removal System (CIRS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
Fans ....

Which ONE (1) of the following is the power supply for the 1B VE Fan?

A. 1MXJ

B. 1MXK

C. 1EMXC

D. 1EMXD

General Discussion

Annulus Ventilation Fans:
Each train has its own 100% capacity fan. Each fan is driven by a 30 hp, 575 VAC, 3 phase, 60 Hz motor, powered from EMXC or EMXD. Design flowrate is 8000 cfm ±10% at 190°F. A Status Light on the HVAC Board will light, if flowrate decreases to less than 80% flow. Selector switches are provided for each fan in the Control Room with each switch having an auto, manual and a reset position. Each train has 2 flow indications on the HVAC board. One is "Inlet and Recirc Flow" that reads in CFM. The other flow indicator is "Flow to Unit Vent" and reads in inches of water. Power supplies to the Annulus Ventilation Fans are:

1(2)A VE Fan: 1(2)EMXC
1(2)B VE Fan: 1(2)EMXD

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because 1MXJ is a protected 600V motor control center that supplies several auxiliary building ventilation fans.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because 1MXK is a protected 600V motor control center that supplies several auxiliary building ventilation fans.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because 1 EMXC is an essential 600V motor control center that supplies the 1A VE fan.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

MNS does not have a Containment Iodine Removal system per se. However, the Annulus Ventilation system does have an Iodine removal function. Since the applicant must have knowledge of the power supplies to the Annulus Ventilation fans which are part of a system which has an Iodine removal function, the K/A is matched.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2013 MNS Audit Exam Q32 (Bank 5726)

Development References

REFERENCES:
Lesson Plan OP-MC-CNT-VE Rev 28, Section 2.1

LEARNING OBJECTIVES:
OP-MC-CNT-VE Objective 15

Student References Provided

SYS027 K2.01 - Containment Iodine Removal System (CIRS)
Knowledge of bus power supplies to the following: (CFR: 41.7)
Fans ....

Remarks/Status

SYS029 K1.05 - Containment Purge System (CPS)

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

Containment air cleanup and recirculation system ....

Given the following on Unit 1:

- Unit has just entered Mode 5 in preparation for a refueling outage
- A lower containment entry is planned for the next shift
- The CRS directs the RO to purge containment in preparation for a containment entry
- Currently the VP system is secured with all fans off and purge and exhaust valves closed

Based on the conditions above, the NORMAL-REFUEL SELECTOR switch will be placed in the ___(1)___ position AND the ratio of supply air will be ___(2)___ (Upper/Lower Containment).

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

A. 1. "NORM"
2. 4/1

B. 1. "NORM"
2. 2/1

C. 1. "REFUEL"
2. 4/1

D. 1. "REFUEL"
2. 2/1

General Discussion

In accordance with OP/1/A/6450/015 (Containment Purge System) the "NORMAL - REFUEL Selector Switch shall be in the NORM position with the Reactor Missile Shields installed to prevent overpressurizing upper Containment.

Based on the conditions given, the unit has just entered MODE 5. Consequently, the Reactor Missile Shields would not yet have been removed and therefore the switch should be in the NORM position.

In accordance with Lesson Plan OP-MC-CNT-VP (Containment Purge System), with the NORMAL - REFUEL Selector switch in the the NORMAL position dampers RBPS-D-8 and 9 in the supply air lines position to provide a flow split of 2/1 ratio of supply air (Upper vs. Lower Containment). Upper and lower supply flows are indicated on RB-CP-1. In the REFUEL position the flow split is 4/1. To operate the system in the Refuel mode, the missile shield must be removed (procedure requirement).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 4/1 is the supply air ratio in the REFUEL position

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because it is logical to conclude that since the unit is entering a refueling outage, the correct position for the NORMAL - REFUEL Selector switch would be the REFUEL position.

Part 2 is plausible because if the applicant concludes that the NORMAL - REFUEL Selector switch should be in the REFUEL position, 4/1 is the correct supply air ratio with the switch in that position.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because it is logical to conclude that since the unit is entering a refueling outage, the correct position for the NORMAL - REFUEL Selector switch would be the REFUEL position.

Part 2 is correct.

Basis for meeting the KA

K/A is matched because the applicant demonstrates knowledge of the cause-effect relationship between Containment Purge and Containment air cleanup (switch positions and supply air flow ratio for the different switch positions).

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant must analyze the conditions given to determine the exact condition of the plant. From the given conditions, because the unit has "JUST" entered MODE 5, the applicant would deduce that the reactor missile shield had not yet been removed.

The applicant would then have to recall from memory that NORMAL - REFUEL Selector switch cannot be in the REFUEL position with the missile shields installed. Again, because it is not given in the stem that the missile shields are installed, the applicant has to determine that from an analysis of the given conditions.

Finally, the applicant has to recall from memory the air supply ratios to upper and lower Containment in each of the VP system modes.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2003 MNS Audit Exam Q21

Development References
REFERENCES: OP-MC-CNT-VP (Containment Purge System) Rev. 25 LEARNING OBJECTIVES: OP-MC-CNT-VP Objectives 6 & 7

Student References Provided

SYS029 K1.05 - Containment Purge System (CPS)

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

Containment air cleanup and recirculation system ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "B". SLM 08/03/17.

SYS033 2.4.31 - Spent Fuel Pool Cooling System (SFPCS)
SYS033 GENERIC
Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

Given the following on Unit 2:

- The core has been off-loaded to the Spent Fuel Pool
- 2A KF Pump is running
- 2B KF Pump is off

Subsequently,

- A Loss of Off-Site Power occurs
- 2A and 2B D/Gs start and load
- 30 minutes after the power loss, Spent Fuel Pool Hi Temperature OAC alarm is received

Based on the conditions above, 2B KF pump ___(1)___ be manually started without resetting the D/G sequencer.

In accordance with OP/2/A/6200/005 (SPENT FUEL COOLING SYSTEM), KF pump flow shall be less than a MAXIMUM of ___(2)___ GPM.

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

A. 1. can
2. 2900

B. 1. can NOT
2. 2900

C. 1. can
2. 2600

D. 1. can NOT
2. 2600

General Discussion

On a Blackout signal, the KF pumps will receive a start permissive signal when 2ETA and 2ETB are re-energized by their respective D/Gs and Load Group 9 is sequenced onto the busses. However, they will not automatically start and must be manually started by the Operators in the Main Control Room.

In accordance with OP/2/A/6200/005 (Spent Fuel Cooling System) Limits and Precautions, maximum KF Pump flow is 2900 gpm (pump runout). Maximum KC System flow through KF HX is 2600 gpm.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because once the D/G sequencer fires due to a blackout or S/I signal, the sequencers and/or SI have to be reset to regain local control of components started by the sequencer. KF pumps receive a start permisssive rarther than an auto start and therefore may be started without resetting the sequencer.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 2600 gpm is the OP/2A/6200/005 limit and precaution for KC system flow through the KF system heat exchanger.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because once the D/G sequencer fires due to a blackout or S/I signal, the sequencers and/or SI have to be reset to regain local control of components started by the sequencer. KF pumps receive a start permisssive rarther than an auto start and therefore may be started without resetting the sequencer.

Part 2 is plausible because 2600 gpm is the OP/2A/6200/005 limit and precaution for KC system flow through the KF system heat exchanger.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate knowledge of why a spent fuel pool high temp alarm could be generated following a blackout with no operator action and determine the required actions to mitigate the event.

Basis for Hi Cog

This is a higher cognitive level question because the applicant must analyze the conditions in the stem to determine why KF pumps are off, recall from memory that the KF pumps receive a start permissive (allowing manual start on a Blackout signal) and recall maximum KF flow allowed.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2009 MNS NRC EXAM (BANK #3031)

Development References

REFERENCES:
Lesson Plan OP-MC-FH-KF Rev 36
AP-41 (Loss of Spent Fuel Cooling or Level)

LEARNING OBJECTIVES:
OP-MC-FH-KF Objective 12

Student References Provided

SYS033 2.4.31 - Spent Fuel Pool Cooling System (SFPCS)
SYS033 GENERIC

Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

Remarks/Status

This question has been selected to send to Chief Examiner for early 401-9 review for KA match. SLM 05/18/17

Rearranged answers form original bank question, correct answer is now "A". SLM 04/06/17.

There are no annunciator alarms and thus no alarm response procedures for the KF system at MNS. We attempted to write a discriminating question based on KF system indications (OAC alarm). All indications are local in the KF pump room or on the OAC.
SLM 05/17/17

Early 401-9 Review Comments - UNSAT

SYS033 2.4.31

It is not plausible that the KF pumps would auto load on the diesel, the KF pumps have no auto-starts, only start permissive, therefore, 2 implausible distractors C/D

Add a bullet
- AP/2/A/5500/41 [LOSS OF SPENT FUEL COOLING OR LEVEL] has been entered.

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

Reword question

1) Without resetting the D/Gs sequencer the 2B KF pump WILL/ WILL NOT be able to be manually started.

2) If one (1) KC pump is in service, the MAXIMUM KF flow shall be less than 2900/ 4000 GPM in accordance with AP/2/A/5500/41

Q34 will be S with the above enhancements

(the 2900 GPM distractor is from OP/2/A/6400/005)

FACILITY RESPONSE:
Re-worded Q1 based on CE recommendations.
Q2 recommendation could not be used because CE suggestion mixes two different pumps/systems. The KC pumps are limited to 4000gpm in AP-41. There are no flow limits in AP-41 for the KF pumps.
However, did stick with the flow concept and ask the KF flow restrictions in the limits and precautions of the KF OP. SLM 8/17/17

SYS034 K4.03 - Fuel Handling Equipment System (FHES)
Knowledge of design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Overload protection ....

Regarding the Reactor Building Fuel Handling Equipment,

1) the setpoint for the reactor building fuel hoist (manipulator crane) overload cutoff limit is ________ pounds.

2) bridge and trolley motion ________ possible if the hoist is in motion.

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

A. 1. 2900
   2. are

B. 1. 1000
   2. are

C. 1. 2900
   2. are NOT

D. 1. 1000
   2. are NOT

General Discussion

The overload cutoff limit for the reactor building manipulator crane is set at 2900 pounds. Auxiliary hoists have a minimum capacity of 1000 pounds .
All horizontal motions are mutually interlocked with hoist movement. No bridge or trolley motion is possible if the hoist is in motion.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant doesn't recall that the hoist, trolley, and bridge are interlocked such that only one is operable at a time.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1000 pounds is the minimum capacity required by the auxiliary hoists .

Part 2 is plausible if the applicant doesn't recall that the hoist, trolley, and bridge are interlocked such that only one is operable at a time.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1000 pounds is the minimum capacity required by the auxiliary hoists .

Part 2 is correct.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate knowledge of design features and interlocks (overload cutoff limit) which provide for overload protection.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2016 CNS NRC (Bank 6365)

Development References

REFERENCES:
Lesson Plan OP-MC-FH-FC (Fuel Handling System) Rev 23, Section 3.1.2

OBJECTIVES:
OP-MC-FH-FC Objective 5

Student References Provided

SYS034 K4.03 - Fuel Handling Equipment System (FHES)
Knowledge of design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Overload protection ....

Remarks/Status

SYS035 A4.05 - Steam Generator System (S/GS)

Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)

Level Control to enhance natural circulation ....

Given the following on Unit 2:

- Unit is at 8% RTP
- A Loss of off-site power occurs
- AP-09 (NATURAL CIRCULATION) has been implemented

Based on the conditions above, feed flow to ALL S/G's will be established using ___(1)___ feedwater.

In accordance with AP-09, if all S/G NR levels are less than 11%, TOTAL feed flow greater than a MINIMUM of ___(2)___ gpm must be maintained.

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

A. 1. main
   2. 450

B. 1. main
   2. 700

C. 1. auxiliary
   2. 450

D. 1. auxiliary
   2. 700

General Discussion

In accordance with AP-09 (Natural Circulation) if any S/G NR level NOT greater than 11 percent, maintain total feed flow greater than 450 gpm until level greater than 11 percent in one S/G.
Based on the conditions in the stem, a loop will result in the loss of RC pumps and a loss of vacuum. Auxiliary feedwater will be required to feed the S/Gs.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because main feedwater is the preferred source and would be feeding the S/Gs prior to the LOOP.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because main feedwater is the preferred source and would be feeding the S/Gs prior to the LOOP.

Part 2 is plausible because 700 GPM is the amount of feedwater required during an ATWS event to ensure a heat sink is maintained.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 700 GPM is the amount of feedwater required during an ATWS event to ensure a heat sink is maintained.

Basis for meeting the KA

K/A is matched because the applicant demonstrates the ability to operate and monitor the auxiliary feedwater system to maintain S/G NR levels properly for natural circulation.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. The applicant is required to analyze the conditions in the stem and determine the affect those conditions will have on the ability to feed the S/Gs. Applicant must also recall from memory the feed flow required per AP-09 to ensure heat removal via steam release and net inventory gain in the S/Gs.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
AP-09 (Natural Circ) Rev 2

LEARNING OBJECTIVES:
NONE

Student References Provided

SYS035 A4.05 - Steam Generator System (S/GS)
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
Level Control to enhance natural circulation ....

Remarks/Status

SYS068 A3.02 - Liquid Radwaste System (LRS)
Ability to monitor automatic operation of the Liquid Radwaste System including: (CFR: 41.7 / 45.5)
Automatic isolation ....

Given the following on Unit 1:

- Annunciator 1RAD2 C/2 (1EMF 44 CONT VENT DRN TANK HI RAD) is in Trip 2 alarm

To validate the automatic actions for the Hi Rad alarm, the balance of plant operator will ensure ___(1)___ are CLOSED.

Based on the conditions above, 1RAD2 F/2 (1EMF 44 LOSS OF CONT VENT DRN TANK SAMPLE FLOW) ___(2)___ be in alarm.

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

COMPONENT LEGEND:

1WP-35 (WMT/VUCDT TO RC CNTRL)
1WM-46 (0EMF-49 OUTLET ISOL)
1WL-320 (1EMF-44 OUTLET ISOL)

A. 1. 1WP-35 and 1WL-320 ONLY
2. will NOT

B. 1. 1WP-35 and 1WL-320 ONLY
2. will

C. 1. 1WP-35, 1WM-46 and 1WL-320
2. will NOT

D. 1. 1WP-35, 1WM-46 and 1WL-320
2. will

General Discussion

EMF 44 Hi Rad comes in when TRIP 2 is exceeded, probably due to a high activity condition in Containment which has accumulated in the VUCDT. WL-320, WM-46, and WP-35 automatically close. The Operator verifies they close, notifies RP, and checks other parameters for possible leakage inside containment.
EMF 44 Loss of Sample Flow comes in when the Loss of Sample Flow Switch activates, probably because no VUCDT Pump is "on", line blockage/pipe leak, or EMF not properly aligned (isolated, or bypass throttled improperly).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because both valves will receive a closed signal but 1WM-46 also receives a closed signal. Also plausible because other EMFs (0EMF 49) hi rad conditions only close 1WP-35 and the EMF isolation.

Part 2 is plausible because loss of VUCDT pumps and improper bypass valve operation may also cause a loss of sample flow.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because both valves will receive a closed signal but 1WM-46 also receives a closed signal. Also plausible because other EMFs (0EMF 49) hi rad conditions only close 1WP-35 and the EMF isolation.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because loss of VUCDT pumps and improper bypass valve operation are common causes for a loss of sample flow.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant demonstrates the ability to monitor automatic isolation of the Liquid Release (by ensuring the correct valves are closed and identifying other plant indications that would be caused by the given condition).

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. First the applicant must recall from memory the correct compensatory actions for an EMF-44 Hi Rad condition and then use integrated plant knowledge to determine other plant indications affected by the given condition.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
Lesson Plan OP-MC-WE-RLR (Radiological Liquid Releases) Rev 22, Section 3.2

LEARNING OBJECTIVES:
OP-MC-WE-RLR Objective 17

Student References Provided

SYS068 A3.02 - Liquid Radwaste System (LRS)
Ability to monitor automatic operation of the Liquid Radwaste System including: (CFR: 41.7 / 45.5)
Automatic isolation ....

Remarks/Status

SYS079 A2.01 - Station Air System (SAS)

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

Cross-connection with IAS ....

Given the following:

- A Loss of Instrument Air has occurred
- VI pressure is 80 PSIG and slowly decreasing

Based on the conditions above, and per AP/1/A/5500/022 (LOSS OF VI), Operators ___(1)___ required to be dispatched to ensure 1VI-820 (VI SUPPLY TO VS CONTROL) is CLOSED.

The VS air compressor ___(2)___ automatically start to maintain VS header pressure.

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

A. 1. are
   2. will

B. 1. are
   2. will NOT

C. 1. are NOT
   2. will

D. 1. are NOT
   2. will NOT

General Discussion

AP/22 step 5 e states "if at any time VI header pressure goes below 82 psig , then dispatch operator to bypass VI dryers and isolate VI to VS per Encl. 5". Encl. 5 directs the operator to "check" VI-820 closed and/or manually close the valve if necessary.
AP/22 step9 RNO b states "Dispatch operator to ensure 1VS-78 (VS Auto Backup to VI) is open" if it did not open automatically when VI pressure reaches 75 PSIG decreasing on a loss of Instrument Air.
Station air receives its normal supply of air from the Instrument Air System via 1VI-820. There is also one Station Air Compressor available as a backup supply of air. This compressor is usually OFF, but can be started if the need arises.

Answer A Discussion

INCORRECT - See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the VS air compressor has 2 modes of operation, automatic and hand (manual). However, the three position VS compressor mode select switch is normally selected to "OFF".

Answer B Discussion

CORRECT. See explanation above.

Answer C Discussion

INCORRECT - See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1VI-820 should have automatically closed at 80 psig VI header pressure. However, AP/22 dispatches operators out to "check" VI-820 closed and/or manually close the valve if necessary if VI pressure decreases below 82 psig.

Part 2 is plausible because the VS air compressor has 2 modes of operation, automatic and hand (manual). However, the three position VS compressor mode select switch is normally selected to "OFF".

Answer D Discussion

INCORRECT - See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1VI-820 should have automatically closed at 80 psig VI header pressure. However, AP/22 dispatches operators out to "check" VI-820 closed and/or manually close the valve if necessary if VI pressure decreases below 82 psig.

Part 2 is correct.

Basis for meeting the KA

K/A is matched because applicants demonstrate the ability to predict the impact a loss of Instrument Air will have on the Station Air system and use AP/22 to mitigate the consequences (operator dispatched to ensure system lineups between the VI and VS systems).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2016 CNS NRC Exam (Bank 6368)

Development References

REFERENCES:
AP/1/A/5500/022 Rev 37
Lesson plan OP-MC-SS-VI (Instrument Air, Station Air, Breathing Air) Rev 38
Section 2.1.2

OBJECTIVES:
OP-MC-SS-VI Objective 4

Student References Provided

SYS079 A2.01 - Station Air System (SAS)

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

Cross-connection with IAS ....

Remarks/Status

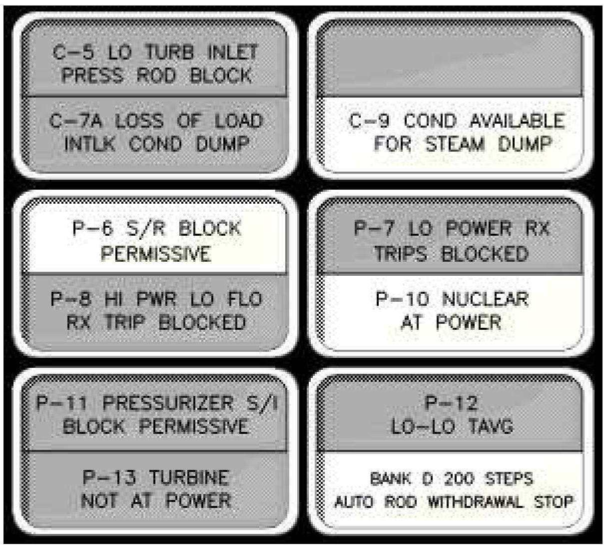
EPE007 2.4.4 - Reactor Trip

EPE007 GENERIC

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

Given the following on Unit 1:

- The crew is performing a power reduction in preparation for a refueling outage
- When the unit reaches 40% power, the following indications are observed on status panel SI-18:



Based on the conditions above,

1) the indication for P-8 "HI PWR LO FLO RX TRIP BLOCK" _______ expected.

2) if one NC pump were to trip, the entry conditions of E-0 (REACTOR TRIP OR SAFETY INJECTION) _______ be met.

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

A. 1. is NOT
   2. will NOT

B. 1. is NOT
   2. will

C. 1. is
   2. will NOT

D. 1. is
   2. will

General Discussion

Once power is lowered below 48% , the P-8 status indication would normally be LIT and the single loop loss of flow Rx trip would be blocked (2/4 PR less than 48%). Since P-8 has obviously failed, the status light remains DARK at 40% power and the single loop loss of flow Rx trip would be unblocked. Therefore, the effect on the Rx protection system would be that with the loss of an NCP the single loop loss of flow Rx trip will occur automatically with Rx power less than 48% because of the failure of the P-8 permissive circuit. Therefore, the entry conditions of E-0 would be met.

Answer A Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because normal operation is for the P-8 permissive to block the automatic reactor trip associated with one loop loss of flow below 48% power. The status light being dark makes an automatic Rx trip plausible because of the logic (lit or dark being blocked or unblocked) and it could be determined that with the status dark that an automatic Rx trip will not occur and therefore the entry conditions of E-0 would not be met.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because of the logic (lit or dark being blocked or unblocked) may lead the applicant to conclude the opposite of what is true.

Part 2 is plausible because normal operation is for the P-8 permissive to block the automatic reactor trip associated with one loop loss of flow below 48% power. The status light being dark makes an automatic Rx trip plausible because of the logic (lit or dark being blocked or unblocked) and it could be determined that with the status dark that an automatic Rx trip will not occur and therefore the entry conditions of E-0 would not be met.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because of the logic (lit or dark being blocked or unblocked) may lead the applicant to conclude the opposite of what is true.

Part 2 is correct.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate the ability to recognize abnormal indications (failure of a permissive P-8 and loss of one NC pump) that are entry conditions for the emergency procedures.

Basis for Hi Cog

This question is higher cognitive because the applicant must determine what affect the failure of the P-8 permissive will have on the operation of the unit below 48% power. Then apply this knowledge to the loss of one NC pump to determine the affect on the plant.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2013 MNS NRC Q9 (Bank 5160)

Development References

REFERENCES:
OP-MC-IC-IPE (Reactor Protection System) Rev 34
E-0 (Reactor Trip or Safety Injection) Rev. 35

LEARNING OBJECTIVES:
OP-MC-IC-IPE Objective 11

Student References Provided

EPE007 2.4.4 - Reactor Trip

EPE007 GENERIC

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

Remarks/Status

APE008 AK3.03 - Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open)

Knowledge of the reasons for the following responses as they apply to the Pressurizer Vapor Space Accident: (CFR 41.5,41.10 / 45.6 / 45.13)

Actions contained in EOP for PZR vapor space accident/ LOCA ....

In accordance with E-0 (REACTOR TRIP OR SAFETY INJECTION) Foldout page criteria:

> ***IF*** *the following conditions are satisfied,* ***THEN*** *trip all NC pumps while maintaining seal injection flow:*
>
> - *At least one NV or NI pump on*
> - *NC subcooling based on core exit T/Cs less than or equal to 0°F*
> - *Reactor power less than 5%*

The basis for performing this action is to ___(1)___ during a ___(2)___.

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

A. 1. minimize mass loss from the NC system
   2. Large-Break LOCA

B. 1. minimize NCS heatup from energy added by the NCPs
   2. Large-Break LOCA

C. 1. minimize mass loss from the NC system
   2. Small-Break LOCA

D. 1. minimize NCS heatup from energy added by the NCPs
   2. Small-Break LOCA

MNS ILT 18-1 SRO NRC Examination **QUESTION 40** 40 **C**

General Discussion

From E-0 Background Document:

IF the following conditions are satisfied, THEN trip all NC pumps while maintaining seal injection flow:
At least one NV or NI pump on
NC subcooling based on core exit T/Cs less than or equal to 0°F.

BASIS: Tripping the NC pumps, when the trip criteria is reached during accident conditions, is done to prevent excessive depletion of NC System water inventory through a small break in the NC System which might lead to severe core uncovery if the NC pumps were tripped for some reason later in the accident.

Answer A Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because conditions would be met to stop the NC pumps during a Large-Break LOCA. However, by design basis the NC pumps must be stopped when conditions are met during a Small-Break LOCA to minimize the potential for core uncovery.

Answer B Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because there are instances in the EOP network where NC pumps are stopped specifically to minimize the heat input into the NC system (i.e. Loss of Secondary Heat Sink scenario).

Part 2 is plausible because conditions would be met to stop the NC pumps during a Large-Break LOCA. However, by design basis the NC pumps must be stopped when conditions are met during a Small-Break LOCA to minimize the potential for core uncovery.

Answer C Discussion

CORRECT. See explanation above.

Answer D Discussion

INCORRECT. See explanation above.

PLAUSIBLE:
Part 1 is plausible because there are instances in the EOP network where NC pumps are stopped specifically to minimize the heat input into the NC system (i.e. Loss of Secondary Heat Sink scenario).

Part 2 is correct..

Basis for meeting the KA

A Pressurizer Vapor Space accident is by definition a Small-Break LOCA. During a Pressurizer Vapor Space accident of sufficient magnitude, a Reactor Trip and Safety Injection would occur, E-0 would be entered, and the Foldout Page criteria would apply. Since the question requires the applicant to have knowledge of the basis for performing steps that apply during a Pressurizer Vapor Space Accident (Small-Break LOCA), the KA is met.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2014 MNS NRC Q40 (Bank 2940)

Development References
REFERENCES: Lesson Plan OP-MC-EP-E0, Rev 22, Section 3.5 LEARNING OBJECTIVE:

Student References Provided

OP-MC-EP-E0 Objective 8

APE008 AK3.03 - Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open)

Knowledge of the reasons for the following responses as they apply to the Pressurizer Vapor Space Accident: (CFR 41.5,41.10 / 45.6 / 45.13)

Actions contained in EOP for PZR vapor space accident/ LOCA ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "C". SLM 03/20/17.

EPE009 EK1.02 - Small Break LOCA

Knowledge of the operational implications of the following concepts as they apply to the small break LOCA: (CFR 41.8 / 41.10 / 45.3)

Use of steam tables ....

Given the following on Unit 2:

- A Small Break LOCA has occurred
- The crew has implemented ES-1.2 (POST LOCA COOLDOWN AND DEPRESSURIZATION)
- At time 1400, the crew initiates a cooldown to cold shutdown in accordance with Step 10 of ES-1.2
- The following parameters are observed at the start of the cooldown:
  - NC Pressure 1600 PSIG and slowly lowering
  - Tcolds 500°F and stable
  - S/G Pressures 665 PSIG and stable

Beginning at time 1400, if the crew establishes and maintains the MAXIMUM cooldown rate allowed by ES-1.2, at time 1500 the crew should expect INDICATED S/G pressures to be approximately ________ PSIG.

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

REFERENCE PROVIDED

A. 232

B. 247

C. 408

D. 423

General Discussion

At time 1400, S/G pressures are at saturation pressure (680 PSIA or 665 PSIG) for existing NC system cold leg temperature.

The allowable cooldown rate IAW ES-1.2 is 100°F / hr. If the crew establishes and maintains a 100°F / hr cooldown rate, at time 1500, NC system T-colds would be 400°F.

The S/G saturation pressure for 400°F is 247 PSIA (or 232 PSIG).

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant uses PSIA straight from the Steam Tables instead of converting to PSIG to get INDICATED S/G pressure.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant incorrectly recalls that the allowable cooldown rate is 50°F / hr instead of 100°F / hr. This is a common cooldown rate used by other Eps. The given temperature would be the correct INDICATED pressure associated with a 50°F / hr cooldown rate.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant incorrectly recalls that the allowable cooldown rate is 50°F / hr instead of 100°F / hr. This is a common cooldown rate used in the Eps. The given temperature would be the correct saturation pressure in PSIA from the steam tables associated with a 50°F / hr cooldown rate.

Basis for meeting the KA

K/A is matched because applicant is required to evaluate, using the steam tables, the SG relationship to the NC System for a SBLOCA and determine the correct procedure flowpath to mitigate the event.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. The applicant is required to analyze the data in the stem and use steam tables to determine saturation temperatures for the pressures given and then understand and apply this data to the NC system - S/G relationship.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
ES-1.2 (Post LOCA Cooldown and Depressurization)

LEARNING OBJECTIVES:

Student References Provided

Steam Tables

EPE009 EK1.02 - Small Break LOCA
Knowledge of the operational implications of the following concepts as they apply to the small break LOCA: (CFR 41.8 / 41.10 / 45.3)
Use of steam tables ....

Remarks/Status

EPE011 EK3.13 - Large Break LOCA

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

Hot-leg injection/recirculation ....

Regarding a Large Break LOCA, transition to ES-1.4 (HOT LEG RECIRCULATION) should be made ___(1)___ hours after the event initiation in order to ___(2)___.

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

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

B. 1. 6
2. ensure core cooling if the Containment Sump screens have failed

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

D. 1. 4
2. ensure core cooling if the Containment Sump screens have failed

---

General Discussion

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

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the TSC would evaluate transferring to Hot Leg Recirc if Cold Leg Recirc was inadequate. Until recently that would have been directed by ECA-1.3 (Containment Sump Blockage). However, that procedure has recently been deleted.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because four hours after event initiation is when E-1 directs to align valve power supplies for HLR.

Part 2 is correct

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because four hours after event initiation is when E-1 directs to align valve power supplies for HLR.

Part 2 is plausible because the TSC would evaluate transferring to Hot Leg Recirc if Cold Leg Recirc was inadequate. Until recently that would have been directed by ECA-1.3 (Containment Sump Blockage). However, that procedure has recently been deleted.

Basis for meeting the KA

K/A is matched because the operator must demonstrate knowledge of the reasons for Hot Leg recirculation (Terminate boil off and Boron concentration/plate out in the core), as it applies to the Large Break LOCA.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2009 MNS AUDIT Q46 (Bank 3164)

Development References

REFERENCES:
Lesson Plan OP-MC-EP-E1 (Loss of Reactor or Secondary Coolant) Rev 29

LEARNING OBJECTIVES:
OP-MC-EP-E1 Objective 4

Student References Provided

EPE011 EK3.13 - Large Break LOCA
Knowledge of the reasons for the following responses as the apply to the Large Break LOCA: (CFR 41.5 / 41.10 / 45.6 / 45.13)
Hot-leg injection/recirculation ....

Remarks/Status

Rearranged answers form original bank question, correct answer is now "A". SLM 03/20/17.

APE022 2.2.44 - Loss of Reactor Coolant Makeup

APE022 GENERIC

Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions. (CFR: 41.5 / 43.5 / 45.12)

Given the following on Unit 2:

- Unit is at 98% RTP
- A 50% load rejection has occurred
- Pressurizer level is greater than setpoint
- 2NV-238 (CHARGING LINE FLOW CONTROL) is in AUTOMATIC and CLOSING (ASSUME NO OPERATOR ACTION)

Based on the conditions above, NC pump seal injection flow will ___(1)___.

If a valid Annunciator 2AD-7 / J1 (NC PUMP SEAL INJ LO FLOW) alarm is received, the BOP must throttle 2NV-241 (SEAL INJECTION FLOW CONTROL) in the ___(2)___ direction to clear the alarm.

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

A. 1. be decreasing
 2. OPEN

B. 1. be decreasing
 2. CLOSED

C. 1. remain the same
 2. OPEN

D. 1. remain the same
 2. CLOSED

General Discussion

With Pressurizer level greater than setpoint Charging flow is reducing (via 2NV-238 closing) to reduce Pressurizer level back to program. This results in not only a reduction in charging flow but a reduction in seal injection flow to the NC pumps (since both are downstream of 2NV-238.

To restore adequate NC pump seal injection flow, the BOP should throttle closed on 2NV-241 to increase the backpressure in the charging line and force more flow to the NC pump seals.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is correct.

Part 2 is plausible because the applicant may conclude that 2NV-241 is a direct acting valve in the flowpath to the NC pump seals. If that were the case and the applicant concludes that 2NV-238 has closed to its charging flow limiter position, opening 2NV-238 while opening 2NV-241 would be the correct action to restore flow to the NC pump seals. Also, Operators normally associate opening a valve with increasing flow to a component served by that valve.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant concludes that throttling closed on 2NV-238 only affects charging flow (with no operator action the position of 2NV-241 hasn't changed).

Part 2 is plausible because the applicant may conclude that 2NV-241 is a direct acting valve in the flowpath to the NC pump seals. If that were the case and the applicant concludes that 2NV-238 has closed to its charging flow limiter position, opening 2NV-238 while opening 2NV-241 would be the correct actions to restore flow to the NC pump seals. Also, Operators normally associate opening a valve with increasing flow to a component served by that valve.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant concludes that throttling closed on 2NV-238 only affects charging flow (with no operator action the position of 2NV-241 hasn't changed).

Part 2 is correct.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate the ability to interpret NV system indications (lowering charging flow), determine expected system response (seal injection low flow annunciator) and understand what operator actions are required to mitigate the conditions.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. First the applicant must evaluate the conditions in the stem to determine the effect on NCP seal injection flow, then recall from memory the operation of NV-241 required to mitigate the event.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2012 MNS NRC Q43 (Bank 5735)

MNS ILT 18-1 SRO NRC Examination QUESTION **43** 43 **B**

Development References
REFERENCES: Lesson Plan OP-MC-PS-NV-DCS (Chemical Volume Control System) Rev 12 LEARNING OBJECTIVES: OP-MC-PS-NV Objective 5

Student References Provided

APE022 2.2.44 - Loss of Reactor Coolant Makeup

APE022 GENERIC

Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions. (CFR: 41.5 / 43.5 / 45.12)

Remarks/Status
This question has been selected to send to Chief Examiner for early 401-9 review for KA match. SLM 05/22/17 Early 401-9 Review Comments - ENHANCEMENT APE022 2.2.44 Add bullet - assume no operator action (or leave this off, just not incorporated into the question) Reword question 1) Based on the conditions above, NC pump seal injection flow will be INCREASING OR DECREASING 2) no required changes Q43 will be S with the above enhancements FACILITY RESPONSE: Changed Q1 based on CE recommendations with the exception of using "remains the same" instead of "increasing" as a distractor. Due to the operating characteristics of the valves that control NCP seal injection "remains the same" is a more plausible distractor. SLM 8/17/17

APE025 AK1.01 - Loss of Residual Heat Removal System (RHRS)

Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System: (CFR 41.8 / 41.10 / 45.3)

Loss of RHRS during all modes of operation ....

Given the following on Unit 2:

- The unit is in MODE 5 and drained to Mid-loop
- ND Train 2A is in service
- ND system flow rate is 3300 GPM
- NC System level is (+)8 inches
- ND Low Discharge Pressure is in alarm on the OAC
- The crew has entered AP-19 (LOSS OF ND OR ND SYSTEM LEAKAGE)

In accordance with AP-19,

1) the crew will be required to _______ to mitigate this event.

2) the first MAJOR action category is to ________.

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

A. 1. stop 2A ND pump
   2. protect the ND pumps

B. 1. reduce ND flow to $\leq$ 3000 GPM
   2. protect the ND pumps

C. 1. stop 2A ND pump
   2. check if adequate heat sink is available

D. 1. reduce ND flow to $\leq$ 3000 GPM
   2. check if adequate heat sink is available

General Discussion

AP-19 will direct the crew to maintain ND flow less than 3000 gpm any time NC level is less than 15 inches.
AP-19 will also direct the crew to secure ND pumps anytime NC level is less than or equal to 4 inches, NC subcooling is less than or equal to zero degrees or if ND-1 or ND-2 closes.

The Major Action Categories in AP-19 are:
1) Protect the ND pumps (Steps 1-4)
2) Address containment related concerns (Step 5)
3) Check if adequate heat sink or quick restart of ND available (Steps 6-14)
4) Establish alternate means of decay heat removal (Steps 15-20, 32)
5) Establish support conditions and restore ND. (Steps 21-46)

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because stopping the ND pumps would be required by AP-19 if NC level is less than or equal to 4 inches, NC subcooling is less than or equal to zero degrees or if ND-1 or ND-2 closes.

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because stopping the ND pumps would be required by AP-19 if NC level is less than or equal to 4 inches, NC subcooling is less than or equal to zero degrees or if ND-1 or ND-2 closes.

Part 2 is plausible because checking if adequate heat sink or quick restart of ND available is a major action category of AP-19 but not the first major action category.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because checking if adequate heat sink or quick restart of ND available is a major action category of AP-19 but not the first major action category.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate knowledge of the operational implications of pump runout conditions and the actions required to mitigate a loss of RHR while at mid-loop.

Basis for Hi Cog

This question is a hi cognitive question because more than one mental step is involved. First, the applicant is required to analyze the conditions given in the stem to determine the correct course of action to mitigate the event and then recall from memory the first major action category of AP-19.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
AP-19 (Loss of ND or ND System Leakage) Rev. 30
Lesson Plan OP-MC-AP-19 (LOSS OF ND OR ND SYSTEM LEAKAGE)

Student References Provided

LEARNING OBJECTIVES:
OP-MC-AP-19 Objective 5

APE025 AK1.01 - Loss of Residual Heat Removal System (RHRS)

Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System: (CFR 41.8 / 41.10 / 45.3)

Loss of RHRS during all modes of operation ....

Remarks/Status

This question has been selected to send to Chief Examiner for early 401-9 review for KA match. SLM 05/22/17

Early 401-9 Review Comments - UNSAT

APE025AK3.02

The question reverses the logic that the K/A is asking (i.e putting the RHRS in service rather than isolating it once in service)

Rejected KA APE025AK3.02 due to no auto isolation of the RHRS system at MNS

Replacement KA APE025 AK1.01 (8/16/2017)

FACILITY RESPONSE:
Replaced with a new question based on the replacement K/A.
NO overlap issues exist between Q16 and Q44. SLM 8/17/17

APE026 AA1. 07 - Loss of Component Cooling Water (CCW)
Ability to operate and / or monitor the following as they apply to the Loss of Component Cooling Water: (CFR 41.7 / 45.5 / 45.6)
Flow rates to the components and systems that are serviced by the CCWS; interactions among the components ....

Given the following on Unit 1:

- The unit is in MODE 4 on ND cooling (Both Trains)
- 1A Train KC is aligned to supply A ND HX, Reactor and Aux Bldg Non-Essential Headers
- 1B Train KC is aligned to supply the B ND HX Header
- Both A Train and both B Train KC pumps are in operation

Subsequently,

- The 1B2 KC pump trips and is tagged for equipment protection

Based on the conditions above and in accordance with OP/1/A/6400/005 (COMPONENTCOOLING WATER SYSTEM) limits and precautions,

1) KC flow to each in service ND HX must be maintained greater than or equal to a MINIMUM of _______ GPM.

2) KC flow through the 1B ND Heat Exchanger shall be throttled to less than a MAXIMUM of _______ GPM.

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

A. 1. 2000
   2. 6000

B. 1. 3000
   2. 6000

C. 1. 2000
   2. 4000

D. 1. 3000
   2. 4000

General Discussion

In accordance with the KC System Limits and Precautions:
KC Flow to each ND HX in service must be maintained greater than or equal to
2000 gpm when both of the following conditions exist:
- NC System temperature greater than or equal to 200°F
- ND in RHR Mode (1NI-173A or 1NI-178B open)

Based on the conditions given, the NC system is greater than 200 degrees and ND is in RHR mode.

If one KC pump is tagged, flow through the train-related ND Heat Exchanger is limited to 4000 GPM to prevent runout of the remaining KC pump.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1is correct.

Part 2 is plausible because 6000 gpm is associated with another limit and precaution that requires isolating the aux bldg. non-essential hdr if total flow to the ND Hxs exceeds this amount.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because there is a 6000 gpm limit associated with total flow to the ND Hxs therefore, 3000 gpm would apply to each ND Hx individually.

Part 2 is plausible because 6000 gpm is associated with another limit and precaution that requires isolating the aux bldg. non-essential hdr if total flow to the ND Hxs exceeds this amount.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because there is a 6000 gpm limit associated with total flow to the ND Hxs therefore, 3000 gpm would apply to each ND Hx individually.

Part 2 is correct.

Basis for meeting the KA

K/A is matched because a loss of a CCW pump has occurred and the applicant is asked to demonstrate knowledge of the flow rate limit to a component (ND HX) supplied by the CCW system.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	2013 MNS NRC Q43 (BANK 5266)

Development References

REFERENCES:
OP/1/A/6400/005 (Component Cooling Water System) Rev. 104

LEARNING OBJECTIVES:
NONE

Student References Provided

APE026 AA1. 07 - Loss of Component Cooling Water (CCW)

Ability to operate and / or monitor the following as they apply to the Loss of Component Cooling Water: (CFR 41.7 / 45.5 / 45.6)

Flow rates to the components and systems that are serviced by the CCWS; interactions among the components ....

Remarks/Status

APE027 AK1.02 - Pressurizer Pressure Control System (PZR PCS) Malfunction

Knowledge of the operational implications of the following concepts as they apply to Pressurizer Pressure Control Malfunctions: (CFR 41.8 / 41.10 / 45.3)

Expansion of liquids as temperature increases ....

Given the following on Unit 2:

- A load increase is in progress
- The Pressurizer Pressure Master Controller **OUTPUT** fails LOW
- All Pressurizer Pressure control components are in AUTO
- NC system pressure is currently 2310 PSIG and rising slowly
- NO operator actions have been taken

Based on the conditions above, which ONE (1) of the following is the effect this failure will have on PZR Surge Line temperature AND the Pressurizer Spray valves?

	PZR Surge Line Temperature	PZR Spray Valve Position
A.	DECREASED	CLOSED
B.	INCREASED	CLOSED
C.	DECREASED	OPEN
D.	INCREASED	OPEN

General Discussion

Due to the PZR pressure control malfunction, pressure will increase. This causes PZR outsurge which increases surge line temp as hotter PZR temp (approximately 630°F) is expelled. So, even though the Pressurizer Spray valves should be full open at the current pressure, because they are controlled by the output of the Pressurizer Pressure Master Controller (which has failed low), the Spray valves are closed.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant concludes that an INSURGE to the Pressurizer has occurred. This is plausible since the Pressurizer heaters would normally energize on an INSURGE to the Pressurizer.

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT. See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant concludes that an INSURGE to the Pressurizer has occurred. This is plausible since the Pressurizer heaters would normally energize on an INSURGE to the Pressurizer.

Part 2 is plausible because the Pressurizer Spray valves should be open at this pressure.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is correct.

Part 2 is plausible because the Pressurizer Spray valves should be open at this pressure.

Basis for meeting the KA

K/A is matched because output failing low would energize the Pressurizer heaters resulting in an increase in the liquid temperature in the pressurizer which results in an expansion of the Pressurizer liquid. The applicant must be able to identify the operation implication of the expansion of the Pressurizer liquid to determine the correct response.

Basis for Hi Cog

This is a higher cognitive level question because it requires the applicant to analyze the effect of energizing the pressurizer heaters on the liquid in the pressurizer and the resultant effect on Surge Line temperature and the effect of the Pressurizer Pressure Master Controller malfunction on Spray Valve position.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2012 MNS NRC Q46 (Bank 5738)

Development References

REFERENCES:
Lesson Plan OP-MC-PS-NC (Reactor Coolant System) Rev. 40 Section 2.6
Lesson Plan OP-MC-PS-IPE-DCS (Pressurizer Pressure Control) Rev. 5 Section 2.5 and 2.6

LEARNING OBJECTIVE:
OP-MC-PS-NC Objective 7

Student References Provided

MNS ILT 18-1 SRO NRC Examination **QUESTION 46** 46 **B**

APE027 AK1.02 - Pressurizer Pressure Control System (PZR PCS) Malfunction

Knowledge of the operational implications of the following concepts as they apply to Pressurizer Pressure Control Malfunctions: (CFR 41.8 / 41.10 / 45.3)

Expansion of liquids as temperature increases ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "B". SLM 03/20/17.

EPE029 EK2.06 - Anticipated Transient Without Scram (ATWS)
Knowledge of the interrelations between the ATWS and the following: (CFR 41.7 / 45.7)
Breakers, relays, and disconnects ....

Given the following on Unit 1:

- Power stable at 100% RTP with surveillance testing in progress
- Reactor Trip Breaker "A" (RTA) and Bypass Breaker "B" (BYB) are racked-in and closed

Subsequently,

- Both Main Feed pumps trip
- All efforts to trip the reactor from the control room were unsuccessful
- The crew has implemented EP/1/A/5000/FR-S.1 (Response to Nuclear Power Generation/ATWS)

Based on the conditions above, Reactor Trip Breaker "A" (RTA) ___(1)___ failed to operate as designed.

In accordance with FR-S.1 Step 8, when an Operator is dispatched to trip the reactor, the MG set Motor and Generator breakers ___(2)___ required to be OPENED locally.

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

A. 1. shunt trip coil ONLY
   2. are

B. 1. shunt trip AND undervoltage coils
   2. are

C. 1. shunt trip coil ONLY
   2. are NOT

D. 1. shunt trip AND undervoltage coils
   2. are NOT

General Discussion

Any manual trip sends a signal to three breakers:
Associated train Reactor Trip Breaker shunt trip coil is energized and the UV coil is de-energized
Associated train Reactor Trip Bypass Breaker shunt trip coil is energized.
Opposite trains bypass breaker UV coil is de-energized
An automatic trip sends a signal to two breakers:
Associated train Reactor Trip Breaker undervoltage coil is de-energized
Opposite train Reactor Trip Bypass Breaker undervoltage coil is de-energized

Since neither reactor trip breaker opened from the control room, both the shunt trip and undervoltage trip coils failed to operate as designed.

Per FR-S.1, an operator is dispatched to open reactor trip and bypass breakers and the M/G set "Motor" and "Generator" breakers.

Answer A Discussion

INCORRECT: See explanation above

PLAUSIBLE:
Part 1 is plausible because the associated RTB will only get a direct signal to energize the shunt trip coil. The undervoltage coil is de--energized by the automatic reactor trip signal generated from SSPS.

Part 2 is correct.

Answer B Discussion

CORRECT : See explanation above

Answer C Discussion

INCORRECT: See explanation above

PLAUSIBLE:
Part 1 is plausible because the associated RTB will only get a direct signal to energize the shunt trip coil. The undervoltage coil is de--energized by the automatic reactor trip signal generated from SSPS.

Part 2 is plausible because the reactor trip breakers were the only breakers that failed to open from the control room and are normally the only breakers used to determine that the reactor is tripped.

Answer D Discussion

INCORRECT: See explanation above

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the reactor trip breakers were the only breakers that failed to open from the control room and are normally the only breakers used to determine that the reactor is tripped.

Basis for meeting the KA

K/A is matched because the applicants are given an ATWS conditions and are asked to show knowledge of proper breaker and relay operation during the event.

Basis for Hi Cog

Question is of a higher cognitive level due to requiring more than one mental step to determine the correct answer. The applicant must analyze the alignment given in the stem and determine how the signal from the manual trip and the signal generated automatically from SSPS has affected the undervoltage and shunt trip coils for the reactor trip and bypass breakers.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2016 CNS NRC (BANK 6311)

Development References

REFERENCES:
Lesson Plan OP-MC-IC-RTB (MG Sets and Reactor Trip Breakers) Rev 19D, Section 3.1.3

Student References Provided

FRS-1 (Response to Nuclear Power Generation / ATWS) Rev 16

LEARNING OBJECTIVES:
OP-MC-IC-RTB Objective 8

EPE029 EK2.06 - Anticipated Transient Without Scram (ATWS)
Knowledge of the interrelations between the ATWS and the following: (CFR 41.7 / 45.7)
Breakers, relays, and disconnects ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "B". SLM 03/20/17.

EPE038 2.1.31 - Steam Generator Tube Rupture (SGTR)

EPE038 GENERIC

Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup. (CFR: 41.10 / 45.12)

Given the following on Unit 1:

- A SGTR has occurred on the 1A SG
- E-3 (S/G TUBE RUPTURE) has been implemented
- Initial NC System cooldown has commenced

In accordance with E-3, when the P-12 (LO-LO Tavg) status light on 1SI-18 is lit, the operator will be required to ___(1)___ to continue NC system cooldown.

After cooldown has re-commenced, a maximum cooldown rate will be achieved when the open status lights for ___(2)___ are lit.

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

A. 1. re-open dump valves using the Steam Pressure controller
   2. ALL steam dump valves

B. 1. place the Steam Dump Select switch to Bypass Interlock
   2. ALL steam dump valves

C. 1. re-open dump valves using the Steam Pressure controller
   2. steam dump valves 3, 12 and 21

D. 1. place the Steam Dump Select switch to Bypass Interlock
   2. steam dump valves 3, 12 and 21

General Discussion

Per E-3, When the P-12 Lo Lo Tavg status light is lit, the next action is to place the Steam Dump Select switch to Bypass Interlock. Once this action has occurred, the cooldown at maximum rate may continue.
Per OP-MC-STM-IDE-DCS lesson plan, cooldown can only be performed using Steam Dump valves SB-3, SB-12 and SB-21(referred to as cooldown valves).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because opening the steam dumps in manual is how the NC system cooldown is initially started. However, an automatic block has occurred due to the P-12 signal and opening the dumps by adjusting the steam pressure controller in manual is blocked.

Part 2 is plausible because prior to the P-12 signal blocking the steam dumps (i.e. when the cooldown was commenced) all of the steam dumps were available to achieve maximum cooldown.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because prior to the P-12 signal blocking the steam dumps (i.e. when the cooldown was commenced) all of the steam dumps were available to achieve maximum cooldown.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because opening the steam dumps in manual is how the NC system cooldown is initially started. However, an automatic block has occurred due to the P-12 signal and opening the dumps by adjusting the steam pressure controller in manual is blocked.

Part 2 is correct.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant demonstrates the ability to operate controls and verify the appropriate system response using indications as it applies to performing a cooldown of the NC system in accordance with E-3 (SGTR). The ability operate controls and verify indications demonstrates the ability to locate system controls and indications.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. The applicant must recall from memory the required action of E-3 to continue the cooldown and then evaluate the affect the P-12 interlock has on the ability to use steam dump valves to determine the steam dump valves available to continue the cooldown.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2013 MNS NRC Q45 (BANK 5191)

Development References

REFERENCES:
E-3 Steam Generator Tube Rupture Rev 25
OP-MC-STM-IDE-DCS Rev. 2

LEARNING OBJECTIVES:
OP-MC-EP-E3 Objectives 3 & 4
OP-MC-STM-IDE-DCS Objective 9

Student References Provided

MNS ILT 18-1 SRO NRC Examination **QUESTION 48** 48 **D**

EPE038 2.1.31 - Steam Generator Tube Rupture (SGTR)

EPE038 GENERIC

Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup. (CFR: 41.10 / 45.12)

Remarks/Status
Rearranged answers form original bank question, correct answer is now "D". SLM 04/12/17.

APE040 AA1.06 - Steam Line Rupture

Ability to operate and / or monitor the following as they apply to the Steam Line Rupture: (CFR 41.7 / 45.5 / 45.6)

S/G and steam line pressures and flows ....

Given the following on Unit 1:

- Unit is at 100% RTP
- NC system pressure is at 2230 PSIG and stable
- 1B S/G pressure is lowering

Based on the conditions above, a Main Steam Isolation (MSI) will occur if 1B S/G pressure decreases to less than a MINIMUM of ___(1)___ PSIG.

If the cause of the S/G pressure decrease is due to the 1B SM PORV being stuck full OPEN, total steam flow will increase by ___(2)___.

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

A. 1. 875
 2. 2.5%

B. 1. 875
 2. 5.5%

C. 1. 775
 2. 2.5%

D. 1. 775
 2. 5.5%

General Discussion

Per ECC-ISE lesson plan, a main steam isolation signal will be generated on low steam pressure if 2/3 channels on 1/4 SGs has a pressure less than 775 psig and NC system pressure is greater than P-11 (1955#).

Per STM-SM lesson plan, Total SM PORV capacity is 10% of total steam flow and each individual SM PORV capacity is 2.5%.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the setpoint for the SG LO STEAM PRESSURE annunciator alarm (1AD-4 / B5).

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the setpoint for the SG LO STEAM PRESSURE annunciator alarm (1AD-4 / B5).

Part 2 is plausible because 5.5% is the design steam relief capacity of a single SM safety valve.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 5.5% is the design steam relief capacity of a single SM safety valve.

Basis for meeting the KA

The K/A is matched because the applicant demonstrates the ability to MONITOR S/G steam line pressures by demonstrating a knowledge of the pressure at which a Main Steam Isolation (MSI) should occur. The applicant also demonstrates the ability to MONITOR S/G flow by demonstrating a knowledge of the magnitude of the steam flow increase if an SM PORV fails 100% open.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

REFERENCES:
Lesson Plan OP-MC-IC-IRX Rev. 4
Lesson Plan OP-MC-TA-AT Rev. 8A

LEARNING OBJECTIVES:
OP-MC-TA-AT Objective 5

Student References Provided

APE040 AA1.06 - Steam Line Rupture
Ability to operate and / or monitor the following as they apply to the Steam Line Rupture: (CFR 41.7 / 45.5 / 45.6)
S/G and steam line pressures and flows ....

Remarks/Status

APE054 AA2.04 - Loss of Main Feedwater (MFW)
Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): (CFR: 43.5 / 45.13)
Proper operation of AFW pumps and regulating valves ....

Given the following on Unit 1:

- A unit shutdown is in progress
- 0200 both Main Feedwater pumps trip

Subsequently, the following conditions are observed:

	TIME			
CONDITION	**0200**	**0205**	**0210**	**0215**
NCS Temp (°F)	557	558	558	559
NCS Press (PSIG)	1965	1960	1976	1991
NR SG A (%)	19	18	19	19
NR SG B (%)	20	18	17	16
NR SG C (%)	20	19	18	16
NR SG D (%)	18	16	18	19

Based on the conditions above,

1) the EARLIEST time that the MD CA pumps will be running is ________.

2) the EARLIEST time that the TD CA pump will be running is ________.

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

A. 1. 0205
 2. 0205

B. 1. 0200
 2. 0205

C. 1. 0205
 2. 0215

D. 1. 0200
 2. 0215

General Discussion

Since NC pressure remains above the P-11 setpoint (1955 PSIG) during the entire event, Auto-Start Defeat could not have been initiated for the MD CA pumps. Therefore, as soon as both Main Feedwater pumps trip the MD CA pumps will auto-start.

The TD CA pump will auto-start when two (2) SG NR levels are less than 17%.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 if the applicant does not understand that the MD CA pumps would have started as soon as both MFW pumps tripped. If not, the applicant would conclude that the pumps started as soon as one (1) SG NR level was less than 17%.

Part 2 is plausible if the applicant concludes that the TD CA pump will start when one (1) SG NR level is less than 17%.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant concludes that the TD CA pump will start when one SG NR level is less than 17%.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 if the applicant does not understand that the MD CA pumps would have started as soon as both MFW pumps tripped. If not, the applicant would conclude that the pumps started as soon as one (1) SG NR level was less than 17%.

Part 2 is correct.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant must analyze plant conditions during a Loss of Feedwater event and determine when the AFW (CA) pumps start during the event. The applicant must have an understanding of the "conditions" that will result in an auto-start of the pumps and in doing so demonstrates a knowledge of the "reasons" for the pumps starting when they did.

Basis for Hi Cog

This question is higher cognitive because it is an analysis level question where the applicant must analyze the plant conditions at each time during the event to determine the correct auto-start time for the TD and MD CA pumps.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2015 MNS NRC Exam Q48 (Bank 6066)

Development References

REFERENCES:
Lesson Plan OP-MC-CF-CA (Auxiliary Feedwater System) Section 2.1 (Motor Driven CA Pumps) and 2.2 (Turbine Driven CA Pump)

LEARNING OBJECTIVES:
OP-MC-CF-CA Objective 4

Student References Provided

APE054 AA2.04 - Loss of Main Feedwater (MFW)
Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): (CFR: 43.5 / 45.13)
Proper operation of AFW pumps and regulating valves ....

Remarks/Status
Rearranged answers from previous bank version of question so as not to appear the same. HCF 06/20/17

EPE055 EA2.06 - Loss of Offsite and Onsite Power (Station Blackout)
Ability to determine or interpret the following as they apply to a Station Blackout : (CFR 43.5 / 45.13)
Faults and lockouts that must be cleared prior to re- energizing buses .....

Given the following initial conditions on Unit 1:

- The 1B D/G is running paralleled to 1ETB for testing when a **Safety Injection** signal occurs

Subsequently,

- A lightning strike results in a simultaneous Loss of Offsite Power (LOOP) AND an 86N Lockout on 1ETB

Based on the conditions above, if the Safety Injection has not been reset when the 86N lockout occurs the 1ETB ___(1)___ will trip.

When the condition causing the 86N Lockout has been corrected, to reset the 86 Lockout an operator will ___(2)___.

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

A.
1. Normal Supply AND Emergency Supply breakers
2. rotate the relay handle in the clockwise direction and verify the orange target disappears

B.
1. Normal Supply AND Emergency Supply breakers
2. push upward on the mechanical plunger until the orange target disappears

C.
1. Normal Supply breaker ONLY
2. rotate the relay handle in the clockwise direction and verify the orange target disappears

D.
1. Normal Supply breaker ONLY
2. push upward on the mechanical plunger until the orange target disappears

---

General Discussion

Per OP-MC-EL-ERD, when initiated the 86N or 86S lockout will trip the associated incoming breaker and the diesel-generator breaker (except during a safety injection actuation; when the diesel-generator breaker will not trip). In addition, breaker re-closing is blocked until the lockout is reset by hand.

To reset an 86 Relay, the relay handle must be rotated clockwise 1/8th of a turn and verifying that the orange flag disappears.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because if the Safety Injection signal was not present at the time the lockout occurred, both breakers would trip.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because if the Safety Injection signal was not present at the time the lockout occurred, both breakers would trip.

Part 2 is plausible because it is how an 87 Relay is reset.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because it is how an 87 Relay is reset.

Basis for meeting the KA

K/A is matched because the applicant demonstrates the ability to interpret the affects of a LOOP with a faulted/locked-out bus on breaker operation.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. The applicant is required to recall from memory the breakers that are affected by an 86N lockout relay actuation and analyze the conditions in the stem to determine what affect they have on operation of the D/G breaker during a subsequent Safety Injection signal.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
OP-MC-EL-ERD Rev 27
MCS-1465.00-00-023 Relaying Design Basis Document
OP/1/A/6100/010L ARP for 1AD-11

LEARNING OBJECTIVES:
OP-MC-EL-ERD Objective 11

Student References Provided

EPE055 EA2.06 - Loss of Offsite and Onsite Power (Station Blackout)
Ability to determine or interpret the following as they apply to a Station Blackout : (CFR 43.5 / 45.13)
Faults and lockouts that must be cleared prior to re- energizing buses .....

Remarks/Status

APE056 AK1.01 - Loss of Offsite Power

Knowledge of the operational implications of the following concepts as they apply to Loss of Offsite Power: CFR 41.8 / 41.10 / 45.3)

Principle of cooling by natural convection ....

Given the following on Unit 1:

- A Loss of Offsite Power has occurred
- The crew has initiated a natural circulation cooldown

Which ONE (1) of the following indicates that natural circulation is occurring per Generic Enclosure 33 (NATURAL CIRCULATION PARAMETERS)?

	NC System Cold Leg Temperatures:	NC System Hot Leg Temperatures:
A.	At saturation temperature for S/G pressure	Going DOWN
B.	Going DOWN	At saturation temperature for S/G pressure
C.	Going DOWN	Going DOWN
D.	At saturation temperature for S/G pressure	At saturation temperature for S/G pressure

---

General Discussion

The indications of Natural Circulation are:

1. NC Subcooling - Greater than 0°F
2. S/G Pressures - Stable or going down
3. NC T-Hots - Stable or going down
4. Core Exit T/Cs - Stable or going down
5. NC T-Colds - At saturation temperature for S/G pressure

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant reverses the indications for Cold Leg Temperatures and Hot Leg Temperatures.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant concludes the requirement for Cold Leg Temperature indication should be the same as Hot Leg Temperature indication.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant concludes the requirement for Hot Leg Temperature indication should be the same as Cold Leg Temperature indication.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate knowledge of the parameters monitored for Natural Circulation, and how to determine that Natural Circulation exists by knowing how those parameters should be trending.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2012 MNS NRC Q52 (Bank 5743)

Development References

REFERENCES:
OP/1/A/5000/G-1 (Natural Circulation Parameters)

LEARNING OBJECTIVES:
NONE

Student References Provided

APE056 AK1.01 - Loss of Offsite Power
Knowledge of the operational implications of the following concepts as they apply to Loss of Offsite Power: CFR 41.8 / 41.10 / 45.3)
Principle of cooling by natural convection ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "A". SLM 03/21/17.

APE057 AA1.01 - Loss of Vital AC Electrical Instrument Bus

Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus: (CFR 41.7 / 45.5 / 45.6)

Manual inverter swapping ....

Given the following on Unit 1:

- The unit is recovering from a loss of 1EVIA Static Inverter
- 1EKVA has been energized from its alternate source
- Repairs to inverter 1EVIA are complete

Which ONE (1) of the following actions is necessary to restore the electrical line-up to a normal configuration in accordance with OP/0/A/6350/001 A (125 VDC/120 VAC INSTRUMENT AND CONTROL POWER SYSTEM)?

A. Manually transfer power from static inverter 1EVIC back to static inverter 1EVIA.

B. Manually transfer power from regulated load center 1KRP back to static inverter 1EVIA.

C. Enable the automatic transfer of power from static inverter 1EVIC back to static inverter 1EVIA.

D. Enable the automatic transfer of power from regulated load center 1KRP back to static inverter 1EVIA.

General Discussion

Each unit's 120 VAC Vital Instrumentation and Control Power System normally receives power from the 125 VDC Vital Instrumentation and Control Power System through static inverters, 1(2)EVIA, 1(2)EVIB, 1(2)EVIC and 1(2)EVID, and their respective manual transfer switch (when in the "Inverter to Load" position).
Two static inverters are fed from each independent 125V DC distribution center. Each static inverter provides power to one of the eight AC power panel boards (1EKVA, 1EKVB, 1EKVC, 1EKVD, 2EKVA, 2EKVB, 2EKVC, and 2EKVD). Four Distribution Centers (EVDA, EVDB, EVDC and EVDD) supply four channels of power which are shared between the two units (Units 1 & 2 EVIA fed from distribution center EVDA and etc.).
A manual transfer switch (also called manual bypass switch), associated with each static inverter, allows power transfer from the respective inverter to an alternate regulated power source (1KRP or 2KRP) during a loss of inverter. Because the manual transfer switch is a "make before break" switch, with overlapping contacts, transfer of the power source can be accomplished without an interruption of power.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because this is a manual alignment and either of the two same train-related buses (EVDA and EVDC / Train "A" buses or EVDB and EVDD / Train "B" buses) can be tied together through their respective bus tie breakers. This will allow two distribution centers to be fed from one battery / battery charger combination. EVDA (and thus 1EVIA) can be powered from EVDC, however, this alignment is performed to remove a battery charger from service.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because either of the two same train-related buses (EVDA and EVDC / Train "A" buses or EVDB and EVDD / Train "B" buses) can be tied together through their respective bus tie breakers. This will allow two distribution centers to be fed from one battery / battery charger combination. EVDA (and thus 1EVIA) can be powered from EVDC, however, this is a MANUAL alignment performed to remove a battery charger from service.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because this is the correct alignment to restore normal power to inverter 1EVIA, however, this alignment can only be performed manually. Also plausible because 1/2 KRP do have an auto swap feature. However, it is for incoming power to the 1/2 KRP bus not the outgoing power to the inverters.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate the ability to manually align Inverter power after a loss of the Vital AC Instrument bus.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2014 MNS NRC Q50 (Bank 4479)

Development References

REFERENCES:
Lesson Plan OP-MC-EL-EPL

LEARNING OBJECTIVES:
OP-MC-EL-EPL Objective 15

Student References Provided

APE057 AA1.01 - Loss of Vital AC Electrical Instrument Bus

Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus: (CFR 41.7 / 45.5 / 45.6)

Manual inverter swapping ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "B". SLM 03/22/17.

APE065 AA2.07 - Loss of Instrument Air

Ability to determine and interpret the following as they apply to the Loss of Instrument Air: (CFR: 43.5 / 45.13)

Whether backup nitrogen supply is controlling valve position ....

Given the following on Unit 1:

- NC temperature is 310°F
- NC pressure is 322 PSIG
- LTOP has been placed in service

Subsequently,

- VI header pressure drops to 20 PSIG
- NC pressure rises to 400 PSIG

Based on the conditions above, nitrogen backup to the Pzr PORVs ___(1)___ AND ___(2)___ will AUTO OPEN.

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

A. 1. has automatically aligned
2. 1NC-34A and 1NC-36B

B. 1. has automatically aligned
2. 1NC-32B and 1NC-34A

C. 1. must be manually aligned
2. 1NC-34A and 1NC-36B

D. 1. must be manually aligned
2. 1NC-32B and 1NC-34A

General Discussion

On an “OPEN” signal, a solenoid actuates to align air to operate the PORVs. Normally the operating air is supplied from VI. All three PORV’s are provided with back-up N2 from the Cold Leg Accumulators, to be used if VI is lost. NC-32B & NC-36B get N2 from CLA “B” via NI-431B, and NC-34A from CLA “A” via NI-430A. Any time “Low Press Mode” is selected, NI-430A & NI-431B will automatically open provided NC temperature < 320°F. NI-430A & NI-431B can be manually opened anytime with control board switch.
Two of the PORVs have low temperature-overpressure protection (LTOP), NC-34A (TR "A") and NC-32B (TR "B"). When NC temperature gets less than 320°F, a train related bistable, (Loop D WR Th for TR "A" and Loop C WR Tc for TR "B") energizes. With the PORV selector switch in "AUTO" (at either the MCB or ASP), "Low Pressure" mode selected, and temperature less than 320°F, the PORV will open when NC pressure increases above 380 (±2 psig).

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because only two of the three Pzr PORVs have reduced setpoints when operating in the Low Pressure Mode; one from Train A, 1NC-34A, and one from Train B, 1NC-32B.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because nitrogen can be aligned manually anytime using the control board switches for NI-430A and NI-431B.

Part 2 is plausible because only two of the three Pzr PORVs have reduced setpoints when operating in the Low Pressure Mode; one from Train A, 1NC-34A, and one from Train B, 1NC-32B.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because nitrogen can be aligned manually anytime using the control board switches for NI-430A and NI-431B.

Part 2 is correct.

Basis for meeting the KA

K/A is matched because the operator must demonstrate the ability to determine whether or NOT the Pzr PORVs will open when VI is unavailable and backup nitrogen is the only supply controlling valve position.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. The applicant must analyze the conditions in the stem to determine the position of the PORV mode select switches and the affect this will have on the backup nitrogen supply valves. Then, recall from memory the PORVs that are selected for low temperature over pressure protection.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2009 MNS AUDIT Q51 (Bank 3169)

Development References

REFERENCES:
Lesson plan OP-MC-PS-IPE Rev 6, Section 2.7.1 and 2.7.2

LEARNING OBJECTIVES:
OP-MC-PS-IPE Obj 4

Student References Provided

APE065 AA2.07 - Loss of Instrument Air
Ability to determine and interpret the following as they apply to the Loss of Instrument Air: (CFR: 43.5 / 45.13)

Whether backup nitrogen supply is controlling valve position ....

Remarks/Status

WE04 EK2.1 - LOCA Outside Containment

Knowledge of the interrelations between the (LOCA Outside Containment) and the following:

(CFR: 41.7 / 45.7)

Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Given the following on Unit 1:

- A Loss of Offsite Power has occurred
- Emergency D/G's have started and loaded their respective busses
- As a result of the transient, an Inner System LOCA into the ND system occurs
- The crew implements ECA-1.2 (LOCA OUTSIDE CONTAINMENT)

Based on the conditions above, and in accordance with ECA-1.2, the crew will be directed to perform an NC system cooldown by dumping steam ___(1)___ at ___(2)___.

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

A. 1. to the condenser
   2. a rate not to exceed 100°F/Hr

B. 1. to the condenser
   2. maximum rate

C. 1. using the SM PORVs
   2. a rate not to exceed 100°F/Hr

D. 1. using the SM PORVs
   2. maximum rate

General Discussion

When performing a cooldown in ECA-1.2, the procedure will direct the operators to dump steam from the S/Gs (either to the condenser if available or via the SM PORVs) at maximum rate. In the conditions given, the loop will cause a loss of RC cooling and require the crew to use the S/G SM PORVs.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because dumping steam to the condenser is the preferred choice but is not available due to the LOOP.

Part 2 is plausible because most emergency procedures that require a cooldown of the NC system use a more controlled rate not to exceed 100 degrees F per hour.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because dumping steam to the condenser is the preferred choice but is not available due to the LOOP.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because most emergency procedures that require a cooldown of the NC system use a more controlled rate not to exceed 100 degrees F per hour.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because it requires the applicant to have knowledge of the interrelations between the LOCA outside containment and components and controls necessary to cooldown and depressurize the NC system (including alternate means when the preferred means is not available).

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. The applicant must analyze the conditions in the stem and determine that dumping steam to the condenser is not available due to loss of RC pumps and then recall from memory the cooldown rate required by ECA-1.2.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
ECA-1.2 (LOCA Outside Containment) Rev 6
Lesson Plan OP-MC-EP-E1 Rev. 29 Section 9.0

LEARNING OBJECTIVES:
OP-MC-EP-E1 Objective 3

Student References Provided

WE04 EK2.1 - LOCA Outside Containment
Knowledge of the interrelations between the (LOCA Outside

Containment) and the following:
(CFR: 41.7 / 45.7)

Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Remarks/Status

WE05 EK2.2 - Loss of Secondary Heat Sink

Knowledge of the interrelations between the (Loss of Secondary Heat Sink) and the following:
(CFR: 41.7 / 45.7)

Facility*s heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.

Given the following on Unit 1:

- A Safety Injection has occurred
- Containment pressure peaked at 2.7 PSIG and is now slowly lowering
- The crew has implemented EP/1/A/5000/FR-H.1 (RESPONSE TO LOSS OF SECONDARY HEAT SINK)
- All attempts to restore CA flow have been unsuccessful

In accordance with FR-H.1,

1) the FIRST source of feedwater which is prioritized for restoration is _______.

2) the crew is required to establish bleed and feed when W/R level in at least 3 S/Gs is less than a MAXIMUM level of _______.

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

A. 1. Main Condensate (CM)
   2. 24%

B. 1. Main Condensate (CM)
   2. 36%

C. 1. Main Feedwater (CF)
   2. 24%

D. 1. Main Feedwater (CF)
   2. 36%

General Discussion

In accordance with FR-H.1, attempts to restore feedwater begin with the Main Feedwater (CF) system. If the Main Feedwater system cannot be restored, then attempts are made to restore the Condensate (CM) system after S/G depressurization.

If attempts to restore feedwater are unsuccessful, NC system feed and bleed must be initiated when WR level in at least three SGs decreases to less than 24% (36% adverse). In this case since Containment pressure has NOT increased above 3 PSIG, adverse numbers will NOT be used.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the main condensate system could be used if S/Gs were first depressurized and are an option specified in FR-H.1 (following attempts to place main feed in service).

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the main condensate system could be used if S/Gs were first depressurized and are an option specified in FR-H.1 (following attempts to place main feed in service).

Part 2 is plausible because this would be the correct answer if adverse containment condition numbers were in effect.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because this would be the correct answer if adverse containment condition numbers were in effect.

Basis for meeting the KA

K/A is matched because it requires the applicant to have knowledge of the interrelations between the Loss of Secondary Heat sink and the facilities decay heat removal systems (i.e. the CF and CM systems) and how to prioritize restoration of those systems. The applicant must also have knowledge of the relationship between the proper operation of those system to the operation of the facility. Specifically, if the CF and CM system cannot be restored, the applicant must know the criteria for initiating NC system feed and bleed.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must analyze the conditions given to determine if Containment adverse numbers apply. The applicant must then recall from memory the correct setpoint for when NC system feed and bleed must be initiated. The applicant must also recall from memory the priority for restoring feedwater.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	2013 MNS NRC Q55 (Bank 5275)

Development References

REFERENCES:
FR-H.1 Rev 19 (Response to Loss of Secondary Heat Sink)

LEARNING OBJECTIVES:
OP-MC-EP-FRH Objective 3

Student References Provided

WE05 EK2.2 - Loss of Secondary Heat Sink

Knowledge of the interrelations between the (Loss of Secondary Heat Sink) and the following:
(CFR: 41.7 / 45.7)

Facility*s heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.

Remarks/Status

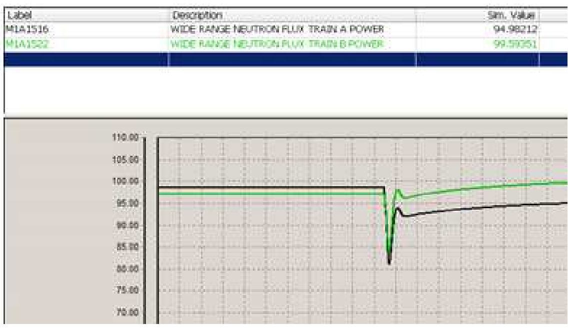
APE003 2.4.47 - Dropped Control Rod

APE003 GENERIC

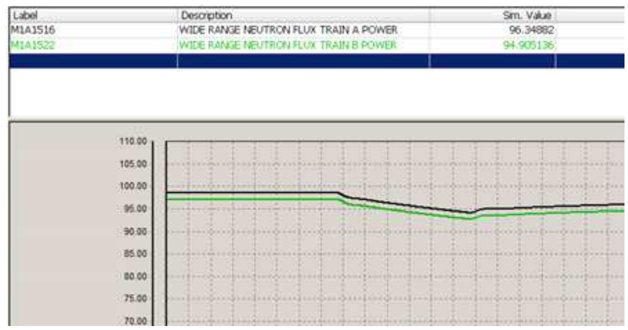
Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material. (CFR: 41.10 / 43.5 / 45.12)

Given the following WR NIS Power trends:

TREND A



TREND B



Based on the trends above, ___(1)___ indicates that a dropped rod has occurred.

For a dropped rod, the **background color** on the CRT for the affected rod group on the Digital Rod Position Indication (DRPI) system will be ___(2)___.

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

A. 1. Trend A
   2. orange

B. 1. Trend A
   2. black

C. 1. Trend B
   2. orange

D. 1. Trend B
   2. black

General Discussion

Trend A provides indications of a dropped rod due to the prompt drop in power at the beginning of the event.

For a dropped rod, the DRPI CRT background will display in orange and the individual rod will display in green. For DRPI DATA A or DATA B failure on an individual rod, the background will display in black while the individual rod will display in yellow. For a DATA A & B failure on an individual rod, the background will display in orange while the individual rod will display in red.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct and therefore plausible.

Part 2 is plausible because for a DRPI Data A or Data B failure on an individual rod, the background color for the affected rod will be black.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because a drop in indicated power has occurred followed by a return to the same power level as prior to the event.

Part 2 is correct and therefore plausible.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because a drop in indicated power has occurred followed by a return to the same power level as prior to the event.

Part 2 is plausible because for a DRPI Data A or Data B failure on an individual rod, the background color for the affected rod will be black.

Basis for meeting the KA

The K/A is match because the applicant is asked to use control room reference material (i.e. WR NIS trend) to diagnose the indications of a dropped rod.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant to analyze the two provided trends to determine which one indicates a dropped rod.

Then, the applicant must recall from memory the indications on the DRPI CRT displays relative to different malfunctions and failures.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
Tech Spec 3.1.4 (Rod Group Alignment Limits)

LEARNING OBJECTIVES:
NONE

Student References Provided

APE003 2.4.47 - Dropped Control Rod

APE003 GENERIC

Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material. (CFR: 41.10 / 43.5 / 45.12)

Remarks/Status

APE005 AK2.02 - Inoperable/Stuck Control Rod

Knowledge of the interrelations between the Inoperable / Stuck Control Rod and the following: (CFR 41.7 / 45.7)

Breakers, relays, disconnects, and control room switches ....

Given the following on Unit 2:

- Unit is at 45% RTP
- Control Bank D, Rod D-4 is 15 steps below the rest of the bank
- AP-14 (ROD CONTROL MALFUNCTION) has been implemented
- The crew is performing the steps of AP-14, Enclosure 1 (RESPONSE TO DROPPED OR MISALIGNED ROD) to realign Rod D-4

In accordance with AP-14,

1) the crew will OPEN the Control Bank "D" lift coil disconnect switch(es) for ________.

2) the Rod Bank selector switch will be placed in ________ to perform rod realignment.

A. 1. the misaligned rod ONLY
   2. Manual

B. 1. the misaligned rod ONLY
   2. CB D position

C. 1. all but the misaligned rod
   2. Manual

D. 1. all but the misaligned rod
   2. CB D position

General Discussion

Per AP-14, the crew will OPEN coil disconnect switches for all rods in the affected bank, EXCEPT for the dropped/misaligned rod and transfer rod control to the affected bank using the ROD BANK SELECTOR Switch.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because if it were desired to lower the other rods in Control Bank D to be in alignment with rod D-4 this would be the correct action.

Part 2 is plausible because with the control bank selector switch in manual control bank D rods would move first with the current plant conditions.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because if it were desired to lower the other rods in Control Bank D to be in alignment with rod D-4 this would be the correct action.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because with the control bank selector switch in manual control bank D rods would move first with the current plant conditions.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate knowledge of the interrelationship between lift coil disconnect switches and rod bank selector switch positions required for recovery of a misaligned control rod.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2015 RNP NRC (BANK 6815)

Development References

REFERENCES:
AP-14 (Rod Control Malfunction) Rev 16

LEARNING OBJECTIVES:
NONE

Student References Provided

APE005 AK2.02 - Inoperable/Stuck Control Rod
Knowledge of the interrelations between the Inoperable / Stuck Control Rod and the following: (CFR 41.7 / 45.7)
Breakers, relays, disconnects, and control room switches ....

Remarks/Status

Rearranged answers form original bank question, correct answer is now "D". SLM 03/27/17.

APE024 AA1.22 - Emergency Boration

Ability to operate and / or monitor the following as they apply to Emergency Boration: (CFR 41.7 / 45.5 / 45.6)

Safety injection valves, switches, flow meters, and indicators ....

Given the following on Unit 1:

- The crew has implemented EP/1/A/5000/FR-S.1 (RESPONSE TO NUCLEAR POWER GENERATION / ATWS) and is initiating emergency boration
- 1NV-265B (U1 NV PUMP BORIC ACID SUP ISOL) is OPEN
- Both Boric Acid transfer pump switches are in ON
- 1NV-244A & 1NV-245B (CHRG HDR CONT ISOLs) are OPEN
- Pressurizer pressure is 2310 PSIG
- Emergency boration flow is 25 GPM

Based on the conditions above, and in accordance with FR-S.1,

1) NC System depressurization _______ required.

2) the crew is required to _______.

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

A.
1. is
2. swap NV pump suction to the FWST

B.
1. is NOT
2. swap NV pump suction to the FWST

C.
1. is
2. manually align safety injection valves

D.
1. is NOT
2. manually align safety injection valves

General Discussion

If emergency boration flow is not > 30 gpm, FR-S.1 will align the NV pump suction to the FWST.
If either of the NV charging line containment isolation valves are closed, FR-S.1 will align the NV pump suction to the FWST and open the cold leg injection isolations, but will not initiate safety injection.
FR-S.1 checks Pzr pressure less than 2335 psig. IF greater than 2335 psig, FR-S.1 directs the operator to open pressurizer PORVs as necessary to reduce pressurizer pressure to < 2135 psig to ensure charging flow is > emergency boration flow.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because Pzr pressure is at the high pressure alarm setpoint and if Pzr pressure were to exceed 2335 psig, depressurization would be required.

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because Pzr pressure is at the high pressure alarm setpoint and if Pzr pressure were to exceed 2335 psig, depressurization would be required.

Part 2 is plausible because if either of the NV charging line containment isolation valves were closed, FR-S.1 will align the NV pump suction to the FWST and open the cold leg injection isolations.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because if either of the NV charging line containment isolation valves were closed, FR-S.1 will align the NV pump suction to the FWST and open the cold leg injection isolations.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate the ability to operate safety injection valves (suction from the FWST and cold leg injections) as applicable for given conditions during an emergency boration required by FR-S.1.

Basis for Hi Cog

Question is of a higher cognitive level because the applicant must evaluate the conditions in the stem and based on the procedure in progress, determine what is required to accomplish required emergency boration flow.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
EP/1/A/5000/FR-S.1 (Response to Nuclear Power Generation / ATWS) step 5 (Rev 16)

LEARNING OBJECTIVES:
OP-MC-EP-FRS Objective 7

Student References Provided

APE024 AA1.22 - Emergency Boration
Ability to operate and / or monitor the following as they apply to Emergency Boration: (CFR 41.7 / 45.5 / 45.6)
Safety injection valves, switches, flow meters, and indicators ....

Remarks/Status

APE032 AA2.04 - Loss of Source Range Nuclear Instrumentation

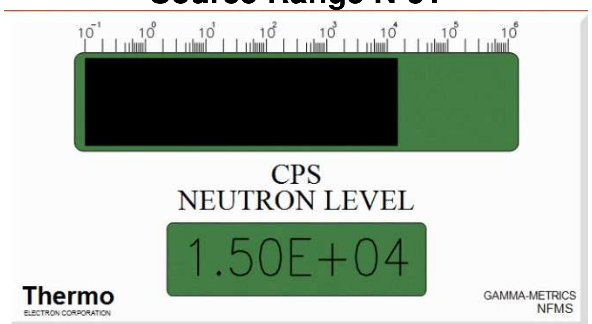
Ability to determine and interpret the following as they apply to the Loss of Source Range Nuclear Instrumentation: (CFR: 43.5 / 45.13)

Satisfactory source-range/intermediate-range overlap ....

Given the following on Unit 1:

- A reactor trip from 4% RTP has occurred
- The crew is performing E-0 (REACTOR TRIP OR SAFETY INJECTION)
- Source Range N-32 is off-scale high
- Other NI indications are as follows:

Source Range N-31



Intermediate Range N-35 and N-36

Based on the indications above, the required overlap between the IR channels and SR N-31 ____(1)____ met.

While removing SR N-32 from service, AP-16 (MALFUNCTION OF NUCLEAR INSTRUMENTATION) Case 1(SOURCE RANGE MALFUNCTION) will direct the crew to ____(2)____.

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

A. 1. is
   2. place the N-32 LEVEL TRIP switch to BYPASS

B. 1. is
   2. block N-32 in SSPS

C. 1. is NOT
   2. place the N-32 LEVEL TRIP switch to BYPASS

D. 1. is NOT
   2. block N-32 in SSPS

General Discussion

IAW IC-ENB lesson plan, each range is required to have at least one decade of overlap between it and the adjacent range.

In accordance with AP-16, while removing N-32 from service, the crew will place the N-32 LEVEL TRIP switch to BYPASS.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because AP-16 directs the crew to block the affected channel in SSPS to avoid a reactor trip if the Control Power breaker or Instrument Power breaker is to be opened.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude the top of the SR indication is at the high flux trip setpoint of 10~5 cps which based on conditions in the stem would not meet overlap requirements of one full decade.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude the top of the SR indication is at the high flux trip setpoint of 10~5 cps which based on conditions in the stem would not meet overlap requirements of one full decade.

Part 2 is plausible because AP-16 directs the crew to block the affected channel in SSPS to avoid a reactor trip if the Control Power breaker or Instrument Power breaker is to be opened.

Basis for meeting the KA

K/A is matched because the applicant demonstrates the ability to determine if proper overlap between IR and SR NIs exists with one SR NI failing to come on scale.

Basis for Hi Cog

This question is higher cognitive because more than one mental step is involved. The applicant is required to analyze the conditions in the stem, relate the power indications to each other to determine overlap and determine which mode and specific condition is required by TS's.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
OP-MC-IC-ENB (Excore Nuclear Instrumentation) Rev 30
TS 3.3.1

LEARNING OBJECTIVES:
OP-MC-IC-ENB Objective 13

Student References Provided

APE032 AA2.04 - Loss of Source Range Nuclear Instrumentation
Ability to determine and interpret the following as they apply to the Loss of Source Range Nuclear Instrumentation: (CFR: 43.5 / 45.13)
Satisfactory source-range/intermediate-range overlap ....

Remarks/Status

APE033 AK3.01 - Loss of Intermediate Range Nuclear Instrumentation

Knowledge of the reasons for the following responses as they apply to the Loss of Intermediate Range Nuclear Instrumentation: (CFR 41.5,41.10 / 45.6 / 45.13)

Termination of startup following loss of intermediate range instrumentation ....

Given the following on Unit 2:

- A reactor start-up is being performed per OP/2/A/6100/003 (CONTROLLING PROCEDURE FOR UNIT OPERATION)
- Reactor power is $7X10^{-6}$ % (IR)

Subsequently,

- IR detector N36 fails low

Based on the conditions above, reactor start-up to the POAH ___(1)___ continue.

At the current power level, source range instrumentation ___(2)___ required to be OPERABLE.

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

A. 1. can
   2. is

B. 1. can NOT
   2. is

C. 1. can
   2. is NOT

D. 1. can NOT
   2. is NOT

General Discussion

Per the initial conditions, reactor power is slightly below the P-6 setpoint. Therefore, the actions in condition H (IR) of TS 3.3.1 are applicable. Condition H requires that the inoperable IR channel be returned to Operable prior to increasing thermal power to greater than P-6.

Tech. Spec 3.3.1 Table-1 requires two source range channels to be operable in mode 2 below P-6.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1is plausible because the applicant may conclude reactor power is above the P-6 setpoint and this would be the correct action if one IR channel failed between P-6 and P-10.

Part 2 is correct.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1is plausible because the applicant may conclude that reactor power is above the P-6 setpoint and this would be the correct action if one IR channel failed between P-6 and P-10.

Part 2 is plausible because the applicant may conclude that reactor power is above the P-6 setpoint and this would be the correct answer because the SR instrumentation is not required to be operable in mode 2 above the P-6 setpoint.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the applicant may conclude that reactor power is above the P-6 setpoint and this would be the correct answer because the SR instrumentation is not required to be operable in mode 2 above the P-6 setpoint.

Basis for meeting the KA

K/A is matched because the applicant must know the reason why the startup must be stopped (or NOT stopped) after the Intermediate Range failure to arrive at the correct answer.

NOTE: This K/A could not be matched by DIRECTLY asking the reason that the startup has to be terminated as any possible distracters would not be plausible. Therefore, the reason for termination had to be asked indirectly.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to perform more than one mental process. The applicant must first analyze the conditions in the stem and determine unit mode and whether power is greater than or less than the P-6 setpoint, then apply TS 3.3.1 actions based on those conclusions.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
T.S. 3.3.1 (Instrumentation) condition F, G, H and I and Table 3.3.1-1
Lesson Plan OP-MC-IC-ENB Rev 29A

LEARNING OBJECTIVES:
OP-MC-IC-IPE Objective 14

Student References Provided

MNS ILT 18-1 SRO NRC Examination **QUESTION 61** 61 **B**

APE033 AK3.01 - Loss of Intermediate Range Nuclear Instrumentation

Knowledge of the reasons for the following responses as they apply to the Loss of Intermediate Range Nuclear Instrumentation: (CFR 41.5,41.10 / 45.6 / 45.13)

Termination of startup following loss of intermediate range instrumentation ....

Remarks/Status
This question has been selected to send to Chief Examiner for early 401-9 review for KA match. SLM 06/26/17 Early 401-9 Review Comments - ENHANCEMENT APE033AK3.01 The as submitted question has partially correct answer in C/D 2) as written the IR could still actuate the trip logic 1/1. Add that - IR detector N36 has failed low Reword question 1)Is SAT as written 2)Recommend: At the current power level, the source range instrument IS/IS NOT required to be OPERABLE Q61 will be S with the above enhancements FACILITY RESPONSE: Made changes based on CE recommendations. SLM 8/17/17

MNS ILT 18-1 SRO NRC Examination **QUESTION 62** 62 **D**

APE061 AK1.01 - Area Radiation Monitoring (ARM) System Alarms

Knowledge of the operational implications of the following concepts as they apply to Area Radiation Monitoring (ARM) System Alarms: CFR 41.8 / 41.10 / 45.3)

Detector limitations ....

Given the following on Unit 1:

- A SGTL has occurred in the 1A S/G
- The crew has implemented AP-10 (NC SYSTEM LEAKAGE WITHIN THE CAPACITY OF BOTH NV PUMPS) Case 1 (S/G TUBE LEAKAGE)
- Unit is at 35% RTP and lowering

1EMF-71 (S/G A LEAKAGE) determines SG tube leak rate by monitoring ____(1)____ activity in the Main Steam lines.

Based on the conditions above, 1EMF-71 ____(2)____ be used at this time to determine the SG tube leak rate.

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

A. 1. gross
2. will

B. 1. gross
2. will NOT

C. 1. N-16
2. will

D. 1. N-16
2. will NOT

General Discussion

EMF's 71-74 monitor energy levels associated with N-16 which is a radioactive isotope present in the Reactor Coolant System. The presence of the N-16 isotope in the SM headers is indication that a primary to secondary leak exists.
Below 40% power, the transport time is so long that the majority of the N-16 has decayed during transport.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1EMF-24 (Steam Line Monitor) detects gross activity and is used in E-3 (SGTR) to aid in determining the affected S/G.

Part 2 is plausible because 1EMF-71 is accurate and would be used to determine S/G leak rate if power was greater than 40%.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 1EMF-24 (Steam Line Monitor) detects gross activity and is used in E-3 (SGTR) to aid in determining the affected S/G.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 1EMF-71 is accurate and would be used to determine S/G leak rate if power was greater than 40%.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate knowledge of which type of radiation is used by certain Area Monitors, the operational implications of this and the detector limitations (at what power level can they be used).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	ILT41 ONS NRC Q64 (Bank 5666)

Development References

REFERENCES:
Lesson Plan OP-MC-WE-EMF (Radiation Monitoring System) Rev 39 Section 2.2.3 and 2.2.4

LEARNING OBJECTIVES:
OP-MC-WE-EMF Objective 2

Student References Provided

APE061 AK1.01 - Area Radiation Monitoring (ARM) System Alarms

Knowledge of the operational implications of the following concepts as they apply to Area Radiation Monitoring (ARM) System Alarms: CFR 41.8 / 41.10 / 45.3)

Detector limitations ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "D". SLM 03/28/17.

APE067 AA1.05 - Plant Fire On Site

Ability to operate and / or monitor the following as they apply to the Plant Fire on Site: (CFR 41.7 / 45.5 / 45.6)

Plant and control room ventilation systems ....

Given the following on Unit 1:

- A LOCA has occurred
- The VE system is in operation
- HVAC Annunciator OAD-12, F/3 (1A VE FILTER FIRE) is received
- Filter temperature is 350°F and rising

Based on the conditions above,

1) 1A VE Fan _______.

2) an operator will be dispatched to _______.

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

A. 1. must be manually tripped
2. manually OPEN the Mulsifyre RF isolation valve

B. 1. must be manually tripped
2. verify automatic actuation of the Mulsifyre RF deluge system

C. 1. has automatically tripped
2. manually OPEN the Mulsifyre RF isolation valve

D. 1. has automatically tripped
2. verify automatic actuation of the Mulsifyre RF deluge system

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General Discussion

The VE fans will trip if any of eight Carbon Bed (charcoal filter) fire detection temperatures switches indicate temperatures above 325°F. This also generates a HVAC Panel alarm (VE FILTER FIRE - > 325°F). If the fans are not running they will not start until the fire detection signal clears.

Per annunciator response for OAD-12, F/3:
Unlock and open: 1RF-800 (1A Annulus Ventilation Filter Mulsifyre RF Isol)
(767' JJ54) and 1RF-1111 (1A Annulus Ventilation Filter Mulsifyre RF Isol)
(767' JJ54)

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the fan has to be secured based on the temperature in the stem and the applicant may conclude this is only performed after validating conditions.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the fan has to be secured based on the temperature in the stem and the applicant may conclude this is only performed after validating conditions.

Part 2 is plausible because many components in the plant that are protected by mulsifyres are actuated automatically.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because many components in the plant that are protected by mulsifyres are actuated automatically.

Basis for meeting the KA

K/A is matched because applicant demonstrates the ability to operate VE system components as required in response to a VE system filter fire.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2007 MNS NRC Q63 (Bank 3584)

Development References

REFERENCES:
OP-MC-CNT-VE Rev 28
OP/0/A/6100/010 P Rev 20

LEARNING OBJECTIVES:
OP-MC-CNT-VE Objective 8

Student References Provided

APE067 AA1.05 - Plant Fire On Site
Ability to operate and / or monitor the following as they apply to the Plant Fire on Site: (CFR 41.7 / 45.5 / 45.6)
Plant and control room ventilation systems ....

Remarks/Status
Rearranged answers form original bank question, correct answer is now "C". SLM 04/17/17.

WE10 2.1.23 - Natural Circulation with Steam Void in Vessel with/without

WE10 GENERIC

Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)

In accordance with ES-0.3 (NATURAL CIRCULATION COOLDOWN WITH STEAM VOID IN VESSEL),

1) when it is desired to restart an NCP, preference is to start the ________ NCP <u>FIRST</u>.

2) when establishing required Pzr level for cooldown and depressurization, charging flow must be maintained less than a MAXIMUM of ________ GPM.

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

A. 1. A
   2. 155

B. 1. A
   2. 200

C. 1. B
   2. 155

D. 1. B
   2. 200

General Discussion

Per ES-0.3,
preference should be given to running B NC pump to provide Pzr spray capability. If B NC pump is not available, running A NC pump along with one or two additional NC pumps may be required for adequate spray.

Control charging and letdown as necessary to restore Pzr level between 25% (50% ACC) and 35% (60% ACC), while maintaining charging flow less than 200 GPM.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the "A" NC pump is the second NC pump of choice as described by the note in ES-0.3.

Part 2 is plausible because 155 GPM is the maximum flowrate allowed through the Regen HX during Normal/Start Up/Shut Down operation.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the "A" NC pump is the second NC pump of choice as described by the note in ES-0.3.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 155 GPM is the maximum flowrate allowed through the Regen HX during Normal/Start Up/Shut Down operation.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate knowledge of specific system and integrated knowledge of ES-0.3(Natural Circulation Cooldown with Steam Void in Vessel).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

REFERENCES:
ES-0.3 (Natural Circulation Cooldown With Steam Void in the Vessel) Rev 14

LEARNING OBJECTIVES:
OP-MC-EP-E0 Objective 5

Student References Provided

WE10 2.1.23 - Natural Circulation with Steam Void in Vessel with/without
WE10 GENERIC
Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)

Remarks/Status

WE13 EK3.2 - Steam Generator Overpressure

Knowledge of the reasons for the following responses as they apply to the (Steam Generator Overpressure)
(CFR: 41.5 / 41.10, 45.6, 45.13)
Normal, abnormal and emergency operating procedures associated with (Steam Generator Overpressure).

Given the following on Unit 1:

- The Unit is in Mode 3
- 1B S/G pressure is 1235 PSIG
- 1B S/G NR level is 95%
- 1A, 1C and 1D S/G pressures are all 850 PSIG and 50% NR level
- All feedwater isolation status lights are DARK
- The crew has implemented FR-H.2 (RESPONSE TO S/G OVERPRESSURE)

In accordance with FR-H.2, based on the conditions above, which ONE (1) of the following is the FIRST action required to be taken AND the reason for this action?

A. Open the 1B S/G PORV;
to immediately reduce pressure in the 1B S/G

B. Manually isolate feedwater to the 1B S/G;
to prevent further pressurization of the 1B S/G

C. Dump steam from the 1B S/G using U1 TDCA pump;
to immediately reduce pressure in the 1B S/G

D. Dump steam from the 1B S/G using the 1B MSIV bypass valve;
to immediately reduce pressure in the 1B S/G

General Discussion

With the indications given, the pressure in the 1B S/G is 1235 PSIG which is greater than the entry criteria for FR H.2 (Response to S/G Overpressure) of 1225 PSIG. The first action is this procedure is to "check the feedwater isolation status lights for the affected S/G LIT", if not the operator is directed to isolate the feedwater per Enc. 1.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because this would quickly reduce pressure in the affected S/G and would be the correct action if the FWI stat lights were lit and S/G NR level were less than 92%.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because dumping steam to the CA pump turbine would quickly relieve pressure in the S/G and placing the TD CA pump in service is an action used in FR-H.2 to lower the pressure.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because dumping steam using the MSIV bypass would quickly relieve pressure in the S/G and opening the affected S/G MSIV bypass is an action used in FR-H.2 to lower the pressure.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate knowledge of the reasons for actions taken in emergency procedure FR-H.2.

Basis for Hi Cog

This is a higher cognitive level question because the applicant must perform a level of analysis concerning the given indications and determine the resulting effect and predict a response.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2011 MNS NRC Q63 (Bank 4416)

Development References

REFERENCES:
FRP H.2 (Response to S/G Overpressure) Rev. 3

OBJECTIVES:
OP-MC-EP-FRH Objectives 3 & 4

Student References Provided

WE13 EK3.2 - Steam Generator Overpressure

Knowledge of the reasons for the following responses as they apply to the (Steam Generator Overpressure)
(CFR: 41.5 / 41.10, 45.6, 45.13)

Normal, abnormal and emergency operating procedures associated with (Steam Generator Overpressure).

Remarks/Status

Rearranged answers form original bank question, correct answer is now "B". SLM 03/29/17.

GEN2.1 2.1.1 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of conduct of operations requirements. (CFR: 41.10 / 45.13)

In accordance with AD-OP-ALL-1000 (CONDUCT OF OPERATIONS),

1) a reactor operator is required to perform an end to end control panel walk-down ________.

2) control panel walk-downs ________ required to be documented in the Narrative Log.

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

A. 1. once per shift at mid shift
   2. are

B. 1. once per shift at mid shift
   2. are NOT

C. 1. every two hours
   2. are

D. 1. every two hours
   2. are NOT

General Discussion

In accordance with AD-OP-ALL-1000 (Conduct of Ops):

A reactor operator shall perform an end to end control panel walk-down every two hours and inform the CRS when complete.

The walk down shall be documented in the Narrative Logbook.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the requirement for Control Room Supervisor control panel walk-downs.

Part 2 is correct and therefore plausible.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is the requirement for Control Room Supervisor control panel walk-downs.

Part 2 is plausible because there are numerous evolutions that happen in the Control Room that are NOT required to be document in the Narrative Log. For example, short-term reliefs are not required to be documented in the Narrative Log.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct and therefore plausible.

Part 2 is plausible because there are numerous evolutions that happen in the Control Room that are NOT required to be document in the Narrative Log. For example, short-term reliefs are not required to be documented in the Narrative Log.

Basis for meeting the KA

K/A is matched because the applicant must demonstrate knowledge of the administrative requirements for control panel walk-downs per AD-OP-ALL-1000 (Conduct of Operations).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

REFERENCES:
AD-OP-ALL-1000 (Conduct of Operations) Rev 7

LEARNING OBJECTIVES:
OP-MC-ADM-ADM Objective 57

Student References Provided

GEN2.1 2.1.1 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of conduct of operations requirements. (CFR: 41.10 / 45.13)

Remarks/Status

GEN2.1 2.1.44 - GENERIC - Conduct of Operations

Conduct of Operations

Knowledge of RO duties in the control room during fuel handling, such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation. (CFR: 41.10 / 43.7 / 45.12)

Given the following on Unit 2:

- Unit is in Mode 6
- Core off-load is in progress
- 2EMF-42 (FUEL BLDG VENT HI RAD) Trip 2 is in alarm
- 2EMF-4 (SPENT FUEL BLDG REFUEL BRDG) Trip 2 is in alarm

In accordance with the annunciator response procedure for 2EMF-42 HI RAD,

1) the control room operators will ensure the _______.

2) evacuation of the Fuel Building _______ required.

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

A. 1. VF Exhaust Bypass Damper is CLOSED
   2. is

B. 1. VF Exhaust Bypass Damper is CLOSED
   2. is NOT

C. 1. VF Supply and Exhaust fans have tripped
   2. is

D. 1. VF Supply and Exhaust fans have tripped
   2. is NOT

General Discussion

In accordance with annunciator response for EMF-42 Hi Rad,
the first immediate action is to ensure the VF Exhaust Bypass damper is closed and the third immediate action is to evacuate personnel from building unless the alarm was set off by purging a Spent Fuel Cask.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the building would not be evacuated had the alarm been due to purging a spent fuel cask.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because had the radiation alarms been in the reactor building, EMF compensatory actions would secure supply and exhaust fans for ventilation systems such as VP and VQ.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because had the radiation alarms been in the reactor building, EMF compensatory actions would secure supply and exhaust fans for ventilation systems such as VP and VQ.

Part 2 is plausible because the building would not be evacuated had the alarm been due to purging a spent fuel cask.

Basis for meeting the KA

K/A is matched because the applicant is required to demonstrate knowledge of RO duties in the control room as it applies to responding to alarms from the fuel handling area.

Basis for Hi Cog

Basis for SRO only

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

Development References

REFERENCES:
OP/2/A/6100/010 R (Annunciator Response for Panel 2RAD-2) Rev. 35

LEARNING OBJECTIVES:
NONE

Student References Provided

GEN2.1 2.1.44 - GENERIC - Conduct of Operations

Conduct of Operations

Knowledge of RO duties in the control room during fuel handling, such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation. (CFR: 41.10 / 43.7 / 45.12)

Remarks/Status

GEN2.2 2.2.35 - GENERIC - Equipment Control
Equipment Control
Ability to determine Technical Specification Mode of Operation. (CFR: 41.7 / 41.10 / 43.2 / 45.13)

Given the following on Unit 1:

- NC system temperature is 85°F
- All Reactor Head closure bolts are fully tensioned

In accordance with Technical Specification Definitions, which ONE (1) of the following describes the current plant MODE and the Reactivity Condition requirements which apply?

A. MODE 5, K_{eff} must be less than 0.99

B. MODE 5, K_{eff} must be less than 0.95

C. MODE 6, K_{eff} must be less than 0.99

D. MODE 6, K_{eff} must be less than 0.95

General Discussion

MODE 5 is defined as <200°F with Keff <.99 and all reactor vessel head closure bolts fully tensioned. MODE 6 is defined as <200°F with at least one reactor vessel head closure bolt not fully tensioned. There are no reactivity condition requirements defined for MODE 6 in the MODE table in Tech Specs. However, the COLR requires that the reactivity condition requirement for MODE 6 is <0.95.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because this is the correct MODE. However, the required Keff is <0.99. Less than 0.95 is plausible as this is the required reactivity condition for MODE 6 described in the COLR.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Plausible because if one reactor vessel head bolt was not fully tensioned Mode 6 would be correct. Keff less than .99 is plausible as that is the required reactivity condition for Mode 5.

Answer D Discussion

NCORRECT: See explanation above.

PLAUSIBLE:
Plausible because if one reactor vessel head bolt was not fully tensioned Mode 6 would be correct. Also, the COLR requires Keff to be less than 0.95 for MODE 6.

Basis for meeting the KA

K/A is met because the applicant must evaluate a given set of conditions and determine the plant MODE and additional conditions which apply to that MODE.

Basis for Hi Cog

This is a higher cognitive level question because the applicant must associate three pieces of information to determine the correct answer. The candidate must recall from memory the general requirements for MODE 5 & 6 from the table in Tech Specs. The applicant must then determine from the given information that all reactor vessel head bolts are fully tensioned applying a note in the TS Table to differentiate between MODE 5 and MODE 6. The applicant must then recall the reactivity condition which applies to that MODE.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2009 MNS NRC RO Retake Q70 (Bank 2270)

Development References

REFERENCES:
OP-MC-ADM-TS (Technical Specifications) Rev 25A

LEARNING OBJECTIVES:
OP-MC-ADM-TS Objective 4

Student References Provided

GEN2.2 2.2.35 - GENERIC - Equipment Control
Equipment Control
Ability to determine Technical Specification Mode of Operation. (CFR: 41.7 / 41.10 / 43.2 / 45.13)

Remarks/Status

Rearranged answers form original bank question, correct answer is now "A". SLM 04/05/17.

GEN2.2 2.2.41 - GENERIC - Equipment Control
Equipment Control
Ability to obtain and interpret station electrical and mechanical drawings. (CFR: 41.10 / 45.12 / 45.13)

Based on drawing MCFD-2580-01.00 (FLOW DIAGRAM OF STEAM GENERATOR BLOWDOWN RECYCLE SYSTEM),

1) the **NORMAL** vent path for the Steam Generator Blowdown Blowoff Tank is to ________.

2) the grid location for the Steam Generator Blowdown **Flow Control** valve for 2D Steam Generator is ________.

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

REFERENCE PROVIDED

A. 1. "D" Heater Extraction
   2. F-10

B. 1. "D" Heater Extraction
   2. I-9

C. 1. the Condenser
   2. F-10

D. 1. the Condenser
   2. I-9

General Discussion

The normal vent flowpath for the SG Blowdown Blowoff Tank as shown on MCFD-2580-01.00 is to "D" Heater Extraction.

The 2D SG Blowdown Flow Control valve (2BB-126) is located at coordinates I-9.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct and therefore plausible.

Part 2 of the question is plausible if the applicant confuses the Blowdown Flow Control Valves with the Blowdown Isolation Valves. The blowdown isolation valves are just upstream of the blowdown flow control valves.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible the Condenser is an alternate vent flowpath for the SG BB Blowoff Tank.

Part 2 of the question is plausible if the applicant confuses the Blowdown Flow Control Valves with the Blowdown Isolation Valves. The blowdown isolation valves are just upstream of the blowdown flow control valves.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible the Condenser is an alternate vent flowpath for the SG BB Blowoff Tank.

Part 2 is correct and therefore plausible.

Basis for meeting the KA

The K/A is matched because it requires the applicant to interpret an MNS Flow Diagram to determine characteristics of the Steam Generator Blowdown Recycle System.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First the applicant must evaluate the SG BB Blowoff tank vent flowpath to determine which path is the normal vent.

Second, the applicant must recall from memory some of the component symbols used in McGuire Flow Diagrams.

Finally, the applicant must analyze the Flow Diagram provide to locate the SG Blowdown Flow Control valves to determine and compare that to the recall knowledge of McGuire Flow Diagram symbols to determine the valve type.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

REFERENCES:
Lesson Plan OP-MC-EL-FDS (Plant Drawings) Rev. 11
MCFD-2580-01.00 (Flow Diagram of Steam Generator Blowdown Recycle System)

LEARNING OBJECTIVES:
OP-MC-EL-FDS Objective 8
OP-MC-EL-FDS Objective 12

Student References Provided

MCFD-2580-01.00, Steam Generator Blowdown Recycle System

MNS ILT 18-1 SRO NRC Examination **QUESTION 69** 69 **B**

GEN2.2 2.2.41 - GENERIC - Equipment Control
Equipment Control
Ability to obtain and interpret station electrical and mechanical drawings. (CFR: 41.10 / 45.12 / 45.13)

Remarks/Status

GEN2.2 2.2.6 - GENERIC - Equipment Control

Equipment Control

Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13)

In accordance with AD-HU-ALL-004 (PROCEDURE AND WORK INSTRUCTION USE AND ADHERENCE),

1) if it is determined that an in progress PT can NOT be performed as written due to an obvious typographical error, the CRS _______ allowed to authorize a Pen and Ink change to the PT.

2) the type of procedure being performed (PT) _______ require a Procedure Revision Request be submitted as soon as time permits.

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

A. 1. is
   2. does

B. 1. is
   2. does NOT

C. 1. is NOT
   2. does

D. 1. is NOT
   2. does NOT

General Discussion

Per AD-HU-ALL-0004 Step 5.14.6.a.1, If the procedure or work instruction problem is an obvious typographical or editorial error as defined in Attachment 2, Field Editorial Corrections, then do not make a formal procedure revision prior to completing the procedure or work instruction. Before continuing and with supervisor approval; correct the error, initial and date, and document the reason along with supervisor approval. As soon as time permits, initiate a procedure revision request (PRR) or model work instruction change request.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant confuses a Temporary Test (TT) procedure with a PT. Temporary Test proceudures do NOT require a PRR.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude that the authority to change an obvious error lies with the user, and that it is only required to keep supervision informed of field changes made during procedure use..

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude that the authority to change an obvious error lies with the user, and that it is only required to keep supervision informed of field changes made during procedure use..

Part 2 is plausible if the applicant confuses a Temporary Test (TT) procedure with a PT. Temporary Test proceudures do NOT require a PRR.

Basis for meeting the KA

K/A is matched because the operator must demonstrate knowledge of the process for making changes to procedures, specifically field changes to an in-progress procedure.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2015 RNP AUDIT (BANK 6272)

Development References

REFERENCES:
AD-HU-ALL-0004 (Procedure and Work Instruction Use and Adherence) Rev 8, Step 5.14.6.a.1

LEARNING OBJECTIVES:
NONE

Student References Provided

GEN2.2 2.2.6 - GENERIC - Equipment Control
Equipment Control
Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13)

Remarks/Status
Rearranged answers form original bank question, correct answer is now "A". SLM 04/12/17.

GEN2.3 2.3.15 - GENERIC - Radiation Control

Radiation Control

Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.12 / 43.4 / 45.9)

Regarding the use of Electronic Dosimeters (ED):

- If a DOSE alarm setpoint is exceeded, the alarm will __(1)___.
- If a DOSE RATE alarm setpoint is exceeded, the alarm will __(2)__.

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

A. 1. clear after pressing and holding the Dose/Dose Rate toggle button on the ED for 10 seconds
   2. clear when the dose rate drops below the alarm setpoint

B. 1. clear after pressing and holding the Dose/Dose Rate toggle button on the ED for 10 seconds
   2. not clear until the ED is reset

C. 1. not clear until the ED is reset
   2. clear when the dose rate drops below the alarm setpoint

D. 1. not clear until the ED is reset
   2. not clear until the ED is reset

General Discussion

This information comes from NSD 507 (Radiation Protection). This is not taught during Generic Rad Worker Training. It is covered during Admin Procedure training in Operator License training.

Electronic Dosimeter (ED) Alarms

ED Dose and Dose Rate Alarms - EDs are programmed during log-on to alarm at a predetermined dose and dose rate. The alarm setpoints are specified by the RWP. The alarm setpoints can be viewed during EDC log-on and they are also located on the RWP. Set points can also be viewed any time after logging on to EDC by pressing and holding the Dose/Dose Rate toggle switch on the ED for 10 seconds. The alarm setpoints and stay time will be displayed and then will automatically return to dose monitoring mode. The dose alarm consists of an audible alarm and a visual alarm. If the dose setpoint is exceeded the dose alarm will sound and a red light will flash on the ED. The audible alarm and the flashing red light will not stop until the ED is reset. The dose rate alarm automatically resets when the dose rate drops below the alarm setpoint. The ED display will indicate the type of alarm. The ED is also programmed to alarm when it is activated for 16 hours or when RWP specific stay time is exceeded.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible because the 10 seconds is associated with using the DOSE/DOSE RATE toggle switch to view the alarm setpoints.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible because the 10 seconds is associated with using the DOSE/DOSE RATE toggle switch to view the alarm setpoints.

Part 2 is plausible because this is how the dose alarm works.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is correct.

Part 2 is plausible because that is how the DOSE alarm works.

Basis for meeting the KA

The KA is matched because the applicant must be familiar with the operation of personnel monitoring equipment (i.e. electronic dosimeters).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2012 MNS NRC Exam Q71 (Bank 5756)

Development References

REFERENCES:
PD-RP-ALL-0001 (Radiation Worker Responsibilities) Rev. 7

Student References Provided

MNS ILT 18-1 SRO NRC Examination **QUESTION 71** | 71 | **C**

LEARNING OBJECTIVES:
OP-MC-RAD-RP Objective 38

GEN2.3 2.3.15 - GENERIC - Radiation Control

Radiation Control

Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.12 / 43.4 / 45.9)

Remarks/Status
Rearranged answers from previous bank version of the question so that it would not look like the same question. HCF 03-22-2017

GEN2.3 2.3.7 - GENERIC - Radiation Control

Radiation Control

Ability to comply with radiation work permit requirements during normal orabnormal conditions. (CFR: 41.12 / 45.10)

Given the following on Unit 2:

- The Unit has experienced several fuel pin failures
- You have been directed to tag out the 2A NI pump
- The 2A NI pump room general area is 300 mREM/hr
- To reach the 2A NI pump room you must transit through a 3 REM/hr high radiation area for 2 minutes and return via the same route
- Your current accumulated annual dose is 950 mREM
- In accordance with your RWP, you must not exceed your ALERT exposure limit

The MAXIMUM allowable stay-time in the 2A NI pump room for hanging the tagout to comply with the RWP requirement that you do NOT exceed your ALERT exposure limit before exiting the RCA is ________minutes.

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

A. 90

B. 110

C. 130

D. 150

General Discussion

The ALERT flag exposure limit is 80% of the Duke Annual Administrative Exposure limit. Therefore, the limit is:

2000 mREM admin limit x 0.8 = 1600 mREM.

The transit exposure is:
3 REM/hr x 1000 mREM / REM - 3000 mREM/hr x 1 hr/60 min = 50 mREM/min x 4 min = 200 mREM

The allowable exposure before reaching the ALERT flag exposure limit is equal to the Total ALERT limit minus the transit exposure and the total annual exposure to date.

Therefore:
(1600 mRem - 200 mREM - 950 mREM = 450 mREM)

Therefore, since the general area dose rates in the 2A NI pump room are 300 mREM/hr, the allowable stay time is:

300 mREM/hr x 1 hr/60 min = 5 mREM/min AND 450 mREM / (5 mREM / min) = 90 minutes.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant only uses the travel time for one direction. If that were the case, they would calculate that they have an extra 100 mREM of exposure available (50 mREM/min exposure during travel time) and would determine that 110 minutes is the allowable stay time.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant uses the EXLUDE exposure limit but and then calculates everything correctly. By using the EXLUDE exposure limit the would conclude that their total exposure limit would be 1800 mREM as opposed to 1600 mREM. With an extra 200 mREM of available exposure, they would calculate that their stay time is 130 minutes.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant uses the EXCLUDE exposure limit and only calculates the travel time in one direction. By using the EXLUDE exposure limit the would conclude that their total exposure limit would be 1800 mREM as opposed to 1600 mREM. By only calculating the travel time in one direction they would calculate the travel time exposure as 100 mREM as opposed to 200 mREM. In total, they would then calculate that they have 750 mREM of available exposure as opposed to 450 mREM and the allowable stay time would be 150 minutes.

Basis for meeting the KA

The KA is matched because the applicant must have knowledge of the ALERT exposure limit prior to determining stay-time in order to comply with RWP requirements.

Basis for Hi Cog

This is a higher cognitive level question because the applicant must calculate the stay-time based on given information.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
REFERENCES: Lesson Plan OP-MC-RAD-RP (Radiation Protection) Rev. 6 LEARNING OBJECTIVES: OP-MC-RAD-RP Objectives 22 & 29 References: 1) Fleet ALARA manual (NSD 507)

Student References Provided

GEN2.3 2.3.7 - GENERIC - Radiation Control

Radiation Control

Ability to comply with radiation work permit requirements during normal orabnormal conditions. (CFR: 41.12 / 45.10)

Remarks/Status

GEN2.4 2.4.16 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, abnormal operating procedures, and severe accident management guidelines. (CFR: 41.10 / 43.5 / 45.13)

Given the following on Unit 1:

- Valid reactor trip annunciator is lit
- All Rod Bottom Lights are lit
- Intermediate Range Startup Rate is positive
- Power Ranges indicate 6%
- All 6900v busses are deenergized
- 1ETA is deenergized
- 1B D/G is OFF
- Safety Injection status light is lit

Which ONE (1) of the following indicates the procedure that will have the HIGHEST priority for the conditions above?

A. ES-0.0 (REDIAGNOSIS)

B. ECA-0.0 (LOSS OF ALL AC POWER)

C. E-0 (REACTOR TRIP OR SAFETY INJECTION)

D. FR-S.1 (RESPONSE TO NUCLEAR POWER GENERATION/ATWS)

General Discussion

Per the ECA-0 Background Document:

"The loss of all AC power procedures are unique within the EPs. With the exception of these procedures, all other EPs are written on the premise that at least one AC emergency bus is energized and associated equipment can be powered from the energized AC emergency bus. Consequently, the guidance provided in other EPs is not applicable following the loss of all AC power.

Thus, ECA-0.0, Loss of All AC Power, has priority over all other EPs."

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because ES-0.0 may be entered at any time at the discretion of the CRS. However, for the conditions given the CRS would be directed to return to the procedure and step in effect.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
E-0 is plausible because this is the procedure that will typically be entered FIRST any time the EOPs are entered. And, while ECA-0.0 may be entered directly, in most cases the CRS will enter E-0 first and then transition to ECA-0.0 when after diagnosis that neither of the 4160 VAC busses have power.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
FR-S.1 is plausible because it is the highest priority Functional Restoration Procedure and indications are given that would result in transition to FR-S.1 were it not for the loss of power.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge of the implementation hierarchy of the Emergency Procedures.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant to diagnose the conditions given to determine the status of the plant and related to completion of automatic actions and the ability to perform the actions of the Eps.

The applicant must then recall from memory the implementation hierarchy of the EPs and associate that to the analyzed conditions to determine which Emergency Procedure has the highest priority.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2006 CNS SRO NRC Examination NRC Q74 (Bank 680)

Development References

REFERENCES:
ECA-0 (Loss of All AC Power) Background Document Rev. 26

LEARNING OBJECTIVES:
OP-MC-ECA-0 Objective 2

Student References Provided

GEN2.4 2.4.16 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, abnormal operating procedures, and severe accident management guidelines. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
Rearranged answers from bank version of question so that it would not appear like CNS bank question. HCF

GEN2.4 2.4.17 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of EOP terms and definitions. (CFR: 41.10 / 45.13)

Given the following on Unit 1:

- The unit is at 100% RTP

Subsequently,

- A reactor trip and Safety Injection occur
- Main Steam and ALL feedwater is isolated to all SGs
- TD CA pump is running
- All SG NR level instruments for each S/G agree and indicate as follows:

1A	1B	1C	1D
80% and rising slowly	0%	38% and lowering slowly	35% and lowering slowly

Which ONE of the following describes the condition of the SGs?

A.

1A	1B	1C	1D
Ruptured	Faulted	Intact	Intact

B.

1A	1B	1C	1D
Faulted	Ruptured	Ruptured	Intact

C.

1A	1B	1C	1D
Ruptured	Faulted	Ruptured	Intact

D.

1A	1B	1C	1D
Faulted	Ruptured	Intact	Intact

General Discussion

After the reactor trip and safety injection main steam and all feedwater has been isolated. The fact that SG 1A is at 80% level indicates that a SGTL or SGTR has occurred in that SG causing level to increase to 80% (ruptured).

1B SG at 0% level indicates that the SG is faulted. The faulted SG would not allow level to increase in the SG even though it is being supplied Auxiliary Feedwater.

1C SG level decreasing slowly is due to it providing steam supply to the TD CA pump.

1D SG level is lowering slowly due to cooldown of the system as the result of the Safety Injection and feeding all S/Gs.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE: The 1A SG being faulted is plausible if the applicant confuses difference between a ruptured and faulted SG and how to diagnose each.

1B SG being ruptured is plausible if the applicant does not understand the difference between a ruptured and faulted SG and how to identify them.

1C SG being ruptured is plausible if the applicant does not understand the difference between a ruptured and faulted SG and how to identify them.

The 1D SG being intact is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE: The 1A SG being ruptured is correct.

1B SG being faulted is correct.

1C SG being ruptured is plausible if the applicant does not understand the difference between a ruptured and faulted SG and how to identify them.

The 1D SG being intact is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE: The 1A SG being faulted is plausible if the applicant confuses difference between a ruptured and faulted SG and how to diagnose each.

1B being ruptured is plausible if the applicant does not understand the difference between a ruptured and faulted SG and how to identify them.

The 1C SG being intact is correct.

The 1D SG being intact is correct.

Basis for meeting the KA

This K/A is met because the applicant is required to recall the definitions of terms associated with implementation of EOPs (ruptured, faulted, intact) and understand how to diagnose plant conditions relative to those terms.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must recall from memory the definitions of rupture, faulted, and intact SGs from OMP 4-3.

Next, the applicant must analyze the conditions given and associated the information obtained by analysis with the recalled memory to determine the correct response.

Basis for SRO only

MNS ILT 18-1 SRO NRC Examination **QUESTION 74** 74 **A**

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2014 MNS NRC Exam Q46 (Bank 5871)

Development References
REFERENCES: OMP 4-3 (Use Of Emergency And Abnormal Procedures And FLEX Support Guidelines) Rev 45 Section 7.16 (Selected Definitions) LEARNING OBJECTIVES: OP-MC-ADM-ADM Objective 6

Student References Provided

GEN2.4 2.4.17 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

Knowledge of EOP terms and definitions. (CFR: 41.10 / 45.13)

Remarks/Status
Rearranged answers from previous bank version of the question so that it would not appear the same as the bank question. HCF 03-21-2017

GEN2.4 2.4.28 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of procedures relating to a security event (non-safeguards information). (CFR: 41.10 / 43.5 / 45.13)

In accordance with AP-47 (SECURITY EVENTS),

1) a confirmed unexploded bomb on site _______ one of the events for which AP-47 provides operator actions.

2) the information contained in AP-47 is designated as _______ information.

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

A. 1. is NOT
2. safeguards

B. 1. is NOT
2. proprietary

C. 1. is
2. safeguards

D. 1. is
2. proprietary

MNS ILT 18-1 SRO NRC Examination QUESTION 75 | 75 | **D**

General Discussion

Withhold from public disclosure under 10CFR2.390(d)

Answer A Discussion

Withhold from public disclosure under 10CFR2.390(d)

Answer B Discussion

Withhold from public disclosure under 10CFR2.390(d)

Answer C Discussion

Withhold from public disclosure under 10CFR2.390(d)

Answer D Discussion

Withhold from public disclosure under 10CFR2.390(d

Basis for meeting the KA

Withhold from public disclosure under 10CFR2.390(d

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References	Student References Provided
REFERENCES: AP-47 (Security Events)	

LEARNING OBJECTIVES:
OP-MC-AP-47 Objective 1

GEN2.4 2.4.28 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of procedures relating to a security event (non-safeguards information). (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

SYS006 2.2.37 - Emergency Core Cooling System (ECCS)

SYS006 GENERIC

Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Given the following on Unit 2:

- The 2A DG is started at 0800 for monthly surveillance (**Fast Start**)
- 15 minutes after the 2A DG is started, the 2B NV pump trips on overcurrent
- While the 2A DG is being unloaded, the diesel trips on Low Lube Oil pressure at 0900 due to a failure of the Engine Driven Lube Oil pump

In accordance with Tech Spec 3.8.1, AC SOURCES - OPERATING,

1) the LATEST time that 2A NV pump shall be declared INOPERABLE is by ________.

2) Surveillance SR 3.8.1.1 for offsite circuits shall be performed by ________.

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

A. 1. 1300
   2. 0900

B. 1. 1300
   2. 1000

C. 1. 1215
   2. 0900

D. 1. 1215
   2. 1000

General Discussion

In accordance with TS 3.8.1, redundant features supported by the DG must be declared inoperable within 4 hours of the DG becoming inoperable concurrent with the redundant feature being inoperable.

For this case, the B.2 condition comes into effect when the DG trips at 0900. Therefore, the 2A NV pump must be declared inoperable at 1300. It is plausible that the NV pump might be declared inoperable at 1215 since the DG trips are in service when the 2B NV pump trips at 0815.

Surveillance SR 3.8.1.1 must be performed within 1 hr of the DG becoming inoperable. Since the DG became inoperable at 0900, the surveillance must be performed by 1000. However, it is plausible to believe that the surveillance must be performed within 1 hr of the DG start if the applicant concludes that DG is declared INOPERABLE prior to the start (as it is on a Slow Start due to running the load limit all the way down). If that were the case, SR 3.8.1.1 would have to be performed at 0900.

Answer A Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is correct and therefore plausible.

Part 2 is plausible if the applicant concludes that the DG was inoperable at 0800 when it was started as this would be the case on a Slow Start.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is plausible If the applicant concludes that the DG was inoperable at the time it was started. Then the 2A NV pump would have to be declared INOPERABLE 4 hours from the time the 2B NV pump tripped as opposed to 4 hours from the time the DG tripped making this the correct time for declaring the 2A NV pump INOPERABLE.

Part 2 is plausible if the applicant concludes that the DG was inoperable at 0800 when it was started as this would be the case on a Slow Start.

Answer D Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is plausible If the applicant concludes that the DG was inoperable at the time it was started. Then the 2A NV pump would have to be declared INOPERABLE 4 hours from the time the 2B NV pump tripped as opposed to 4 hours from the time the DG tripped making this the correct time for declaring the 2A NV pump INOPERABLE.

Part 2 is correct.

Basis for meeting the KA

The KA is matched because it requires the applicant to evaluate a given set of conditions and based on that evaluation determine the operability (time it becomes inoperable) of safety related equipmant.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must recall from memory the requirements for offsite power sources and redundant features for TS 3.8.1. Then, the applicant must calculate the time required to declare the 2A NV pump INOPERABLE and complete SR 3.8.1.1.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):

1) Can the question be answered solely by knowing ≤1-hour TS/TRM Action? Part 2 of the question can be answered by knowing ≤1-hour TS action requirements and is therefore RO knowledge. However, Part 1 of the question cannot be answered by knowing ≤1-hour TS action requirements.

2) Can the question be answered solely by knowing the LCO/TRM information listed "above the line? " NO. This question cannot be answered with "above the line" knowledge.

3) Can the question be answered solely by knowing the TS safety limits? NO. The question is NOT related to TS Safety Limits.

4) Does the question involve one or more of the following for the TS, TRM, or ODCM:

- application of required actions (TS Section 3) and SRs (TS Section 4) in accordance with rules of application requirements (TS Section 1) YES. The applicant must have knowledge of the application of the TS 3.8.1 B.2 which is a 4 hour action statement.

- application of generic LCO requirements (LCO 3.0.1 through 3.0.7 and SR 4.0.1 through 4.0.4) NO.

- knowledge of TS bases that is required to analyze TS-required actions and terminology
NO. This question does NOT require knowledge of the TS bases.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References

REFERENCES:
TS 3.8.1, AC Sources - Operating
PT/2/A/4350/002A, DG 2A Operability Test Rev. 102

LEARNING OBJECTIVES:
OP-MC-DG-DG Objective 14

Student References Provided

SYS006 2.2.37 - Emergency Core Cooling System (ECCS)
SYS006 GENERIC
Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Remarks/Status

This question has been selected for early submittal. The concern is that the question may not strictly meet the KA at the SRO level. This first part of the question is a direct match for the K/A but is RO level knowledge. The second part of the question matches the KA at the SRO level. However, it does so indirectly. HCF 03/07/2017

Early 401-9 Review Comments - UNSAT (Partial)

SYS006 2.2.37

The submitted answer choice as selected has conflicting information, ie 2 right answers. The LCO Bases LCO states in part: Four accumulators are required to ensure that 100% of the contents of three of the accumulators will reach the core during a LOCA. This is consistent with the assumption that the contents of one accumulator spill through the break. If less than three accumulators are injected during the blowdown phase of a LOCA, the ECCS acceptance criteria of 10 CFR 50.46 (Ref. 3) could be violated. Therefore answer B is also correct.

The first part question is an RO job function

Recommendation to use submitted question 79 for this KA as it meets the KA as written with the following enhancement.

Reword question (79)

1)The LATEST time the 2A NV pump is required to be declared INOPERABLE by is 1300/1215

2)SAT

Q76 will be S with the above enhancements

Facility Response:
Replaced question 76 with question 79 as recommended by Chief Examiner and made recommended changes to question 79. HCF 08/16/17

SYS022 2.2.12 - Containment Cooling System (CCS)
SYS022 GENERIC
Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)

Given the following sequence of events on Unit 2:

- December 21, 2016 - PT/2/A/4450/006A (VX SYSTEM TRAIN 2A PERFORMANCE TEST) was last performed on the 2A CONTAINMENT AIR RETURN FAN (VX) to meet SR 3.6.11.1 (required every 92 days per the Surveillance Frequency Control Program)
- February 15, 2017 - Unit 2 entered MODE 5 to repair an NC system leak inside Containment
- February 25, 2017 - Unit 2 entered MODE 4 during a return to full power

Based on the conditions above, which ONE (1) of the following is the LATEST date that PT/2/A/4450/006A can be performed before the 2A VX Fan will become INOPERABLE?

REFERENCE PROVIDED

A. March 23, 2017

B. April 2, 2017

C. April 15, 2017

D. April 25, 2017

General Discussion

The required frequency for performance of PT/2/A/4450/006A is every 92 days. Since the test was performed on December 21, 2016, the next performance is due on March 23, 2017.

The equipment is not required to be declared inoperable unless the surveillance is not performed within 1.25 times the required frequency. This means that as long as PT/2/A/4450/006A is performed within 115 days of December 21, 2016, the 2A VX Fan need not be declared inoperable. This would mean that the 2A VX Fan would become INOPERABLE on April 15, 2017.

In this question, the applicant is presented with a situation where Unit 2 is in MODE 5 for 10 days. In MODE 5, Tech Spec 3.6.11 is NOT applicable. However, this does NOT stop the time clock for the required surveillance frequency. Therefore, the 2A V X Fan will still become INOPERABLE on April 15, 2017.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because March 23, 2017 is 92 days from the last performance of PT/2/A/4450/006A. If the applicant does not recall the "frequency x 1.25" allowance in Tech Specs, they would conclude that this is the correct choice.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant concludes that the required surveillance frequency clock stops when the unit is in a MODE where the Tech Spec is not applicable. If so, and the applicant does not recall the "frequency x 1.25" allowance in Tech Specs, they would add 10 days to the 92 day frequency requirement (e.g. 102 days) and determine that April 2, 2017 was the correct choice.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant concludes that the required frequency time clock stops when the Unit is in a MODE where the Tech Spec does not apply. So, with the "frequency x 1.25" allowance plus 10 days, the applicant would determine that the 2A VX Fan would become INOPERABLE at 125 days from the last performance (e.g. April 25, 2017).

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge related to applying TS Surveillance requirements to a Containment VX Fan which is part of the Containment Cooling System.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must recall from memory the Tech Spec Surveillance requirements related to Frequency. This includes the 1.25 times the frequency rule and the fact that entry into a MODE where the TS does not apply does not stop the clock for surveillance frequency requirements. Then, the applicant analyze the given sequence of event and determine, using the calendar, the date that the 2A VX fan becomes inoperable.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):

1) Can the question be answered solely by knowing ≤1-hour TS/TRM Action?
NO. This question is related to TS Surveillance requirements.

2) Can the question be answered solely by knowing the LCO/TRM information listed "above the line? "
NO. This question is NOT related to "above the line" TS knowledge.

3) Can the question be answered solely by knowing the TS safety limits?
NO. This question is NOT related to TS Safety Limits.

4) Does the question involve one or more of the following for the TS, TRM, or ODCM:

- application of required actions (TS Section 3) and SRs (TS Section 4) in accordance with rules of application requirements (TS Section 1)
YES. This question involves knowledge of TS Surveillance Frequency Requirements in TS Section 1.4 and SR 3.0.2.

- application of generic LCO requirements (LCO 3.0.1 through 3.0.7 and SR 4.0.1 through 4.0.4)
YES. This requires knowledge of application requirements contained in TS 3.0.2.

- knowledge of TS bases that is required to analyze TS-required actions and terminology
NO.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References

REFERENCES:
PT/2/A/4450/006A (VX System Train 2A Performance Test)
Tech Spec 1.4 (Frequency)
Tech Spec Section 3.0 (Surveillance Applicability)

LEARNING OBJECTIVES:
NONE

Student References Provided

Tech Spec 3.6.11 (ARS)
2016/2017 Calendar

SYS022 2.2.12 - Containment Cooling System (CCS)
SYS022 GENERIC
Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)

Remarks/Status

SYS059 A2.04 - Main Feedwater (MFW) System

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

Feeding a dry S/G ....

Given the following sequence of events:

1400 - Crew implements E-0 (REACTOR TRIP OR SAFETY INJECTION) due to a main steam line break

1405 - The following indications are observed:
- Feed flow to each S/G = 125 GPM
- All S/G NR Levels = 0%
- NC T-Colds = 535°F and lowering

1430 - Crew transitions to E-2 (FAULTED S/G ISOLATION)

1435 - Crew transitions to ECA-2.1 (UNCONTROLLED DEPRESSURIZATION OF ALL S/Gs) because all MSIVs are failed OPEN

1505 - The following indications are observed:
- Feed flow to each S/G = 125 GPM
- All S/G NR Levels = 0%
- All S/G WR Levels = 20%
- NC T-Colds = 410°F and lowering

Based on the conditions above and in accordance with ECA-2.1, the crew will ___(1)___.

The basis for the action taken by the crew is because ___(2)___.

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

A. 1. maintain current feed flow
   2. minimum heat sink requirements have not been met

B. 1. maintain current feed flow
   2. the ECA-2.1 requirements for reducing feed flow have not been met

C. 1. throttle feed flow to 25 GPM to each S/G
   2. minimum heat sink requirements no longer apply

D. 1. throttle feed flow to 25 GPM to each S/G
   2. a thermal shock concern would exist if the S/G's are allowed to dry out

---

General Discussion

When the step in ECA-2.1 is reached that determines if S/G feed flow should be reduced, several parameters are checked. First, all NR S/G levels are checked greater than 11%. If not, the operator is sent to the RNO where they are directed to maintain at least 25 GPM flow to the S/G until level is greater than 11%.

Next, the operator checks cooldown rate less than 100°F in one hour. If the cooldown rate is excessive, the operator is directed to the RNO where they will reduce feed flow to 25 GPM. If cooldown is not excessive, they will maintain the current feed flow until NR S/G levels approach 50%. They will then throttle flow to maintain NR S/G levels less than 50%.

A reduction of feed flow to the S/Gs has three primary effects:

1.To minimize any additional cooldown resulting from the addition of feedwater,
2.To prevent S/G tube dryout by maintaining a minimum feed flow of 25 GPM to the S/Gs, (and prevent thermal shock in a dry S/G if feed flow is subsequently raised)
AND
3.To minimize the water inventory in the S/Gs that eventually is the source of additional steam flow to containment or the environment.

Answer A Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is plausible because if the cooldown rate was less than 100°F in one hour, the current feed flow would be maintained.

Part 2 is plausible because based on the conditions given, normal heat sink requirements are NOT met.

Answer B Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is plausible because if the cooldown rate was less than 100°F in one hour, the current feed flow would be maintained.

Part 2 is plausible if the steam break was smaller you could reach the same step in ECA-2.1 and NOT meet the requirements for reducing CA flow (i.e. if the cooldown rate was lower).

Answer C Discussion

INCORRECT: See Explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because throttle flow would imply that minimum heat sink requirements no longer applied, However, they do still apply and flow would not be throttled if the cooldown rate were not excessive.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant is presented with a set of conditions where feed flow to all S/Gs could potentially be isolated (i.e. All S/Gs are faulted and the applicant therefore concludes that all feedflow to the S/Gs should be isolated). The applicant is then asked to predict the impact and use procedures (ECA-2.1) to correct, control, or mitigate the consequences of the event.

NOTE: As written, the K/A seems to be asking the impact of feeding a dry S/G and using procedures to control feeding a dry S/G. However, Westinghouse procedures do not address feeding a dry S/G. Westinghouse procedures are written to take actions to prevent S/G dryout. If S/G dryout does occur (i.e. minimum flow cannot be established to prevent dryout), AFW flow is NOT re-established after dryout until plant engineering performs an evaluation as part of the long-term plant recovery operation.

Basis for Hi Cog

This is a higher cognitive level question because it requires multiple mental steps. First, the applicant must recall from memory the requirements of ECA-2.1 for reducing S/G feed flow. Next, the applicant must evaluate the information provided to determine current conditions and the cooldown rate since the event started. Finally, the applicant must associate the recalled information to the evaluated information to determine the correct response.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)? NO. No part of this question is associated with systems level knowledge.

2) Can the question be answered solely by knowing immediate operator actions? NO. There are no immediate actions associated with ECA-2.1.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs? NO. The question has nothing to do with procedure entry conditions.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure? NO. Part of the mitigation strategy of ECA-2.1 is to control feed flow. However, this doesn't not tell the operator the specific requirement for controlling feed flow.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
YES. The applicant must evaluate the conditions given and based on that evaluation determine which section of the procedure should be performed (i.e. reduce feed flow or maintain current feed flow until S/Gs are at least greater than 11%)

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
NO.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References

REFERENCES:
ECA-2.1 (Uncontrolled Depressurization of All S/Gs) Rev. 21
ECA-2.1 Background Document Rev. 12B

LEARNING OBJECTIVES:
OP-MC-EP-E2 Objective 4

Student References Provided

SYS059 A2.04 - Main Feedwater (MFW) System
Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13)
Feeding a dry S/G ....

Remarks/Status

SYS064 A2.03 - Emergency Diesel Generator (ED/G) System

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

Parallel operation of ED/Gs ....

Given the following conditions on Unit 1:

- Unit is at 100% RTP
- A Fast Start of 1A D/G has been performed for PT/1/A/4350/002 A (DIESEL GENERATOR 1A OPERABILITY TEST)
- Upon starting, the D/G reached 4160VAC at 10.5 seconds
- The D/G was subsequently loaded as follows:

TIME	ACTION
1408	Synchronized to 1ETA
1425	Load = 3600 KW
1456	Load = 4000 KW
1515	Load = 3600 KW
1520	Load = 1900 KW
1535	Separated from 1ETA

Based on the indications above, the acceptance criteria of PT/1/A/4350/002 A for:

1) fast start time to reach required voltage ________ met.

2) KW loading ________ met.

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

A. 1) is
2) is

B. 1) is
2) is NOT

C. 1) is NOT
2) is

D. 1) is NOT
2) is NOT

General Discussion

In accordance with PT/1/A/4350/002A (Diesel Generator 1A Operability Test), "Generator voltage and frequency shall be at least 3740 V and 57 Hz within 11 seconds after an auto or manual fast start signal".

Since the D/G reached it's required voltage in 10.5 seconds the time to reach required voltage is met.

In accordance with PT/1/A/4350/002A, the D/G must be loaded to between 3600 and 4000 KW for 1 hour to met the acceptance criteria of the surveillance. For the example given, the D/G load reaches 3000 KW at time 1425 which starts the clock for loading time for the PT. The D/G is unloaded to less than 3600 KW sometime between 1515 and 1520. Since the time from 1425 to 1520 is less than one hour, the D/G does not meet the loading requirement of 3600 - 4000 KW for one hour.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
The first part is correct.

The second is plausible if the applicant concludes that the 1 hour loading requirement is the total loading time (from the time the D/G is synced to the Emergency Bus) which in the example given is greater than 1 hour.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
If the applicant confuses the D/G fast start time (11 seconds) with the time that an UV condition must exist on the emergency bus before a BO signal is initiated (8.5 seconds), they would conclude that 10.5 seconds is above the limit for a fast start and that the acceptance criteria was not met. Therefore, this answer is plausible.

If the applicant confuses the total loading time with the time loaded to 3600 - 4000 KW, they would conclude that the acceptance criteria is met since the total time the D/G is loaded is greater than 1 hour.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
If the applicant confuses the D/G fast start time (11 seconds) with the time that an UV condition must exist on the emergency bus before a BO signal is initiated (8.5 seconds), they would conclude that 10.5 seconds is above the limit for a fast start and that the acceptance criteria was not met. Therefore, this answer is plausible.

The second part is correct and therefore plausible.

Basis for meeting the KA

The K/A is matched because it requires the applicant to evaluate a given set of parameters and predict the impact related to the PT regarding whether two of the acceptance criteria of the procedure are met.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must recall from memory the acceptance critera of PT/1/A/4350/002 related to fast start and loading. Then, the applicant must perform a calculation of times at specific loads to determine if the loading criteria is met.

Basis for SRO only

At MNS, signing for PT acceptance criteria being met is an SRO only function.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
REFERENCES: PT/1/A/4350/002A (Diesel Generator 1A Operability Test) LEARNING OBJECTIVES: NONE

Student References Provided

SYS064 A2.03 - Emergency Diesel Generator (ED/G) System

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

Parallel operation of ED/Gs ....

Remarks/Status
This question selected for early review. The problem is that we do not do any evolutions or performance tests where a DG is unloaded in steps over time. Therefore, it is extremely difficult to write and operationally valid question at the SRO level that matches this K/A. This is as close as we could come. May need a new KA (or a suggestion) if the question is not an acceptable match. HCF 05/18/17 Early 401-9 Review Comment - UNSAT (KA Match) - SYS064 A2.10 The KA is not applicable to be tested at the site because the unloading is not done over a period of time as identified in the A2.10 K/A. Replacement KA SYS064 A2.03 (8/16/2017) Parallel operation of ED/Gs IR 3.1 Facility Response: Replaced KA and replaced question with one in which the applicant has to evaluate surveillance data and determine if acceptance criteria is met. SLM 08/16/17

SYS073 A2.02 - Process Radiation Monitoring (PRM) System

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

Detector failure ....

Given the following on Unit 1:

- A continuous release of the Ventilation Unit Condensate Drain Tank (VUCDT) is in progress
- After the release is initiated 1EMF 44 (Ventilation Unit Condensate Drain Tank) count rate indication fails to a reading of less than background

While repairs are being made to 1EMF 44, the contents of the VUCDT may be discharged via a ___(1)___ release.

To resume discharging the VUCDT, updated LWR paperwork ___(2)___ required.

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

A. 1. batch
   2. is

B. 1. batch
   2. is NOT

C. 1. continuous
   2. is

D. 1. continuous
   2. is NOT

General Discussion

In accordance with OP/1/A/6500/001A, (Ventilation Unit Condensate Drain Tank Operation), Enclosure 4.3 (Pumping VUCDT to RC Discharge Using
Continuous Release Method), if at any time 1EMF-44 is non-functional, release of the VUCDT shall be made using a BATCH release. CONTINUOUS release not allowed with 1EMF-44 non-functional.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is correct and therefore plausible.

Part 2 is plausible because if the release is stopped by a Trip II condition on 1EMF 44, RP may allow the release to be re-started (using the same LWR paperwork) after the Trip II condition is reset.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1is plausible because the release is being initially conducted via a continuous release. If the release were stopped by a Trip II condition on 1EMF 44, RP may allow the release to be re-started via the continuous release method after 1EMF 44 is reset.

Part 2 is plausible because 0EMF-49 is capable of auto-closing the same valves as 1EMF-44 to isolate the LWR discharge flow path.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible because the release is being initially conducted via a continuous release. If the release were stopped by a Trip II condition on 1EMF 44, RP may allow the release to be re-started via the continuous release method after 1EMF 44 is reset.

Part 2 is plausible because if the release is stopped by a Trip II condition on 1EMF 44, RP may allow the release to be re-started (using the same LWR paperwork) after the Trip II condition is reset.

Basis for meeting the KA

The K/A is matched because the conditions given indicate that a detector failure has occurred (i.e. indications less than background), the applicant must "predict the impacts" of the failure (i.e. via what method the VUCDT can be discharged), and they must use procedures (i.e. the requirements of the OP for the release) to "correct, CONTROL, or mitigate the consequences" of the detector failure.

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)? NO. Systems knowledge not involved in answering either part of this question.

2) Can the question be answered solely by knowing immediate operator actions? NO. There are NO immediate actions in Operating Procedures.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs? NO. The question is in no way related to procedure entry conditions.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure? NO. Not related to purpose, sequence of events or mitigative stategy of the procedure.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed.

YES. The applicant must evaluate given plant conditions and select the appropriate section of OP/1/A/6500 001A to implement.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps. NO

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures. NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures. NO.

As a side note, this task is an SRO Only objective in McGuire Lesson Plan OP-MC-WE-RLR (Objective 16).

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	MODIFIED	2005 MNS NRC SRO Examination NRC Q91 (Bank 3704)

Development References

REFERENCES:
OP/1/A/6500/001A, Ventilation Unit Condensate Drain Tank Operation , Rev. 68
Lesson Plan OP-MC-WE-RLR, Radiological Liquid Releases

LEARNING OBJECTIVES:
OP-MC-WE-RLR Objective 16 (SRO Only)

Student References Provided

SYS073 A2.02 - Process Radiation Monitoring (PRM) System

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

Detector failure ....

Remarks/Status

SYS001 A2.03 - Control Rod Drive System

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 : (CFR: 41.5/43.5/45.3/45.13)

Effect of stuck rod or Misaligned rod

Given the following on Unit 1:

- A unit startup is in progress
- Reactor power is 4%
- The crew determines that Control Rod M-4 is misaligned by 14 steps

In accordance with AP-14 (ROD CONTROL MALFUNCTION) Enclosure 1 (RESPONSE TO DROPPED OR MISALIGNED ROD),

1) the crew will use ________ to determine reactor power during implementation of steps in Enclosure 1.

2) based on current plant conditions, the crew will ________.

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

PROCEDURE LEGEND:

OP/1/A/6100/003 (CONTROLLING PROCEDURE FOR UNIT OPERATION)

A. 1. Thermal Power Best Estimate
2. remain in AP-14 and hold at current power level

B. 1. Excore Nuclear Instruments
2. remain in AP-14 and hold at current power level

C. 1. Thermal Power Best Estimate
2. transition to OP/1/A/6100/003 and shutdown to MODE 3

D. 1. Excore Nuclear Instruments
2. transition to OP/1/A/6100/003 and shutdown to MODE 3

General Discussion

In accordance with AP-14 with a misaligned or dropped rod and reactor power less than 5%, the crew must shut down to MODE 3.

In accordance with AP-14, the crew will use Thermal Power Best Estimate to determine reactor power during implementation of Enclosure 1.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because AP-14 directs the crews "Do not move rods until IAE determines rod movement is available". Later in AP-14, the procedure also directs "Do not continue until troubleshooting is complete and IAE determines rod realignment is permissible". Also, in accordance with AP-14, if reactor power was greater than 5%, the appropriate action would be to maintain the plant stable until the misaligned rod could be corrected.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because during the implementation of most Aps and Eps , the crew would use Excore Nuclear Instrument indication to determine reactor power.

Part 2 is plausible because AP-14 directs the crews "Do not move rods until IAE determines rod movement is available". Later in AP-14, the procedure also directs "Do not continue until troubleshooting is complete and IAE determines rod realignment is permissible". Also, in accordance with AP-14, if reactor power was greater than 5%, the appropriate action would be to maintain the plant stable until the misaligned rod could be corrected.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because during the implementation of most Aps and Eps , the crew would use Excore Nuclear Instrument indication to determine reactor power.

Part 2 is correct.

Basis for meeting the KA

A misaligned rod has occurred and the applicant must predict the impact of the malfunction (i.e. whether a shutdown to MODE 3 is required OR maintaining current power level) AND use procedures (AP-14, Enclosure 1) to correct control or mitigate the consequences of the event (i.e. knowledge of which indications are evaluated to determine appropriate actions in the Enclosure).

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant must analyze the given conditions to determine that the reactor is at less than 5% power (i.e. just reached the POAH).

The applicant must then determine from that evaluation that the required action is to shutdown to MODE 3.

The applicant must also recall from memory that AP-14 Enclosure 1 directs the crew to use Thermal Power Best Estimate to evaluate power level for determining the procedure flowpath in the Enclosure.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?
NO. Neither part of this question is related to systems knowledge.

2) Can the question be answered solely by knowing immediate operator actions?
NO. This is NOT related to the immediate actions of AP-14.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. The question requires knowledge beyond the entry conditions for AP-14.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?
NO. The knowledge required to answer this question is beyond the purpose, sequence of events, and mitigative strategy of AP-14.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
YES. The question requires the applicant to assess current plant conditions and based on that analysis determine whether the crew should remain in AP-14 or transition to another procedure.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures.
YES. Based on diagnostic steps in Enclosure 1, the applicant must determine whether the actions in the enclosure should be implemented or if transition to another procedure is required.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures.
NO.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2014 MNS NRC Exam Q90 (Bank 5228)

Development References

REFERENCES:
AP-14 (Rod Control Malfunction)

LEARNING OBJECTIVES:
AP14004

Student References Provided

SYS001 A2.03 - Control Rod Drive System
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 : (CFR: 41.5/43.5/45.3/45.13)
Effect of stuck rod or Misaligned rod

Remarks/Status

Rearranged answers from previous bank version of the question so that it would not appear to be the same question. HCF 04/18/17

SYS072 A2.03 - Area Radiation Monitoring (ARM) System

Ability to (a) predict the impacts of the following malfunctions or operations on the ARM system- and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 43.3 / 45.13)

Blown power-supply fuses ....

Given the following on Unit 2:

- Fuel movement is in progress when 2EMF-3 (CONTAINMENT REFUELING BRIDGE) fails due to a loss of power to the EMF module
- A fuel assembly is currently being moved using the Reactor Building Manipulator Crane

Based on the conditions above, the Containment Evacuation alarm ___(1)___ sound.

In accordance with SLC 16.7.6 (RADIATION MONITORING FOR PLANT OPERATIONS) Basis, fuel movement ___(2)___ continue long enough to place a suspended fuel assembly in a storage location.

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

A. 1. will
   2. may NOT

B. 1. will
   2. may

C. 1. will NOT
   2. may NOT

D. 1. will NOT
   2. may

General Discussion

On a loss of power to 2EMF-3, a Trip 2 signal will be initiated. A Trip 2 on 2EMF-3 will result in the Containment Evacuation Alarm annunciating.

In accordance with the SLC 16.7.6 Basis, while the spec itself directs immediate suspension of fuel movement, the basis states that this does not preclude the operator from placing a suspended fuel assembly into a "safe storage location".

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the spec directs the crew to immediately suspend fuel movement.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because it would be logical to conclude that, on a loss of power to the module, it would be incapable of generating a Trip 2 signal and the automatic actions associated with the Trip 2 signal.

Part 2 is plausible because the spec directs the crew to immediately suspend fuel movement.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because it would be logical to conclude that, on a loss of power to the module, it would be incapable of generating a Trip 2 signal and the automatic actions associated with the Trip 2 signal.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because it requires the applicant to predict the impact of the loss of power to 2EMF-3 (an Area Radition Monitor), and use a procedure (SLC 16.7.6) to mitigate the consequences of the event (i.e. whether the fuel assembly can be placed in a storage location).

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):

1) Can the question be answered solely by knowing ≤1-hour TS/TRM Action?
NO. While the action to suspend fuel movement in SLC 16.7.6 is a "less than or equal to 1 hr" action, if that action were implemented at face value, the fuel assembly would be left suspended from the Reactor Building Manipulator Crane. It is only though knowledge of the SLC 16.7.6 Basis that the SRO gains the requisite knowledge of the "qualifier" for "immediately suspend fuel movement" and the understanding that fuel movement may continue long enough to place a suspended fuel assembly in a safe storage location.

2) Can the question be answered solely by knowing the LCO/TRM information listed "above the line? "
NO. This information needed to answer this question is NOT "above the line" knowledge.

3) Can the question be answered solely by knowing the TS safety limits?
NO. This question is related to knowledge of SLC Basis and NOT TS Safety Limits.

4) Does the question involve one or more of the following for the TS, TRM, or ODCM:

- application of required actions (TS Section 3) and SRs (TS Section 4) in accordance with rules of application requirements (TS Section 1)
YES. Know of the SLC Basis is required to correct apply the action related to suspension of fuel movement.

- application of generic LCO requirements (LCO 3.0.1 through 3.0.7 and SR 4.0.1 through 4.0.4)

NO.

- knowledge of TS bases that is required to analyze TS-required actions and terminology
YES. Knowledge of the SLC Basis is required to be able to correctly apply the SLC action based on interpretation of the terminology "immediate".

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References

REFERENCES:
OP/2/A/6100/010 S (Annunciator Response for 2RAD-3)
SLC 16.7.6 (Radiation Monitoring for Plant Operation)

LEARNING OBJECTIVES:
NONE

Student References Provided

SYS072 A2.03 - Area Radiation Monitoring (ARM) System

Ability to (a) predict the impacts of the following malfunctions or operations on the ARM system- and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 43.3 / 45.13)

Blown power-supply fuses ....

Remarks/Status

SYS086 2.4.30 - Fire Protection System (FPS)

SYS086 GENERIC

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

Given the following:

- Both Units at 100% RTP
- "C" Main Fire pump is tagged for maintenance

Subsequently,

- A piping rupture occurs on the RF header
- "A" Main Fire pump is running
- "B" Main Fire pump is OFF
- RF header pressure has stabilized at 75 PSIG

Based on the conditions above, ___(1)___ operated as expected.

In accordance with RP-10 (NRC IMMEDIATE NOTIFICATION REQUIREMENTS), If a shutdown to MODE 3 is required by SLC 16.9.1(FIRE SUPPRESSION WATER SYSTEM), a ___(2)___ report to the NRC is also required.

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

REFERENCE PROVIDED

A. 1. "A" Main Fire pump ONLY has
   2. 8 hour

B. 1. "A" Main Fire pump ONLY has
   2. 4 hour

C. 1. "A" AND "B" Main Fire pumps have
   2. 8 hour

D. 1. "A" AND "B" Main Fire pumps have
   2. 4 hour

General Discussion

As system pressure decreases, a pressure switch starts the "A" Fire Pump when system pressure decreases to 83 psig. A second pressure switch starts the "B" Fire Pump when system pressure decreases to 78 psig. A third pressure switch starts the "C" Fire Pump when system pressure decreases to 73 psig. There is a backup pressure switch on an orificed line on the pump discharge for each Main Fire Pump. These switches are set for 60 psig and serve as a backup fire pump start and test switch.

In accordance with RP-10, the initiation of any nuclear plant shutdown required by Technical Specifications (SLCs are considered part of Tech Specs) requires a 4 hour report to the NRC.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct

Part 2 is plausible if the applicant misses the "tech spec required shutdown" 4 hour report or concludes that SLCs do not qualify as a tech spec required shutdown. They might then conclude that an 8 hour report is required under Section 4.1.4.3 of RP-10 for "The nuclear power plant being in an unanalyzed condition that significantly degrades plant safety."

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude the A and C main fire pumps have received a start signal and C min fire pump is tagged. Also plausible that the applicant concludes only one autotstart setpoint has been exceeded and therefore B main fire pump has operated as expected.

Part 2 is plausible if the applicant misses the "tech spec required shutdown" 4 hour report or concludes that SLCs do not qualify as a tech spec required shutdown. They might then conclude that an 8 hour report is required under Section 4.1.4.3 of RP-10 for "The nuclear power plant being in an unanalyzed condition that significantly degrades plant safety."

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the applicant may conclude the A and C main fire pumps have received a start signal and C min fire pump is tagged. Also plausible that the applicant concludes only one autotstart setpoint has been exceeded and therefore B main fire pump has operated as expected.

Part 2 is correct.

Basis for meeting the KA

The K/A is matched because it requires the applicant to analyze condtions related to the loss of Fire Protection System equipment related to required actions and reporting requirements to the NRC.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applciant must analyze the conditions in the stem to determine if main fire pumps have operated as expected.

Next, the applicant is required to evaluate a postulated event against the requirements of RP-10 to determine when a report to the NRC is required.

Basis for SRO only

.This question is SRO only as described in 10 CFR 55.43(b)(1), Conditions and Limitations in the Facility License. Specifically, this question related to reporting requirements when a Tech Spec LCO is not met and a Tech Spec required shutdown must be initiated. This is exclusively an SRO function at MNS.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
REFERENCES: Lesson Plan OP-MC-SS-RFY Rev. 30 RP-10 (NRC IMMEDIATE NOTIFICATION REQUIREMENTS) LEARNING OBJECTIVES:

Student References Provided
RP-10 (NRC Immediate Notification Requirements)

SYS086 2.4.30 - Fire Protection System (FPS)

SYS086 GENERIC

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

Remarks/Status

EPE007 EA2.04 - Reactor Trip

Ability to determine or interpret the following as they apply to a reactor trip: (CFR 41.7 / 45.5 / 45.6)

If reactor should have tripped but has not done so, manually trip the reactor and carry out actions in ATWS EOP

....

Given the following on Unit 1:

- Unit is at 30% RTP
- NC pump 1C trips due to mis-operation during I&E testing
- Five minutes after the 1C NCP trip, a lockout occurs on 1A Busline due to a fault
- The Reactor Trip breakers remain closed

1) Which ONE (1) of the following describes the plant response?

2) For the conditions described above, which ONE (1) of the following is a subsequent action required and the basis for this action?

PROCEDURE LEGEND:

TECHNICAL SPECIFICATION 3.4.4 (RCS LOOPS MODES 1 & 2)

A. 1. An ATWS is in progress.
   2. Manually trip the turbine to conserve SG inventory.

B. 1. An ATWS is in progress.
   2. Manually trip the turbine to generate a redundant reactor trip signal.

C. 1. 1TA and 1TC auto-swap.
   2. Restart 1C NC pump within 6 hours to comply with TS 3.4.4.

D. 1. 1TA and 1TC auto-swap.
   2. Place the unit in MODE 3 within 6 hours to comply with TS 3.4.4.

General Discussion

For the conditions given, because the 1C NC pump has tripped prior to 1A Busline Lockout, a slow transfer of 1TA and 1TC will occur. The slow transfer will result in an underfrequency condition on 1TA and 1TC which will cause all four NC pumps to trip. This results in a reactor trip signal. Since the reactor trip breakers remain closed, an ATWS condition exists.

One of the actions required for the ATWS condition is to manually trip the main turbine to converse inventory in the SGs. The worse case ATWS scenario is a failure of the reactor to trip coincident with a loss of heat sink.

Had the 1B or 1D NC pump tripped prior to the 1A Busline Lockout, a fast transfer of the 1TA and 1TC busses would have occurred, no underfrequency condition would have occurred, and the remaining NC pumps would still be running. Therefore, an ATWS condition would not exist. However, since the unit would be in MODE 1 with less than 4 NC loops in service, a shutdown to MODE 3 within 6 hours would be required IAW TS 3.4.4.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is correct.

Part 2 is plausible because tripping the turbine would provide a redundant reactor trip signal.

Additionally, because manually initiating a protective feature to cause another protective feature to actuate is SOMETIMES true in the EOPs, licensed operators often conclude that the basis for manually initiating a protective feature (i.e. turbine trip, reactor, safety injection) is to cause another protective feature to occur is true when it is not. For example, in ECA-0.0 (Loss of All AC Power), one of the actions taken it to initiate Safety Injection. The basis for this is to generate a LOCA signal to the sequencer which may start the DG.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant concludes conditions are met for a fast transfer of 1TA and 1TC. If that were the case the auto-swap would occur and no ATWS condition would exist.

Part 2 is plausible because if the pump were restarted, the unit would be in compliance with TS 3.4.4. However, since reactor power is greater than 25% RTP, restarting the NC pump is not allowed.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible if the applicant concludes conditions are met for a fast transfer of 1TA and 1TC. If that were the case the auto-swap would occur and no ATWS condition would exist.

Part 2 is plausible because if a fast transfer of 1TA and 1TC occurred, this would be the correct action.

Basis for meeting the KA

This K/A is matched because the applicant is being asked to evaluate (interpret) a set of plant conditions and determine whether or not an ATWS has occurred. He is then asked about actions contained in the ATWS EOP (Immediately tripping the main turbine) and the reason for that action.

Basis for Hi Cog

This question is Hi Cog because it requires more than one mental step. First, the applicant must evaluate a complex set of conditions and determine whether the reactor should have tripped. Next, the applicant must recall from memory the actions that are required by procedure for the conditions that exist, and the basis for those actions.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?

NO. While there is a systems knowledge aspect to the first part of the question, the applicant must also have knowledge of the administrative requirements of OMP 4-3 to understand if the conditions constitute and ATWS condition. The second part of the question cannot be answered with systems knowledge.

2) Can the question be answered solely by knowing immediate operator actions? NO. For the correct answer, the action is one of the immediate actions of FR-S.1. However, that actions is present in both A2 and B2. To select between A2 and B2, the applicant must have knowledge of the EOP basis which is NOT part of the immediate actions of FR-S.1. Therefore, the question CANNOT be answered solely by knowing immediate operator actions.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs? NO. Knowledge of the entry conditions for FR-S.1 alone will NOT allow the applicant to determine the correct response.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure? NO. The question does not relate solely to the purpose, sequence of event, or overall mitigative strategy of FR-S.1.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed

YES. The applicant must assess a complex set conditions given and determine whether an ATWS is in progress or whether to simply apply the requirements of TS 3.4.4. Technically speaking, C1 and D1 are correct. 1TA and 1TC do auto-swap. However, the auto-swap is a slow transfer as opposed to a fast transfer. Therefore, an underfrequency will occur on 1TA and 1TC resulting in a trip of all NCPs. Therefore, the reactor trip breakers should have opened and, in accordance with OMP 4-3 (Use of Emergency and Abnormal Procedures and FLEX Support Guidelines) an ATWS is in progress (i.e. a transient has occurred coincident with a failure of the reactor protective system).

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps. NO.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures. NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures. YES. This requires knowledge of OMP 4-3 to understand that the conditions which constitute an ATWS condition have been met.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2011 MNS NRC Exam Q84 (Bank 4434)

Development References

REFERENCES:
OMP 4-3 (Use of Emergency and Abnormal Procedures and FLEX Support Guidelines)
FRP S.1 (Response to Nuclear Power Generation/ATWS) Background Document

LEARNING OBJECTIVES:
NONE

Student References Provided

EPE007 EA2.04 - Reactor Trip
Ability to determine or interpret the following as they apply to a reactor trip: (CFR 41.7 / 45.5 / 45.6)
If reactor should have tripped but has not done so, manually trip the reactor and carry out actions in ATWS EOP
....

Remarks/Status

Rearranged answers from previous bank question so that the question does not appear exactly the same. HCF

EPE009 EA2.38 - Small Break LOCA
Ability to determine or interpret the following as they apply to a small break LOCA: (CFR 43.5 / 45.13)
Existence of head bubble ....

Given the following on Unit 2:

- A Small Break LOCA has occurred coincident with a loss of offsite power
- The crew is performing ES-1.1 (SAFETY INJECTION TERMINATION) and has reached Step 31 to "determine required plant recovery procedure"
- Seal cooling to the NC pumps has been maintained throughout the event
- NC CET Subcooling = 40°F
- RVLIS Upper Range level = 80%
- PZR level = 30%

At Step 31 the crew will transition from ES-1.1 ___(1)___.

Based on the conditions above, after the crew implements ES-0.3, if offsite power is restored, the MINIMUM required PZR level to start an NCP ___(2)___ met.

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

PROCEDURE LEGEND:

ES-0.2 (NATURAL CIRCULATION COOLDOWN)
ES-0.3 (NATURAL CIRCULATION COOLDOWN WITH STEAM VOID IN THE VESSEL)

A. 1. to ES-0.2 and then to ES-0.3
2. is

B. 1. directly to ES-0.3
2. is

C. 1. to ES-0.2 and then to ES-0.3
2. is NOT

D. 1. directly to ES-0.3
2. is NOT

General Discussion

In ES-1.1 at Step 31, with no NCPs running, the crew will transition to ES-0.2 (Natural Circulation Cooldown) Once in ES-0.2, the crew will transition to ES-0.3 if a faster cooldown is needed.

In ES-0.3, with RVLIS Upper level less than 90%, PZR level must be greater than 90%. Therefore, based on the conditions given, PZR level is currently not sufficient to start an NC pump.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct and therefore plausible.

Part 2 is plausible because 25%-35% is the required PZR level range required by ES-0.3 if an NC pump cannot be started.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because with RVLIS Upper Range level at 80%, it indicates that there is a steam void in the reactor vessel.

Part 2 is plausible because 25%-35% is the required PZR level range required by ES-0.3 if an NC pump cannot be started.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because with RVLIS Upper Range level at 80%, it indicates that there is a steam void in the reactor vessel.

Part 2 is correct and therefore plausible.

Basis for meeting the KA

The K/A is matched because the applicant must "interpret" the indications provided related to performing ES-0.3 to determine if an NCP can be started.

Basis for Hi Cog

This is a higher cognitive level question because it required more than one mental step. First, the applicant must recall from memory the allowable transitions out of ES-1.1, Then, the applicant must analyze the conditions given to determine if an NCP can be started.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?
NO. Neither part of this question can be answered solely based on systems knowledge.

2) Can the question be answered solely by knowing immediate operator actions?
NO. There are no immediate actions in ES-0.3.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. Neither part of this question is related to entry conditions for AOPs or EOPs.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?
NO. Starting an NC pump in ES-0.3 is part of the overall mitigative strategy. However, the specifics related to conditions which must be met to start the NC pump OR the basis for establishing those conditions is NOT part of the overall mitigative strategy OR purpose OR sequence of events in ES-0.3.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
YES. The first part of the question requires the applicant to assess the conditions given to determine if the steps to start an NC pump in ES-0.3 can continue or if those steps must be bypassed until the proper conditions to start the NC pump can be met.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
YES. The question involves knowledge of when to implement another procedure (OP/2/A/6150/002A, REACTOR COOLANT PUMP OPERATION, Enclosure 4.1, STARTUP AND OPERATION) in ES-0.3. The applicant must understand that they cannot continue in ES-0.3 while establishing conditions to start the NC pump because the next step (establish PZR level 25-35%) would conflict with guidance to establish PZR level greater than 90% to accommodate void collapse when the NC pump is started from earlier in Step 3.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
YES. Step 3 is a diagnostic step to determine if PZR level is sufficient (base on RVLIS Upper level) to accommodate void collapse when the NC pump is started. This would result in a transition to the OP to establish conditions and start an NC pump

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References

REFERENCES:
ES-0.3 (Natural Circulation Cooldown With Steam Void in Vessel) Rev. 14

LEARNING OBJECTIVES:
OP-MC-EP-E0 Objective 10

Student References Provided

EPE009 EA2.38 - Small Break LOCA

Ability to determine or interpret the following as they apply to a small break LOCA: (CFR 43.5 / 45.13)

Existence of head bubble ....

Remarks/Status

This question selected for early review. The concern here is with the K/A match. The "ability to determine" as it relates to the existence of a head bubble would be RO level knowledge. So, we've tried to hit the "ability to INTERPRET" part of the K/A relative to "interpreting" the indications that are consistent with the existence of a head bubble and determining a correct course of action (i.e. whether action to start an NC pump IAW the OP can be taken). Need Chief Examiner to determine if this is an acceptable K/A match at the SRO level. HCF 05/22/17

Early 401-9 Review Comments:

Plausibility is lacking for over pressurization on B/D 2) answers given the question has referenced a MINIMUM pressurizer level rather than a MAXIMUM.

Recommendation

Replace stem 2nd bullet with: ES-1.1 (Safety Injection Termination) is in progress at step 31 [determine the required plant recovery procedure as follows:]

Remove the 3rd and 5th bullet

Replace question

1) Based on the conditions above, ES-1.1 DIRECTS/ DOES NOT DIRECT the operator to GO TO ES-0.3 [NATURAL CIRCULATION COOLDOWN WITH STEAM VOID IN VESSEL]

2) Based on the conditions above if offsite power is restored, the MINIMUM pressurizer level required by ES-03 to start an NC pump IS/ IS NOT met.

Q85 will be S with the above enhancements

Facility Resolution: Did not feel that we could re-write question 1 exactly as suggested. The reason being that, based on question 2, the applicants would be driven to incorrectly picking "directs" because question 2 tells them that they're ending up in ES-0.3. Instead we re-wrote the question to ask "At Step 31, the crew will transition from ES-1.1 (DIRECTLY TO ES-0.3 / TO ES-0.2 AND THEN TO ES-0.2)."

Then re-wrote question 2 to read "Based on the conditions above, after the crew implements ES-0.3, if offsite power is restored, the MINIMUM required PZR level to start an NCP (IS / IS NOT) met.

Will resubmit this question to Chief Examiner with explanation as to why we re-wrote it the way we did and see if it meets the intent of his proposed changes. HCF 08/17/17

EPE011 EA2.08 - Large Break LOCA

Ability to determine or interpret the following as they apply to a Large Break LOCA: (CFR 43.5 / 45.13)

Conditions necessary for recovery when accident reaches stable phase ...

Given the following on Unit 1:

- A LBLOCA has occurred
- Containment pressure peaked at 3.8 PSIG
- The crew has implemented ES-1.3 (TRANSFER TO COLD LEG RECIRC)
- At Step 8 of ES-1.3, the crew is directed to "align NS for recirc" and the following conditions exist:
  - Containment pressure is currently 2.8 PSIG and stable
  - 1NI-185A (1A ND PUMP SUCTION FROM CONT SUMP ISOL) is OPEN
  - 1NS-20A (1A NS PUMP SUCTION FROM FWST ISOL) **FAILED** to CLOSE from the control room

Based on the conditions above,

1) Train "A" of NS _______ be aligned for recirculation.

2) and in accordance with ES-1.3, after one of the NS trains is aligned for recirc, the NS pump on the train aligned for recirculation _____ be started.

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

A. 1. can
   2. will

B. 1. can
   2. will NOT

C. 1. can NOT
   2. will

D. 1. can NOT
   2. will NOT

General Discussion

An interlock prevents opening a Containment Sump Isolation Valve (NS1B or NS18A) unless the Containment Sump Isolation Valve (NI184B or NI185A) is open and the FWST Suction Valve (NS3B or NS20A) is closed.

The Containment Spray System is manually aligned and started from the Control Room following a LOCA per EP/1(2)/A/5000/ES-1.3, Transfer to Cold Leg Recirc. Both trains of NS will be manually aligned for containment sump recirculation (suctions from FWST CLOSED and suctions from sump OPEN). If containment pressure is >3 psig, then one train of NS is started by opening that train's discharge valves and starting the pump. If containment pressure is ≤ 3 psig, then neither train will be started.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible since 1NI-185A is open and this is an interlock required to open 1NS-18A. However, 1NS-20A must also be closed.

Part 2 is plausible because containment pressure has risen to greater than 3.0 psig. However, containment pressure must be greater than 3 psig when implementing the applicable step in ES-1.3 to start an NS pump. Otherwise, NS is aligned to recirc on both trains with no pump running.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible since 1NI-185A is open and this is an interlock required to open 1NS-18A. However, 1NS-20A must also be closed..

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because containment pressure has risen to greater than 3.0 psig. However, containment pressure must be greater than 3 psig when implementing the applicable step in ES-1.3 to start an NS pump. Otherwise, NS is aligned to recirc on both trains with no pump running.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

This question matches the K/A because a large break LOCA has occurred and the applicant is required to have knowledge of the conditions required to align NS during transfer to cold leg recirculation after the plant has been stabilized.

Basis for Hi Cog

This question is higher cognitive because the applicant is required to analyze the conditions in the stem and then determine the affect those conditions will have on making the NS alignment to the containment sump and whether or not NS will be started or just aligned for recirc.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):
1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?
NO. The question can NOT be answered soley with systems knowledge.

2) Can the question be answered solely by knowing immediate operator actions?
NO. There are no immediate operator actions associated with ES-1.3.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. This question does NOT involve entry conditions for ES-1.3. It is related to section transition requirements with the body of the procedure.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?
NO. This question goes beyond the purpose, sequence of events, and mitigative strategy of the procedure.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. YES. This question does involve assessment of plant conditions to determine which section of the procedure should be performed.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
NO.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
YES. This question requires the applicant to have specific knowledge of the diagnostic step in ES-1.3 which directs aligning NS for recirculation and which will determine if an NS pump should be started once its respective train is aligned for recirc.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References

REFERENCES:
ES-1.3 (Transfer to Cold Leg Recirc) Rev. 17

LEARNING OBJECTIVES:
OP-MC-EP-E1 Objective 2

Student References Provided

EPE011 EA2.08 - Large Break LOCA

Ability to determine or interpret the following as they apply to a Large Break LOCA: (CFR 43.5 / 45.13)

Conditions necessary for recovery when accident reaches stable phase ...

Remarks/Status

APE026 2.4.46 - Loss of Component Cooling Water (CCW)
APE026 GENERIC
Ability to verify that the alarms are consistent with the plant conditions. (CFR: 41.10 / 43.5 / 45.3 / 45.12)

Given the following sequence of events on Unit 2:
Initial conditions:

Time = 0800:
- Unit 2 is at 100% RTP
- "2A" Train KC pumps are running
- "2B" Train KC pumps are secured
- "2A" KC Surge Tank level is 3.5 feet and decreasing slowly
- 2B KC Surge Tank level is 6.1 feet

Time = 0810:
- 2A KC Surge Tank level is 2.8 feet and decreasing slowly
- 2B KC Surge Tank level is 6.1 feet
- Crew implements AP-21 (LOSS OF KC OR KC SYSTEM LEAKAGE)
- An AO is dispatched to initiate makeup to the Unit 2 KC Surge tank

Based on the conditions above, at time 0810, annunciator 2AD10 / C-1 (KC SURGE TANK ABNORMAL LEVEL) ___(1)___ be LIT.

In accordance with AP-21, considering that the AO initiates KC Surge Tank makeup within the time critical time, the criteria to perform Enclosure 2 (ISOLATION OF KC NON-ESSENTIAL HEADERS) ___(2)___ be met prior to makeup initiation.

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

A. 1. will NOT
   2. will

B. 1. will NOT
   2. will NOT

C. 1. will
   2. will

D. 1. will
   2. will NOT

General Discussion

From the information given, KC Surge Tank level decreases from 3.5 feet to 2.8 feet over a period of 10 minutes. This is a total of 0.7 feet or 0.07 feet/min.

Since the overhead annunciator alarm comes in at 4 feet, at time 0810 the overhead alarm will already be LIT.

AP-21 would direct the crew to perform Enclosure 2 (Isolation of KC Non-Essential Headers) if KC Surge Tank level decreases to 2.0 feet. If one were to assume that surge tank level continues to decrease at the same rate 0.07 feet/min, in the time critical time of 10 minutes, KC Surge Tank level would be at 2.1 feet. In reality, if the size of the leak opening remains the same, the rate of level decrease will slow due to a decrease in static head and the level will actually be slightly higher than 2.1 feet. Therefore, Enclosure 2 will not be required to be initiated prior to initiation of KC Surge Tank makeup.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses the alarm setpoint (4.0 feet) with the Foldout page level required to isolate the KC Non-Essential Headers (2.0 feet).

Part 2 is plausible if the applicant confuses the criteria for initiating Enclosure 2 with the AP-21 criteria for isolating 2A KC Train from 2B KC Train (at 3.0 feet). If so, they would conclude that the criteria to initiate Enclosure 2 is met.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses the alarm setpoint (4.0 feet) with the Foldout page level required to isolate the KC Non-Essential Headers (2.0 feet).

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant confuses the criteria for initiating Enclosure 2 with the AP-21 criteria for isolating 2A KC Train from 2B KC Train (at 3.0 feet). If so, they would conclude that the criteria to initiate Enclosure 2 is met.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The KA matched because if the applicant demonstrates the ability to use a curve of KC surge tank level track the KC Surge Tank level decrease relative to the KC Surge Tank Abnormal Level alarm setpoint they demonstrate that they have the ability to verify that the alarm is consistent with trending plant conditions.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant must use the KC Surge Tank level curve to determine tank level at various times and from that calculate a leak rate from the system.

The applicant must also recall from memory the Time Critical Operator Action time for initiating KC Surge Tank makeup as listed in the Time Critical Operator Action time list.

Next, the applicant must associate the tank levels and leak rates with the Time Critical Operator Action time to determine if makeup will be initiated BEFORE or AFTER the annunciator alarm setpoint.

Finally, the applicant must recall the first of the "leak isolation" directives contained in AP-21.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?
YES. The first part of the question is RO level knowledge.

2) Can the question be answered solely by knowing immediate operator actions?
NO. AP-21 contains NO immediate operator actions.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. Neither part of this question is directly related to the entry conditions for AP-21.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?
NO. This question is related to different leak isolation strategies based on specific conditions and not overall mitigative strategy or sequence of events.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
YES. This question involves analyzing the conditions given to determine which section of the AP should be selected for mitigation based on current conditions.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
YES. This question requires the applicant to analyze the conditions given in the stem of the question to determine if implementing an isolation of the specific headers (in accordance with Enclosure 2) is warranted. For the specific conditions given, it is not warranted.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
YES. The applicant must analyze the conditions given to determine if the actions (procedure sub-section) should be performed to isolate on KC Train from the other Train.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References

REFERENCES:
AP-21 (Loss of KC or KC System Leakage)
Unit 2 Databook Curve 7.31 (Component Cooling Surge Tank - Volume vs. Compartment Level)

LEARNING OBJECTIVES:
OP-MC-AP-21 Objective 6 (SRO Only)

Student References Provided

APE026 2.4.46 - Loss of Component Cooling Water (CCW)
APE026 GENERIC
Ability to verify that the alarms are consistent with the plant conditions. (CFR: 41.10 / 43.5 / 45.3 / 45.12)

Remarks/Status

This question selected for early review based on potential KA match problem as it does not strictly match the KA at the SRO level. HCF 05-22-17

Early 401-9 Review Comments:

Add to the stem of the question: the 2B KC pumps are secured (or what their configuration is)

At time 0810 remove 5th bullet

Reword question

1) is SAT

2) In accordance with AP-21, considering that the AO initiates KC Surge Tank makeup within the time critical time, ENCLOSURE 2 IS/ IS NOT required to be performed at this time

Q87 will be S with the above enhancements

Facility Resolution:
Revised question with slight change from Chief Examiner's suggestion. Felt that ending the second question with " at this time" could leave room for interpetation. Even if the AO initiates makeup within the time critical time, if that makeup isn't sufficient to stop the level decrease, the criteria to peform Enclosure 2 could still be met after makeup is initiated. By bounding the time over which the criteria could be met to initiate Enclosure 2, it leaves no room for interpretation by the applicant and makes the question less likely to be challenged on appeal. Will discuss with Chief Examiner to make sure he is okay with our version of his suggestion. HCF 08/17/17

APE057 2.4.8 - Loss of Vital AC Electrical Instrument Bus
APE057 GENERIC
Knowledge of how abnormal operating procedures are used in conjunction with EOPs. (CFR: 41.10 / 43.5 / 45.13)

Given the following on Unit 1:

- The unit is at 100% RTP
- Pressurizer Pressure Channel 2 has been removed from service for I&E repairs
- All associated bistables have been tripped

Subsequently,

- A momentary spike causes the 1EKVA Supply breaker to trip

Based on the conditions above, a ___(1)___ has/have occurred.

After the immediate actions of E-0 (REACTOR TRIP OR SAFETY INJECTION) are complete, concurrent implementation of AP-015 (LOSS OF VITAL OR AUX CONTROL POWER) ___(2)___ allowed in accordance with OMP 4-3 (Use Of Emergency And Abnormal Procedures And FLEX Support Guidelines).

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

A. 1. Reactor Trip ONLY
   2. is

B. 1. Reactor Trip ONLY
   2. is NOT

C. 1. Reactor Trip AND Safety Injection
   2. is

D. 1. Reactor Trip AND Safety Injection
   2. is NOT

General Discussion

With the bistables for Pressurizer Pressure Channel 2 in the trip position, when power is lost to 1EKVA, all bistables associated with 1EKVA instrumentation assume their safety-related postion (i.e. tripped). The only exception to this is the Containment Hi Pressure bistable. Therefore, both a Reactor Trip and Safety Injection occur on Low Pressurizer pressure.

In accordance with OMP 4-3 (Use Of Emergency And Abnormal Procedures And FLEX Support Guidelines) Section 7.18 (Multiple Use of EPs and APs), allows Aps to be implemented concurrently with Eps. However, the procedure cautions that "it should be avoided" and cautions that Aps implemented concurrently with Eps when a Safety Injection has occurred should be done so with caution as Aps are generally written assuming a Safety Injection has NOT occurred.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses the Pressurizer Lo Pressure bistable operation with the Containment Hi Pressure bistable operation. The Containment Hi Pressure bistables are energized to actuate as opposed to de-energized to actuate. If the Pressurizer Lo Pressure bistables functioned in the same way, for the conditions given, a Reactor Trip would have occurred and a Safety Injection would NOT have occurred. Additionally, the applicant could confuse the operation of the Low PZR Pressure SI Block that is available less than P-11 (1955 PSIG) and conclude that the Low PZR Pressure SI is blocked and will not occur.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible if the applicant confuses the Pressurizer Lo Pressure bistable operation with the Containment Hi Pressure bistable operation. The Containment Hi Pressure bistables are energized to actuate as opposed to de-energized to actuate. If the Pressurizer Lo Pressure bistables functioned in the same way, for the conditions given, a Reactor Trip would have occurred and a Safety Injection would NOT have occurred. Additionally, the applicant could confuse the operation of the Low PZR Pressure SI Block that is available less than P-11 (1955 PSIG) and conclude that the Low PZR Pressure SI is blocked and will not occur.

Part 2 is plausible if the applicant concludes that because OMP 4-3 states that AP implmentation during Eps should be avoided means that it may not be done under any circumstances.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant concludes that because OMP 4-3 states that AP implementation during Eps should be avoided means that it may not be done under any circumstances.

Basis for meeting the KA

The K/A is matched because the applicant is presented with a set of conditions where a Vital AC Instrument Bus has been lost and must determine if the AP which addresses the Loss of Instrument Bus may be implemented concurrently with the EPs (i.e. E--0)

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must recall from memory the logic for the Pressurizer Low Pressure Safety Injection and Pressurizer Low Pressure Reactor Trip.

Next, the applicant must analyze the conditions given to determine if only a Reactor Trip has occurred or whether it has occurred in conjunction with a Safety Injection.

Finally, the applicant must recall from memory the procedure use requirements contained in OMP 4-3 as they relate to concurrent implementation of Eps and Aps.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 10, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?

NO. While the FIRST part of the question can be answered with systems level knowledge, the SECOND part of the question cannot.

2) Can the question be answered solely by knowing immediate operator actions?
NO. The SECOND part of the question mentions the immediate actions of E-0. However, the question cannot be answered based on knowledge of those immediate actions.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. Neither part of the question can be answered based on knowledge of the AP or EP entry condtions.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?
NO. Neither part of the question is related to knowledge of the purpose, sequence of event or mitigative strategy of AP-15 or E-0.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
NO. There is no procedure selection in this question.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
NO. Not related to when an attachement or appendix should be implemented.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
NO. Does not related to diagnostic steps or decision points.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
YES. The applicant must have knowledge of OMP 4-3 (an administrative procedure) to be able to determine that AP-15 may be implemented concurrently with E-0.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References

REFERENCES:
OMP 4-3 (Use Of Emergency And Abnormal Procedures And FLEX Support Guidelines)
Lesson Plan OP-MC-ECC-ISE (Engineered Safeguards Actuation System)

LEARNING OBJECTIVES:

Lesson Plan OP-MC-IC-IPE (Reactor Protection System)

Student References Provided

APE057 2.4.8 - Loss of Vital AC Electrical Instrument Bus
APE057 GENERIC
Knowledge of how abnormal operating procedures are used in conjunction with EOPs. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

APE062 2.4.9 - Loss of Nuclear Service Water
APE062 GENERIC
Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.
(CFR: 41.10 / 43.5 / 45.13)

Given the following on Unit 2:

- The reactor vessel head has just been removed in preparation for refueling
- Both trains of ND are in service
- The CV Equipment Hatch is closed
- Both airlocks are OPEN to allow personnel and equipment access
- NC system temperature is 120°F

Subsequently, the following sequence of events occur:

- **0900** -
  - A complete loss of Nuclear Service Water (RN) occurs
  - Component Cooling Water (KC) temperature is increasing
  - NC system heatup rate is 5°F / min
  - Containment Closure is initiated
- **0917** - **Upper** Containment Airlock is closed
- **0920** - **Lower** Containment Airlock is closed

Based on the conditions above, in accordance with the Emergency Action Levels (EALs), the EARLIEST time that an Emergency Action Level threshold will be met is ___(1)___.

In accordance with the Emergency Action Levels (EALs), the event that the Shift Manager will declare is an ___(2)___.

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

<u>REFERENCE PROVIDED</u>

A. 1. 0916
   2. ALERT

B. 1. 0916
   2. UNUSUAL EVENT

C. 1. 0922
   2. ALERT

D. 1. 0922
   2. UNUSUAL EVENT

General Discussion

Starting at an initial temperature of 120°F, with an actual heatup rate of 5° / min, NC system temperature will reach 200°F in 16 minutes (or 0916). This would meet the criteria in the EALs for an UNUSUAL EVENT. However, since the closure time for theUpper and Lower PALs is 17 and 20 minutes respectively, Containment Closure will NOT be established prior to exceeding 200°F. Therefore, the conditions to declare an ALERT will be met.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the conditions for an UNUSUAL EVENT are met. And, if Containment Closure was met at the time NC System temperature crosses 200°F, the correct classification would be an UNUSUAL EVENT.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 0922 is the time associated with the calculated time to boil. If the applicant simply adds 22 minutes to 0900 concluding that this is the time to reach 200°F, they would determine that the EAL threshold is met at 0922.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because 0922 is the time associated with the calculated time to boil. If the applicant simply adds 22 minutes to 0900 concluding that this is the time to reach 200°F, they would determine that the EAL threshold is met at 0922.

If the applicant erroneously concludes that the EAL threshold is met at 0922, the correct classification based on that erroneous determination would be and UNUSUAL EVENT since Containment Closure would be met before the threshold was reached.

Basis for meeting the KA

A loss of Nuclear Service Water (RN) has occurred which in turn results in a loss of shutdown cooling (ND). The applicant must apply concepts related to loss of shutdown cooling to Emergency Classifications (mitigation strategies). Therefore, the K/A is matched.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must perform a calculation to determine when the EAL threshold will be met.

Next, the applicant will apply all of the conditions given to the EAL Wall Charts to determine to Action Level of the event.

Therefore, the question meets the criteria for a higher cognitive level question.

Basis for SRO only

At MNS, EAL Classification is strictly an SRO Only task (OP-MC-EP-EAL Objective 6).

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References

REFERENCES:
EAL Wall Charts

LEARNING OBJECTIVES:
OP-MC-EP-EAL Objective 6

Student References Provided

EAL Wall Charts

APE062 2.4.9 - Loss of Nuclear Service Water

APE062 GENERIC

Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

APE003 AA2.03 - Dropped Control Rod

Ability to determine and interpret the following as they apply to the Dropped Control Rod: (CFR: 43.5 / 45.13)

Dropped rod, using in-core/ex-core instrumentation, in-core or loop temperature measurements ....

Given the following on Unit 2:

- The unit is operating at 100% RTP
- Rod control is in AUTOMATIC
- Annunciator 2AD-2 / D9 (RPI AT BOTTOM ROD DROP) alarms
- DRPI indicates that rod M14 (adjacent to Power Range N-44) has dropped

Based on the conditions above, over the next several hours the overall core QPTR will ___(1)___.

In accordance with AP-14 (ROD CONTROL MALFUNCTION) Enclosure 1 (RESPONSE TO DROPPED OR MISALIGNED ROD), power must be reduced to less than a MAXIMUM of ___(2)___ prior to recovering the dropped rod.

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

A. 1. increase
   2. 75%

B. 1. increase
   2. 50%

C. 1. decrease
   2. 75%

D. 1. decrease
   2. 50%

General Discussion

As a result of the dropped rod, indication on N-44 will decrease and be less than the indicated power on the other three power ranges. This will result in an indicated power tilt in that quadrant. Over the next several hours, Xenon will build in at the dropped rod assembly further suppressing power in that location (and that quadrant) and thus INCREASING the severity of the quadrant power tilt.

In accordance with AP-14, power must be less than 50% prior to recovering the dropped control rod.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is correct.

Part 2 is plausible because AP-14 specifies that power must be reduced to less than 75% RTP to comply with the requirements of Tech Spec 3.1.4 (Rod Group Alignment Limits).

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

Part 1 is plausible because actual indication on the NI channel will decrease. If the applicant confuses NI indication with what happens to QPTR, they will conclude that this is the correct response. Also, the applicant could confuse overall core QPTR with QPT in the affected quadrant. The QPT in the effected quadrant will decrease while the overall core QPTR will increase.

Part 2 is plausible because AP-14 specifies that power must be reduced to less than 75% RTP to comply with the requirements of Tech Spec 3.1.4 (Rod Group Alignment Limits).

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because actual indication on the NI channel will decrease. If the applicant confuses NI indication with what happens to QPTR, they will conclude that this is the correct response. Also, the applicant could confuse overall core QPTR with QPT in the affected quadrant. The QPT in the effected quadrant will decrease while the overall core QPTR will increase.

Part 2 is plausible because AP-14 specifies that power must be reduced to less than 50% RTP to recover a dropped rod.

Basis for meeting the KA

The K/A is matched because the applicant is presented with a situation where a dropped rod is indicated. The applicant demonstrates the ability to "interpret" the effect of the dropped rod based on the response of the excore nuclear instruments (i.e. indication of the Quadrant Power Tilt Ratio).

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. The applicant must analyze the conditions given to determine the effect of a dropped rod on QPTR. Then the applicant must recall from memory the AP-14 requirements to recover the dropped control rod.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?
NO. While the first part of the question can be answered with systems knowledge, the second part of the question cannot.

2) Can the question be answered solely by knowing immediate operator actions?
NO. The question does NOT relate to immediate actions of the AP.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. This is not related to the entry conditions of AP-14.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?

NO. This does not relate to the purpose, sequence of events, or mitigative strategy of AP-14.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
NO.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
NO.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
YES. The step that begins recovery of the dropped control rod is a diagnostic step which determines if power is less than the required limit to proceed with the recovery in accordance with the sub-steps of AP-14.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	MODIFIED	2015 MNS SRO Exam Q82

Development References

REFERENCES:
Tech Spec 3.1.4 (Rod Group Alignment Limits)
AP-14 ENCL. 1

LEARNING OBJECTIVES:
OP-MC-IC-IRE Objective 14

Student References Provided

APE003 AA2.03 - Dropped Control Rod
Ability to determine and interpret the following as they apply to the Dropped Control Rod: (CFR: 43.5 / 45.13)
Dropped rod, using in-core/ex-core instrumentation, in-core or loop temperature measurements ....

Remarks/Status

Modified question from 2015 MNS NRC SRO examination to ask the power level to recover the dropped rod as opposed to the power level to meet Tech Spec 3.1.4 (Rod Group Alignment Limits). This changes the correct answer from "A" to "B".

APE036 2.4.31 - Fuel Handling Incidents
APE036 GENERIC
Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

Given the following on Unit 1:

- The unit is in a refueling outage
- Core unload is in progress
- The Spent Fuel Pool Level Low computer alarm has actuated
- Actual pool level is minus 2 feet and slowly DECREASING
- 1EMF-17 (SPENT FUEL BLDG. REFUELING BRIDGE) and 1EMF-42 (FUEL BUILDING RADIATION MONITOR) are in the trip 1 condition
- 1AD-13 / B-6 (INCORE INST ROOM SUMP HI LEVEL) is LIT

Based on the conditions above,

1) the CRS will implement ________.

2) the action the crew is required to take is to initiate makeup using ________.

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

PROCEDURE LEGEND:

AP-40 (LOSS OF REFUELING CAVITY LEVEL)
AP-41 (LOSS OF SPENT FUEL COOLING OR LEVEL) CASE II (LOSS OF SPENT FUEL LEVEL)

A. 1. AP-41, CASE II
2. the FW pump from the FWST

B. 1. AP-41, CASE II
2. Demineralized Water

C. 1. AP-40
2. the FW pump from the FWST

D. 1. AP-40
2. Demineralized Water

General Discussion

While the entry conditions for AP-40 (Loss of Refueling Cavity Level) AND AP-41 (Loss of Spent Fuel Cooling or Level) Case II (Loss of Spent Fuel Level) are met , the background document for AP-40 states that this procedures purpose is to ensure proper response in the event of loss of water in the refueling cavity. If the spent fuel pool level is going down concurrently, AP-40 provides guidance to mitigate BOTH the loss of refueling cavity level and spent fuel pool level. Based on the conditions in the stem (core unload in progress) the SRO applicant will determine that implementation of AP-40 is the correct action.

In accordance with the actions of AP-40, the crew will initiate makeup to the refueling cavity using the FW pump from the FWST.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the entry conditions for AP-41, Case II are met and this procedure would be entered if the refueling cavity was not tied to the spent fuel pool.

Part 2 is correct.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the entry conditions for AP-41, Case II are met and this procedure would be entered if the refueling cavity was not tied to the spent fuel pool.

Part 2 is plausible because the normal method of makeup is using Demineralized Water to the Spent Fuel Pool. Additionally, it is the method that Operators are most familiar with because it is typically the only method of makeup ever used.

Answer C Discussion

CORRECT: See explanation above.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the normal method of makeup is using Demineralized Water to the Spent Fuel Pool. Additionally, it is the method that Operators are most familiar with because it is typically the only method of makeup ever used.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge of the response procedures associated with a Fuel Handling Incident.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must analyze the conditions given in the stem and based on that analysis, select the appropriate procedure to implement.

Next, the applicant must recall from memory the methods of makeup specified in the selected procedure.

Basis for SRO only

This is an SRO only question because it requires the applicant to have knowledge of "Fuel-Handling Facilities and Procedures" as specified by 10 CFR 55.43(b)(7).

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References

REFERENCES:
AP-40 (Loss of Refueling Cavity Level)
AP-41 (Loss of Spent Fuel Cooling or Level) Case II (Loss of Spent Fuel Level)

LEARNING OBJECTIVES:
OP-MC-AP-40 Objective 2

Student References Provided

APE036 2.4.31 - Fuel Handling Incidents

APE036 GENERIC

Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

Remarks/Status

APE037 AA2.03 - Steam Generator (S/G) Tube Leak

Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: (CFR: 43.5 / 45.13)

That the expected indication on main steam lines from the S/Gs should show increasing radiation levels ....

Given the following on Unit 1:

- The unit is at 100% RTP
- 1EMF-24 has a Trip I alarm with the following indication:

- The crew implements AP-10 (NC SYSTEM LEAKAGE WITHIN THE CAPACITY OF BOTH NV PUMPS) Case 1 (STEAM GENERATOR TUBE LEAKAGE)

In accordance with AP-10, Case 1,

1) the CRS will determine if the indication is valid by directing RP to frisk all Unit 1 ________ and compare them to determine if any activity level is significantly higher.

2) if the indication is valid and the leak rate is subsequently determined to be 0.08 GPM, a power reduction to less than 50% within 1 hour ________ required.

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

A. 1. Main Steam Lines
   2. is

B. 1. Main Steam Lines
   2. is NOT

C. 1. SG Cation Columns
   2. is

D. 1. SG Cation Columns
   2. is NOT

General Discussion

In accordance with AP-10, Case 1, the CRS will direct RP to frisk all SG Cation Columns on the effected unit to determine if activity levels are significantly higher on one SG.

The applicant will use 0.08 GPM to calculate that SG Tube leakage is approximately 115 GPD. In accordance with AP-10, Case 1, if leakage exceeds 125 GPD, the crew will reduce power to less than 50% within 1 hour. Therefore, with the conditions given, while a unit shutdown is required (as directed by PT/1/A/4250/001C - Primary to Secondary Leakage Monitoring, Enclosure 13.3 - Action Level 2) a power reduction to less that 50% power within 1 hour is NOT required.

NOTE that if leakage increases to greater than 125 GPD during the shutdown, the crew would implement Enclosure 13.4 (Action Level 3) which will direct the crew to reduce power to less than 50% within 1 hour.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible as frisking the steam lines could indicate the SG with the tube leak. Additionally, the Westinghouse Owner's Group (WOG) Emergency Response Guideline (ERG) for E-3 states that one of the actions for identifying the ruptured S/G(s) is to "Check for high radiation from any steamline". The ERG goes on to state that "Hand-held radiation monitors may be an effective means of detecting high steamline radiation for plants without main steamline radiation monitors." It just so happens that at MNS, we frisk the S/G cation columns as opposed to the Main Steamlines themselves as they are a more reliable indication of the affected S/G.

Part 2 is plausible because the PT for Primary to Secondary Leakage Monitoring uses the number of 100 GPD as the break points for Action Level 2. Action Level 2 requires a unit shutdown to MODE 3. If the applicant confuses the actions of AL2 and AL3, they could conclude that they are required to reduce power to less than 50% within one hour (one of the AL3 requirements).

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible as frisking the steam lines could indicate the SG with the tube leak. Additionally, the Westinghouse Owner's Group (WOG) Emergency Response Guideline (ERG) for E-3 states that one of the actions for identifying the ruptured S/G(s) is to "Check for high radiation from any steamline". The ERG goes on to state that "Hand-held radiation monitors may be an effective means of detecting high steamline radiation for plants without main steamline radiation monitors." It just so happens that at MNS, we frisk the S/G cation columns as opposed to the Main Steamlines themselves as they are a more reliable indication of the affected S/G.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because the PT for Primary to Secondary Leakage Monitoring uses the number of 100 GPD as the break points for Action Level 2. Action Level 2 requires a unit shutdown to MODE 3. If the applicant confuses the actions of AL2 and AL3, they could conclude that they are required to reduce power to less than 50% within one hour (one of the AL3 requirements).

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge of what actions are procedurally required (IAW AP-10) to determine if the indication on the S/G which is showing increased radiation levels is expected.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step.

First, the applicant must recall from memory the actions of AP-10 Case 1 to determine which S/G (if any) is leaking.

Next, the applicant must recall from memory the leakage requirements from AP-10, Case 1 which determine whether a rapid power reduction to less than 50% power is required.

Finally, the applicant must perform a calculation to determine if the leakage limit of AP-10, Case 1 has been exceeded.

MNS ILT 18-1 SRO NRC Examination **QUESTION 92** 92 **D**

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?
NOT. Neither part of this question can be answered with systems knowledge.

2) Can the question be answered solely by knowing immediate operator actions?
NO. There are NO immediate actions associated with AP-10.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. Neither part of this question can be answered based on knowledge of AP or EOP entry conditions.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?
NO. Neither part of the question is related to procedure purpose, sequence of events, or procedure mitigative strategy.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
YES. The question requires the applicant to evaluate the conditions given to determine whether the section of the procedure to reduce power to less than 50% wihin one hour must be performed OR whether the section which requires a shutdown to MODE 3 be commenced.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
NO.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO.

NOTE: Per Lesson Plan OP-MC-AP-10 Objective 7 - "Given scenarios describing accident events and plant conditions, evaluate appropriate operator actions and procedure transitions as described in AP/10", this is an SRO only task.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References

REFERENCES:
AP-10 (NC System Leakage Within the Capacity of Both NV Pumps) Case 1 (Steam Generator Tube Leakage) Rev. 23
PT/1/A/4250/001C (Primary to Secondary Leakage Monitoring)

LEARNING OBJECTIVES:
OP-MC-AP-10 Objective 7

Student References Provided

APE037 AA2.03 - Steam Generator (S/G) Tube Leak
Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: (CFR: 43.5 / 45.13)
That the expected indication on main steam lines from the S/Gs should show increasing radiation levels ....

Remarks/Status

APE067 2.4.41 - Plant Fire On Site

APE067 GENERIC

Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11)

Given the following on Unit 2:

- The unit is at 100% RTP
- At 1000, the U2 TB Rounds AO reports that there is a fire on the 2A DG Battery Charger Panel, the panel is charred, and all breakers on the battery charger have tripped
- The Fire Brigade is dispatched and at 1020, the Fire Brigade Team Leader reports that the fire is out

Per RP/0/A/5700/000 (CLASSIFICATION OF EMERGENCY), based on the conditions above, the Shift Manager must classify the event no later than ___(1)___.

In accordance with the Emergency Action Level (EAL) Wall Charts, the classification for this event is a/an ___(2)___.

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

REFERENCE PROVIDED

A. 1. 1015
   2. ALERT

B. 1. 1030
   2. ALERT

C. 1. 1015
   2. UNUSUAL EVENT

D. 1. 1030
   2. UNUSUAL EVENT

General Discussion

Since there was a fire in the DG room (i.e. DG Battery charger), there was a fire (Table S-5) , and the fire has resulted in degraded performance of one train of a Safety System needed for the current operating mode (i.e. 2A DG), there is indication at time 1000 that an Emergency Action Threshold has been exceeded (SA9.1). Therefore, the EAL must be declared at 1015.

The classification based on the EAL Wall Chart would be an ALERT.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because if the applicant believes that the fire has to have not been extinguished for 15 min for an EAL threshold to be met (as is the case with the U.E. classification), the fire would have had to exist at 1015 for the threshold to be met. Therefore, the SM would have 15 minutes from that time to classify the event making the correct answer 10:30.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant only reviews the hazards section (vs. System Malfunction). If that were the case, this would be the classification determined.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because if the applicant believes that the fire has to have not been extinguished for 15 min for an EAL threshold to be met (as is the case with the U.E. classification), the fire would have had to exist at 1015 for the threshold to be met. Therefore, the SM would have 15 minutes from that time to classify the event making the correct answer 10:30.

Part 2 is plausible if the applicant only reviews the hazards section (vs. System Malfunction). If that were the case, this would be the classification determined.

Basis for meeting the KA

The K/A is met because the applicant must have knowledge of how to classify an event base on meeting EAL Thresholds for a Fire Event on plant site.

Basis for Hi Cog

This is a higher cognitive level question because it requires more than one mental step. First, the applicant must analyze the conditions given and compare those conditions to the EAL Wall Charts to determine the correct classification.

Second, the applicant must recall from memory the rules of usage for EAL classification (RP/0/A/57000/000) to determine when the classification must be made.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?
NO. Neither part of the qustion can be answered using systems knowledge.

2) Can the question be answered solely by knowing immediate operator actions?
NO. There are no immediate actions associated with the EAL Wall Charts or RP-000.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. This question has nothing to do with EOP or AP entry conditions.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?
NO. This question is not related to purpose, mitigative strategy, or sequence of events in a procedure.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
YES. This question requires the applicant to evaluate the conditions given and then select which Emergency Plan procedure to implement. For the conditions given the two choice would be RP-001 (Notification of Unusual Event) OR RP-002 (Alert).

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
YES. This question requires the applicant to evaluate the conditions given and determine when the event must be declared which initiates completing the event notification form (an attachment).

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO.

Additionally, at MNS, per Lesson Plan OP-MC-EP-EAL (Emergency Action Levels) Objective 6, this is and SRO only task.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
REFERENCES: EAL Wall Chart RP/0/A/5700/000 Classification of Emergency LEARNING OBJECTIVES: OP-MC-EP-EAL Objective 6

Student References Provided
EAL Wall Charts

APE067 2.4.41 - Plant Fire On Site
APE067 GENERIC
Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11)

Remarks/Status

GEN2.1 2.1.13 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of facility requirements for controlling vital/controlled access. (CFR: 41.10 / 43.5 / 45.9 / 45.10)

Given the following on Unit 2:

- The unit is cooling down in MODE 4 in preparation for a Forced Outage
- Engineering has requested access to the Containment Annulus area for an inspection

In accordance with MSD-585 (REACTOR BUILDING PERSONNEL ACCESS AND MATERIAL CONTROL),

1) permission from the WCC SRO for the Annulus entry ________ required.

2) the use of the "buddy system" ________ required for entry into the Annulus.

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

A. 1. is
   2. is

B. 1. is
   2. is NOT

C. 1. is NOT
   2. is

D. 1. is NOT
   2. is NOT

General Discussion

Per MSD-585, Attachment 4.3 (Procedure for Containment Entry Modes 1-4), permission to enter Containment must be obtained from the WCC SRO prior to entry.

Per MSD-585, the buddy system is required in MODES 1-4 for BOTH containment and annulus entries.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant confuses MODE 4 entry requirements with MODE 5 entry requirements because use of the buddy system is not required in MODE 5.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the Annulus is not within the containment boundary. Therefore, the applicant could conclude that no special permission is required for annulus entry. Or if the applicant concludes that permission from the WCC SRO for annulus entry is required in MODES 1-3, they would determine that it is NOT required under the current conditions.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the Annulus is not within the containment boundary. Therefore, the applicant could conclude that no special permission is required for annulus entry. Or if the applicant concludes that permission from the WCC SRO for annulus entry is required in MODES 1-3, they would determine that it is NOT required under the current conditions.

Part 2 is plausible if the applicant confuses MODE 4 entry requirements with MODE 5 entry requirements because use of the buddy system is not required in MODE 5.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge of MSD-585 which provides direction for Containment access during all modes of operation.

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):
1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?
NO. Neither part of this question is related to systems knowledge.

2) Can the question be answered solely by knowing immediate operator actions?
NO. There are NO immediate actions associated with MSD-585.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. This question is not related to AOP or EOP entry conditions.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?
NO. This question is NOT related to the purpose, sequence of events, or mitigative strategy of MSD-585 (as it has no mitigative strategy).

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
YES. For the question given, the applicant must evaluate the conditions given to determine that, based on current conditions, they would

implement Attachment 4.4 of MSD-585 which requires permission from the SRO for the Annulus entry. If the applicant implemented the wrong enclosure (4.3), they would see that permission was required from the WCC SRO for Containment entry and would conclude that is was not required for Annulus entry.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
YES. The applicant must understand that based on current conditions, Attachment 4.4 must be implemented for the Annulus entry.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	MODIFIED	2016 MNS NRC Q98 MODIFIED

Development References

REFERENCES:
MSD-585 (Reactor Building Personnel Access and Material Control)

LEARNING OBJECTIVES:
NONE

Student References Provided

GEN2.1 2.1.13 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of facility requirements for controlling vital/controlled access. (CFR: 41.10 / 43.5 / 45.9 / 45.10)

Remarks/Status

GEN2.1 2.1.45 - GENERIC - Conduct of Operations

Conduct of Operations

Ability to identify and interpret diverse indications to validate the response of another indication. (CFR: 41.7 / 43.5 / 45.4)

Given the following on Unit 2:

- Annunciator 2RAD-1 / E-5 (2 EMF 38 CONTAINMENT PART ALERT) alarms
- The crew observes that 2EMF-38L (Containment Particulate Monitor) is in Trip 1

In accordance with Tech Spec 3.4.15 (RCS LEAKAGE DETECTION INSTRUMENTATION) Bases, which ONE (1) of the following is required by the LCO to be capable of identifying a 1 GPM Reactor Coolant system leak in 1 hour or less after leakage has reached the sumps?

A. Volume Control Tank level

B. Incore Instrument sump level

C. 2EMF-39 (Unit 2 Containment Gas Monitor)

D. Containment Floor and Equipment (CFAE) sump level

General Discussion

In accordance with Tech Spec 3.4.15 Basis:

"The reactor coolant contains radioactivity that, when released to the containment, can be detected by radiation monitoring instrumentation. U.S. NRC Regulatory Guide (RG) 1.45, Reactor Coolant Pressure Boundary Leakage Detection Systems, (Ref. 2), describes acceptable methods of implementing the requirements for leakage detection systems. Although RG 1.45 is not a license condition, it is generally accepted for use to support licensing basis. RG 1.45 states that instrument sensitivities of 10-9 µCi/cc radioactivity for air particulate monitoring are practical for leakage detection systems. The containment atmosphere particulate radioactivity monitor at McGuire meets or exceeds this accepted sensitivity.

RG 1.45 also states that detector systems should be able to respond to a one gpm leak, or its equivalent, in one hour or less. The containment atmosphere particulate radioactivity monitor at McGuire has demonstrated capabilities of detecting a 1.0 gpm leak within one hour at the sensitivity recommended in Regulatory Guide 1.45 using the RCS corrosion product activities from the UFSAR."

For MNS, 1(2) EMF-38 are the credited RG 1.45 radiation monitors.

Tech Spec 3.4.15 Basis also states:

"As leakage may go to either or both of the two CFAE sumps, a 1 gpm sump input (cumulative between sumps A and B) is detectable in 1 hour after leakage has reached the sumps (Ref 8)."

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because the Volume Control Tank is discussed in Tech Spec 3.4.15 Basis as one of the diverse indications for determining NC system leakage and it is the normal method used to perform an NC system leak rate calculation.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because the incore instrument sump level is credited by Tech Spec 3.4.15 as being able to detect a 1 GPM leak within 4 hours.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:

This answer is plausible because 2EMF-39 will most likely alarm if there is significant leakage into containment. Also, the applicant could confuse 2EMF-39 with 2EMF-38 and conclude that BOTH are credited with detecting a 1 GPM leak within 1 hour.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The KA is matched because the applicant must have knowledge of the TS Basis to be able to identify which indication would be a diverse indication credited for identifying a small NC system leak into containment.

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):

1) Can the question be answered solely by knowing ≤1-hour TS/TRM Action?
NO. This question can NOT be answered by knowing less than 1 hour Tech Specs. The only "less than one hour" spec associated with Tech Spec 3.4.15 is if all leakage detection method required by the spec are inoperable. That is not the case with this question.

2) Can the question be answered solely by knowing the LCO/TRM information listed "above the line? "
NO. The required knowledge to answer this question is not "above-the-line" knowledge.

3) Can the question be answered solely by knowing the TS safety limits?
NO. This question is not related to TS Safety Limits.

4) Does the question involve one or more of the following for the TS, TRM, or ODCM:

- application of required actions (TS Section 3) and SRs (TS Section 4) in accordance with rules of application requirements (TS Section 1)
NO.

- application of generic LCO requirements (LCO 3.0.1 through 3.0.7 and SR 4.0.1 through 4.0.4)
NO.

- knowledge of TS bases that is required to analyze TS-required actions and terminology
YES. This question requires the applicant to have knowledge of the TS basis to determine the correct response.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	2012 MNS NRC EXAM Q95 (Bank 5780)

Development References

REFERENCES:
Tech Spec 3.4.15 (RCS Leakage Detection Instrumentation)
Tech Spec 3.4.15 Basis

LEARNING OBJECTIVES:
OP-MC-WE-EMF Objective 10

Student References Provided

GEN2.1 2.1.45 - GENERIC - Conduct of Operations
Conduct of Operations
Ability to identify and interpret diverse indications to validate the response of another indication. (CFR: 41.7 / 43.5 / 45.4)

Remarks/Status

GEN2.2 2.2.23 - GENERIC - Equipment Control
Equipment Control
Ability to track Technical Specification limiting conditions for operations. (CFR: 41.10 / 43.2 / 45.13)

Given the following initial conditions on Unit 1:

- The unit is in MODE 3 preparing for a unit startup
- The OSM has asked you to evaluate the following valve stroke time results:

VALVE	STROKE TIME (sec)
1CF-32AB (1A S/G CF CONTROL)	9.2
1CF-104AB (1A S/G CF CONTROL BYPASS)	8.2
1CF-126B (1A S/G CF TO CA NOZZLE BYPASS)	11.2
1CF-23AB (1B S/G CF CONTROL)	11.0
1CF-105AB (1B S/G CF CONTROL BYPASS)	8.3
1CF-127B (1B S/G CF TO CA NOZZLE BYPASS)	11.2
1CF-20AB (1C S/G CF CONTROL)	8.2
1CF-106AB (1C S/G CF CONTROL BYPASS)	10.0
1CF-128B (1C S/G CF TO CA NOZZLE BYPASS)	8.1
1CF-17AB (1D S/G CF CONTROL)	10.3
1CF-107AB (1D S/G CF CONTROL BYPASS)	8.5
1CF-129B (1D S/G CF TO CA NOZZLE BYPASS)	8.3

Based on the conditions above, which ONE (1) of the following indicates the applicable Action Statements of Tech Spec 3.7.3 (MFIVs, MFCVs, MFCVs Bypass Valves, and MFW/AFW NBVs)?

REFERENCE PROVIDED

A. B, C, AND D

B. B and C ONLY

C. B and D ONLY

D. D ONLY

General Discussion

In accordance with Tech Spec 3.7.3 (MFIVs, MFCVs, MFCVs Bypass Valves, and MFW/AFW NBVs):

Condition B is applicable for one or more inoperable CF Control Valves (1CF-23AB and 1CF-17AB).

Condition C is applicable for one or more CF Control Bypass or CF/CA Nozzle Bypass Valves (1CF-126B, 1CF-127B).

Condition D is applicable for two inoperable valves in the same flow path (1CF-23AB and 1CF-127B).

For the conditions given, Condition B applies to the 1D S/G flowpath, Condition B, C, and D apply to the 1B S/G flowpath, Condition C applies to the 1A S/G flowpath.

Therefore, Conditions B, C, and D are applicable.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
It is common for operators to overlook the fact that the CF/CA Nozzle Bypass valves are in in the same flowpath with the CF Control and CF Control Bypass valves. Therefore, it is plausible for the applicant to overlook that Condition D applies to the 1B S/G Flowpath and determine that ONLY Conditions B and C apply.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
If the applicant overlooks that Condition C is applicable for 1A S/G Flowpath and concludes that since Conditions B and C are bounded by Condition D on the 1B S/G Flowpath (and consequently did not require separate entries), they would conclude that Condition B was applicable for the 1D S/G Flowpath and that Condition D was applicable for the 1B S/G Flowpath.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
It is plausible for the applicant to conclude that Condition D bounds Conditions B and C and that, regardless of the number of valves that are INOPERABLE, separate entries for Conditions B and C are not required.

Basis for meeting the KA

The K/A is matched because the SRO applicant demonstrates the ability to determine which Tech Spec conditions apply. In doing so, they demonstrate the ability to accurately track Tech Spec LCOs.

Basis for Hi Cog

This question is a higher cognitive level question because it requires detailed analysis and application of Tech Specs.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in the Clarification Guidance for SRO-only Questions Rev 1 dated 03/11/2010 for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):

1) This question can NOT be answered by knowing less than 1 hour Tech Specs
The potential Tech Spec action times for this condition are either 8 or 72 hours.

2) This question can NOT be answered by knowing information listed "above-the-line".
The question can only be answered by have knowledge of LOC actions and action times which are "below-the-line".

3) This question can NOT be answered by knowing the TS Safety Limits or their bases.
This question is associated with Tech Spec 3.7.3 (MFIVs, MFCVs, MFCVs Bypass Valves, and MFW/AFW NBVs) and NOT Tech Spec Safety Limits (TS 2.0) or their bases.

4) This question requires the applicant to analyze conditions relative to Tech Specs and determine which LCO conditions are applicable. As such, it is SRO level knowledge.

MNS ILT 18-1 SRO NRC Examination **QUESTION 96** 96 **A**

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2014 MNS NRC Exam Q79 (Bank 5894)

Development References
REFERENCES: Tech Spec 3.7.3 (MFIVs, MFCVs, MFCVs Bypass Valves, and MFW/AFW NBVs) LEARNING OBJECTIVES: OP-MC-CF-CF Objective 27

Student References Provided
Tech Spec 3.7.3 (MFIVs, MFCVs, MFCV□s Bypass Valves, and MFW/AFW NBVs)

GEN2.2 2.2.23 - GENERIC - Equipment Control
Equipment Control
Ability to track Technical Specification limiting conditions for operations. (CFR: 41.10 / 43.2 / 45.13)

Remarks/Status
Rearranged answers from previous bank version of the question so that it would not appear the same. HCF 08/03/2017

GEN2.2 2.2.37 - GENERIC - Equipment Control
Equipment Control
Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Given the following on Unit 1:

- Unit is at 100% RTP
- 1EMF-33 (CONDENSER AIR EJECTOR EXHAUST) is in Trip 2 alarm
- 1EMF-71 (S/G A LEAKAGE) is in Trip 2 alarm
- Pressurizer level has been stabilized using AP-10 (NC LEAKAGE WITHIN THE CAPACITY OF BOTH NV PUMPS)
- Letdown flow is 45 GPM
- Charging flow is 78 GPM

The MAXIMUM time that AP-10 allows for the unit to reach MODE 3 for the conditions specified is ___(1)___.

In accordance with SLC 16.9.7 (STBY S/D SYSTEM) Condition C (LEAKAGE), the Standby Makeup Pump is ___(2)___ .

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

A. 1. 3 hours
   2. NON-FUNCTIONAL

B. 1. 3 hours
   2. FUNCTIONAL

C. 1. 6 hours
   2. NON-FUNCTIONAL

D. 1. 6 hours
   2. FUNCTIONAL

General Discussion

With the indications given, the crew would be required to enter AP-10 (NC System Leakage), Case 1 (S/G Tube leakage). This procedure would direct the crew to stabilize PZR level and determine leak size.

Leakage rate is 78 - 45 - 12= 21 gpm. In accordance with SLC 16.9.7, the Standby Makeup Pump is NON-FUNCTIONAL . Step 6 of AP-10 Case 1, directs an SRO to evaluate if leakage exceeds SLC 16.9.7 Condition C limits. The limit is defined as >20 GPM. Per TS 3.4.13 (NC Operational Leakage), the limit for a individual S/G tube leakage of 135 GPD would be exceeded. If this leakage is exceeded, Condition B requires the unit be in Mode 3 in 6 hours. Per Step 7 of AP-10, Case 1, if the leakage in one S/G is greater than 125 GPD, the unit is required to be in Mode 3 within 3 hours of exceeding 125 GPD.

Answer A Discussion

CORRECT: See explanation above.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant subtracts actual seal injection going into the NC system (20 GPM) instead of the seal return flow (12 GPM) from charging flow along with subtracting letdown flow (45 GPM). If that were the case, the applicant would determine that total leakage would be 13 GPM (78 - 45 - 20) instead of 21 GPM (78 -45 -12). In this case, since the applicant determines leakage to be less than 20 GPM, the Standby Makeup Pump would NOT have to be declared NON-FUNCTIONAL.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is correct per the requirement of Condition B of TS 3.4.13 (NC Operational Leakage) which requires the unit to be in Mode 3 in 6 hours. It would reasonable for the applicant to believe this would also be the required time specified in AP-10.

Part 2 is correct.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because this is correct per the requirement of Condition B of TS 3.4.13 (NC Operational Leakage) which requires the unit to be in Mode 3 in 6 hours. It would reasonable for the applicant to believe this would also be the required time specified in AP-10.

Part 2 is plausible if the applicant subtracts actual seal injection going into the NC system (20 GPM) instead of the seal return flow (12 GPM) from charging flow along with subtracting letdown flow (45 GPM). If that were the case, the applicant would determine that total leakage would be 13 GPM (78 - 45 - 20) instead of 21 GPM (78 -45 -12). In this case, since the applicant determines leakage to be less than 20 GPM, the Standby Makeup Pump would NOT have to be declared NON-FUNCTIONAL.

Basis for meeting the KA

The K/A is match because the applicant must have know of the licensing commitments related to the Standby Makeup Pump (which is part of the Chemical Volume Control System) and Tech Specs related to leakage.

Basis for Hi Cog

This is a higher cognitive level question because the applicant must perform calculation (solve a problem) and then perform a level of analysis concerning the given indications and predict the impact and determine the correct procedural course of action.

Basis for SRO only

This question meets the following criteria for an SRO only question as described in This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(2) (Tech Specs):

1) Can the question be answered solely by knowing ≤1-hour TS/TRM Action?
NO. This question is NOT related to less than 1 hr Tech Spec actions.

2) Can the question be answered solely by knowing the LCO/TRM information listed "above the line? "
NO. This question is related to "below the line" knowledge.

3) Can the question be answered solely by knowing the TS safety limits?
NO. This is NOT a TS Safety Limit.

4) Does the question involve one or more of the following for the TS, TRM, or ODCM:

- application of required actions (TS Section 3) and SRs (TS Section 4) in accordance with rules of application requirements (TS Section 1)
YES. This requires knowleged of the application of SLC 16.9.7.

- application of generic LCO requirements (LCO 3.0.1 through 3.0.7 and SR 4.0.1 through 4.0.4)
NO.

- knowledge of TS bases that is required to analyze TS-required actions and terminology
NO.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2013 MNS SRO Examination Q76 (Bank)

Development References

REFERENCES:
AP-10 (NC System Leakage Within the Capacity of Both NV Pumps)
SLC 16.9.7 (Standby Shutdown System)

LEARNING OBJECTIVES:
OP-MC-AP-10 Objectives 5, 6, & 7

Student References Provided

GEN2.2 2.2.37 - GENERIC - Equipment Control
Equipment Control
Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Remarks/Status

GEN2.3 2.3.6 - GENERIC - Radiation Control
Radiation Control
Ability to approve release permits. (CFR: 41.13 / 43.4 / 45.10)

Given the following plant conditions:

- Unit 1 is in the process of making a radioactive gaseous waste release from the Waste Gas Decay Tank in accordance with OP/0/A/6200/519 (WASTE GAS DECAY TANK RELEASE)
- Allowable Release Rate = 40 CFM
- Recommended Release Rate = 31 CFM
- 0EMF-50 (WASTE GAS DISCH) Trip 1 setpoint = 2.0E5 CPM
- 0EMF-50 Trip 2 setpoint = 3.0E5 CPM
- 1EMF-36 (UNIT VENT GAS) is NOT in service

Time	0200	0215	0230	0245
Release Rate (CFM)	32	30	35	41
0EMF-50 (CPM)	2.8E5	3.2E5	3.1E5	4.2E5

Which ONE (1) of the following is the EARLIEST time that the operators are <u>required</u> to terminate the GWR paperwork and re-initiate the release with new GWR paperwork?

A. 0200

B. 0215

C. 0230

D. 0245

General Discussion

During a release to the environment, the operator should monitor release rates and EMF readings to ensure the readings are as expected.
In most cases, the maximum release flow rate capability is significantly less than the most restrictive flow rate based on activity. Therefore, there is usually no problem with the release flow rate being higher than the GWR permitted flow rate. For example, the most restrictive release rate for VP is 9.47 E+04 cfm while the maximum release rate is only 3.1 E+04 cfm. However, in the rare case where the release rate limit is less than the maximum system capability, the operator needs to ensure the release rate stays below the limit. If the release rate exceeds the GWR recommended release, he/she should IMMEDIATELY reduce the release rate to within the limits, contact RP, and write a PIP. [Operator Fundamentals: Monitoring Plant Conditions and Indications Closely]
The gaseous releases will automatically terminate on EMF Trip 2 signals. If this occurs, the GWR paperwork should be terminated and new paperwork should be started.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible because the actual release rate is above the Recommended Release Rate and 0EMF-50 is above the Trip 1 setpoint.

Answer B Discussion

CORRECT: See explanation above.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant concludes that both the Recommended Release Rate and the 0EMF-50 Trip 2 setpoint must be exceeded before the release paperwork must be terminated.

Answer D Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
This answer is plausible if the applicant concludes that both the Maximum Release Rate and the 0EMF-50 Trip 2 setpoint must be exceeded before the release paperwork must be terminated.

Basis for meeting the KA

The K/A is matched because it requires the applicant to have knowledge of GWR release permits and when they must be terminated (i.e. when a current release permit is no longer "approved").

Basis for Hi Cog

This is a higher cognitive level because it requires more than one mental step. First, it requires the applicant to recall from memory the requirements of OP/0/A/6200/519 regarding when GWR paperwork must be terminated and new release paperwork developed. Then, the applicant must evaluated conditions over time against initial conditions for the GWR release to determine when the release and the current GWR paperwork must be terminated.

Basis for SRO only

This is an SRO only question because it meets the requirements of ES-401 Attachment 2 (Clarification Guidance for SRO-Only Questions) Section II (Examples of Additional Knowledge and Abilities as They Pertain to an SRO License
and the 10 CFR 55.43(b) Topics [ES-401, Section D.1.c]) Part D Radiation Hazards That May Arise during Normal and Abnormal Situations, including Maintenance Activities and Various Contamination Conditions [10 CFR 55.43(b)(4)] as it relates to the "process for gaseous/liquid release approvals (i.e., release permits)."

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2011 MNS SRO Audit Examination Q97 (Bank 4503)

Development References

REFERENCES:
OP/0/A/6200/519 Rev. 5
Lesson Plan OP-MC-WE-RGR Rev. 14

LEARNING OBJECTIVES:
OP-MC-WE-RGR Objectives 3 and 5

Student References Provided

GEN2.3 2.3.6 - GENERIC - Radiation Control

MNS ILT 18-1 SRO NRC Examination **QUESTION 98** 98 **B**

Radiation Control
Ability to approve release permits. (CFR: 41.13 / 43.4 / 45.10)

Remarks/Status
Modified the distractors at times 0230 and 0245 from the original bank version of the question for improved plausibility. Changed Maximum Observed System Release Rate to allowable release rate. HCF 06-14-17

MNS ILT 18-1 SRO NRC Examination **QUESTION 99** 99 **D**

GEN2.4 2.4.18 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.1 / 45.13)

Given the following on Unit 1:

- The unit was initially at 25% RTP with a power increase in progress
- The unit experienced a complete loss of all onsite and offsite power
- ECA-0.0 (LOSS OF ALL AC POWER) has been implemented
- Operators have been dispatched to the SSF to place the Standby Makeup Pump in service
- The crew has determined that a cooldown and depressurization of the NC system is required using the S/G PORVs
- No power has been restored from onsite or offsite sources yet

In accordance with the ECA-0.0 Background Document,

1) the basis for not allowing the S/Gs to depressurize to less than 190 PSIG is to prevent _______.

2) the MAXIMUM time the crew has to start the Standby Makeup Pump to prevent a postulated NC Pump Seal LOCA is _______.

A. 1. inadvertent criticality due to cooldown
2. 5 minutes

B. 1. nitrogen injection from the CLAs
2. 5 minutes

C. 1. inadvertent criticality due to cooldown
2. 10 minutes

D. 1. nitrogen injection from the CLAs
2. 10 minutes

General Discussion

In accordance with ECA-0.0:

Lowering S/G pressures to less than 190 PSIG will cause injection of CLA N2 into the NC System.

In accordance with MNS Time Critical list it is assumed that the Standby Makeup Pump can be started with 10 minutes of a loss of NC pump seal cooling.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the depressurization of the SGs to initiate flow will cause a large cooldown and positive reactivity addition.

Part 2 is plausible because 5 minutes is the assumed time for starting the SBMUP during an AP-20 loss of RN event.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible because 5 minutes is the assumed time for starting the SBMUP during an AP-20 loss of RN event.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because the depressurization of the SGs to initiate flow will cause a large cooldown and positive reactivity addition.

Part 2 is correct.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The K/A is matched because the applicant must have knowledge of the basis for performing actions during ECA-0.0.

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?
NO. Neither part of this question can be answered based on systems knowledge.

2) Can the question be answered solely by knowing immediate operator actions?
NO. This question involves knowledge of the basis for actions performed in ECA-0.0 and does NOT relate to immediate actions.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. This question does NOT have any relation to knowledge of AOP or EOP entry conditions. It involves knowledge of the basis for performing specific actions within ECA-0.0.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?
NO. This question does not required knowledge related to the procedure mitigative strategy. It requires knowledge of the basis for performing actions in ECA-0.0 which is beyond requisite mitigative strategy knowledge.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
NO.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps

YES. This question involves knowledge of the implementation of the enclosures required to place the standby makeup pump in service. Knowledge of when and how to implement these enclosures is required to ensure that the time-critical time for placing the standby makeup in service is met. This ensure that an NC pump seal LOCA does not occur. This requires the Enclosures to be implemented in conjunction with the body of ECA-0.0 and coordination of these actions is critical.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
NO.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	2011 MNS NRC Exam Q 76 (Bank 4427)

Development References

REFERENCES:
ECA-0.0 (Loss of All AC Power)

LEARNING OBJECTIVES:
OP-MC-EP-ECA-0

Student References Provided

GEN2.4 2.4.18 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.1 / 45.13)

Remarks/Status

Rearranged answers from the bank version of the questions so that the question would appear different than bank question.

GEN2.4 2.4.31 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

In accordance with RP-004 (General Emergency) and RP-029 (Notifications to Offsite Agencies from the Control Room):

1) the INITIAL notification of a General Emergency ___(1)___ require a Protective Action Recommendation (PAR) to be made.

2) if evacuation of areas outside the site boundary are required, the MINIMUM geographic RADIUS around the site that requires evacuation is ___(2)___.

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

A. 1. does NOT
2. 5 miles

B. 1. does NOT
2. 2 miles

C. 1. does
2. 5 miles

D. 1. does
2. 2 miles

General Discussion

In accordance with RP-004 (General Emergency) a Protective Action Recommendation (PAR) for the general public is required as part of the notification of General Emergency.

There is no requirement in RP-003 (Site Area Emergency) to make a Protective Action Recommendation to the general public. However, on-site PARs can be made (e.g. site evacuation) and in some instances are made during a Site Area Emergency. Additionally, a Site Assembly is required as an on-site protective action in the event of a SAE.

IF the event is a Rapidly Progressing Severe Accident, all areas within a 2 mile radius of the plant must be evacuated AND all zones 2-5 miles downwind must be evacuated.

Answer A Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because applicants normally deal with General Emergency scenarios where an Rapidly Progressing Severe Accident (RPSA) is in progress. If an RPSA is not in progress it takes several steps to get to the directions in Attachment 3 which require a PAR to be made. And, in some cases that PAR may be Shelter In Place. Therefore, it would be easy for an applicant to conclude that if something other than a RPSA was in progress, that PARs would not be required.

Part 2 is plausible if the applicant confuses evacuating areas AROUND the site with areas DOWNWIND of the site. During an RPSA, they are required to evacuate all areas within a 2 mile radius in addition to all areas 2-5 miles downwind.

Answer B Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is plausible because applicants normally deal with General Emergency scenarios where an Rapidly Progressing Severe Accident (RPSA) is in progress. If an RPSA is not in progress it takes several steps to get to the directions in Attachment 3 which require a PAR to be made. And, in some cases that PAR may be Shelter In Place. Therefore, it would be easy for an applicant to conclude that if something other than a RPSA was in progress, that PARs would not be required.

Part 2 is correct.

Answer C Discussion

INCORRECT: See explanation above.

PLAUSIBLE:
Part 1 is correct.

Part 2 is plausible if the applicant confuses evacuating areas AROUND the site with areas DOWNWIND of the site. During an RPSA, they are required to evacuate all areas within a 2 mile radius in addition to all areas 2-5 miles downwind.

Answer D Discussion

CORRECT: See explanation above.

Basis for meeting the KA

The KA is matched because the applicant must have knowledge of Emergency Plan Response Procedures (e.g. RP-004 and RP-029).

Basis for Hi Cog

Basis for SRO only

This question meets the following criteria for an SRO only question as described in NUREG-1021 Rev. 11, ES-401 Attachment 2 "Clarification Guidance for SRO-only Questions" for screening questions linked to 10CFR55.43(b)(5) (Assessment and selection of procedures):

1) Can the question be answered solely by knowing "systems knowledge" (i.e., how the system works, flowpath, logic, component location)?
NO. This question is in no way related to systems knowledge.

2) Can the question be answered solely by knowing immediate operator actions?
NO. There are no immediate actions in either RP-004 or RP-029.

3) Can the question be answered solely by knowing entry conditions for AOPs or plant parameters that require direct entry into major EOPs?
NO. This question does not relate in any way to entry conditions for AOPs or EOPs.

4) Can the question be answered solely by knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure?

NO. This question is related to administrative requirements within the body of the procedure that do not relate to the purpose, sequence of events, or mitigative strategy of the procedure.

5) Does the question require one or more of the following:

- assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed
NO.

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
YES. This question relates to the knowledge of implementing Protective Action Recommendations (Attachment 3 of RP-029) and coordinating that activity with the overall Emergency Plan response.

- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific sub-procedures or emergency contingency procedures
NO.

- knowledge of administrative procedures that specify hierarchy, implementation, and/or coordination of plant normal, abnormal, and emergency procedures
YES. This question is related to an administrative procedures (RP-004 and RP-029) that specify implementation of the site's Emergency Plan.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	2012 MNS NRC Exam Q100 (Bank 5784)

Development References

REFERENCES:
RP-004 (General Emergency)
RP-029 (Notifications to Offsite Agencies from the Control Room) Enclosure 4.4 (Protective Action Recommendations) Rev. 21

LEARNING OBJECTIVES:
NONE

Student References Provided

GEN2.4 2.4.31 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

Remarks/Status

Rearranged answer so the question would appear different from previous "bank" version of the exam. HCF 03-09-2017

Facility: **McGuire**	Scenario No.: **1**	Op Test No.: **N18-1**	
Examiners:		Operators:	(SRO)
			(RO)
			(BOP)

Initial Conditions:	The plant is at 100% power (MOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.
Turnover:	The following equipment is Out-Of-Service: The 1B MDCA Pump is OOS due to a Control Power Fuse failure. ACTION has been taken in accordance with Technical Specification LCO 3.7.5 ACTION B.1. The 1B EDG is OOS due to Fuel Pump replacement. ACTION has been taken in accordance with Technical Specification LCO 3.8.1 ACTION B.1, B.2, B.3.1 and B.4. Maintenance has been completed on the 1B EDG, and it has been started for retest. NVP-5230, NCP 1A #1 Seal Differential Pressure indicator, failed last shift (IAE is investigating). MCB Annunciator 1AD-9, C-8, "CONT HI-HI PRESS ALERT," will not ILLUMINATE (IAE is investigating). The BOP will synch the 1B EDG to 1ETB and complete the post-maintenance testing.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	N-BOP N(TS)-SRO	1B EDG Surveillance/1C Cold Leg Accumulator Boron Concentration Low
2	REM HS0179 MAL DEH008A	C-RO C-BOP C-SRO	MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL
3	MAL SG001A	R-RO C-BOP C(TS)-SRO	Steam Generator Tube Leak
4	MAL IRE009	C-RO C-SRO	Control Rods fail to MOVE in AUTO
5	MAL ISE007A/B EP002A/B DG004B DG001A	M-RO M-BOP M-SRO	Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start
6	MAL CA005	NA	TDCA Pump trips on Overspeed
7	MAL CA004A	C-BOP C-SRO	1A MDCA Pump fails to start

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2018 NRC Scenario #1

The plant is at 100% power (MOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.

The following equipment is Out-Of-Service: The 1B MDCA Pump is OOS due to a Control Power Fuse failure. ACTION has been taken in accordance with Technical Specification LCO 3.7.5 ACTION B.1. The 1B EDG is OOS due to Fuel Pump replacement. ACTION has been taken in accordance with Technical Specification LCO 3.8.1 ACTION B.1, B.2, B.3.1 and B.4. Maintenance has been completed on the 1B EDG, and it has been started for retest. NVP-5230, NCP 1A #1 Seal Differential Pressure indicator, failed last shift (IAE is investigating). MCB Annunciator 1AD-9, C-8, “CONT HI-HI PRESS ALERT,” will not ILLUMINATE (IAE is investigating). The BOP will synch the 1B EDG to 1ETB and complete the post-maintenance testing.

Shortly after taking the watch, the operator will continue with Enclosure 13.2, “1B D/G Fast Start” of PT/1/A/4350/002B, “Diesel Generator 1B Operability Test,” and parallel the 1B EDG with Bus 1ETB. This test will continue throughout the remainder of the scenario. During this surveillance, Chemistry will call and report the results of a periodic sample of the Cold Leg Accumulators. The 1C Cold Leg Accumulator Boron concentration will be low. The operator will address Technical Specification LCO 3.5.1, “Accumulators.”

Following this, MSR Relief Valve 1HS179 will fail open causing a loss of turbine efficiency and an increase in reactor power. The operator will implement AP/1/A/5500/01, “Steam Leak.” The operator will recognize the failure, and perform a rapid downpower in accordance with AP/1/A/5500/04, “Rapid Downpower,” attempting to, and eventually shutting the valve. Just prior to the downpower being stopped the Turbine Control will fail to MANUAL (This is done to set up RO action on subsequent SGTL).

Subsequently, a 30 gpm Steam Generator Tube Leak will occur (no build-in) on the 1A Steam Generator. The operator will enter AP/1/A/5500/10, “NC System Leakage Within the Capacity of Both NV Pumps.” The operator will address Technical Specification LCO 3.4.13, “RCS Operational Leakage,” and SLC 16.9.7, “Standby Shutdown System.” The crew will be directed by AP/1/A/5500/10 to reduce plant power to Mode 3 within 3 hours. The operator will perform a rapid downpower in accordance with AP/1/A/5500/04, “Rapid Downpower.”

During the downpower, the Control Rods fail to move in AUTO. The operator will enter AP/1/A/5500/14, “Rod Control Malfunction,” and take manual control of the rods.

After this, a Loss of Off-Site Power will occur, along with an inadvertent Feedwater Isolation Signal. Simultaneously, the 1B EDG will trip on overspeed. The 1A EDG will fail to start both automatically and manually and a station blackout will exist. The operator will enter EP/1/A/5000/E-0, “Reactor Trip or Safety Injection,” and then EP/1/A/5000/ECA-0.0, “Loss of All AC Power;” or enter ECA-0.0 directly. Simultaneously, the TDCA Pump will start but trip on overspeed.

The operator will start the 1A EDG by manually actuating Safety Injection, and power will be restored to Bus 1ETA. However, the 1A MDCA Pump will fail to start (All other equipment will sequence as expected); and the operator will need to manually start the pump. This pump will fail to manually start until the crew has addressed the Red Path on the Heat Sink Critical Safety Function.

With Bus 1ETA re-energized the operator will return to, or go to, EP/1/A/5000/E-0, “Reactor Trip or Safety Injection.” However, shortly after entry and progression through E-0, a Red Path will develop

on the Heat Sink Critical Safety Function Status Tree. The operator will implement EP/1/A/5000/FR-H.1, "Response to Loss of Secondary Heat Sink," and direct evaluation of the 1A MDCA Pump failure and replacement of the breaker. Ultimately, the operator will manually start the 1A MDCA Pump and restore the Secondary Heat Sink.

The scenario will terminate at step 7.e of FR-H.1 after Secondary Heat Sink has been restored.

<u>Critical Tasks:</u>

Energize at least one AC Emergency Bus before proceeding past Step 18 in ECA-0.0.

Safety Significance: Failure to energize an AC Emergency Bus when able to do so constitutes "mis-operation" or incorrect performance which leads to degraded emergency power capacity. Failure to perform the Critical Task may result in a needless challenge and/or degradation of a fission product barrier at the point of the RCP Seals, and will result in the inability to add inventory through the ECCS during a subsequent small break LOCA. Step 18 in ECA-0.0 is chosen as the success threshold because according to the basis of Step 18 of ECA-0.0, until AC power is restored, plant conditions will deteriorate due to NC pump seal leakage. In Steps 15-18 the operator is directed to defeat automatic loading of the emergency bus in order to safely allow local power source restoration. Since the conditions existed to restart the 1A EDG prior to performance of Step 18, and the crew has proceeded beyond this step, the crew has unnecessarily made power restoration more difficult, while plant conditions deteriorate. This threshold provides the examiners with a Measurable Performance Indication.

Restore a Secondary Heat Sink by replacing the breaker and starting the 1A MDCA Pump before establishing NCS Bleed and Feed in FR-H.1.

Safety Significance: Failure to restore a Secondary Heat Sink with AFW flow, when able to do so under the postulated plant conditions, results in "adverse consequence or a significant degradation in the mitigative capability of the plant." In this case, the minimum required AFW flow rate can be established by manually starting the 1A MDCA Pump (After Breaker Replacement). Therefore, failure to do so represents a failure by the crew to "demonstrate the following abilities: (1) Effectively direct or manipulate engineered safety feature (ESF) controls that would prevent (degraded emergency core cooling system (ECCS) … capacity), (2) Recognize a failure or an incorrect automatic actuation of an ESF system or component, and (3) Take one or more actions that would prevent a challenge to plant safety."

PROGRAM: McGuire Operations Training

MODULE: Initial License Operator Training Class ILT 18-1

TOPIC: NRC Simulator Exam

Scenario N18-1-1

REFERENCES:

1. Technical Specification LCO 3.8.1, “AC Sources - Operating” (Amendment 221/203)
2. Technical Specification LCO 3.7.5, “Auxiliary Feedwater (AFW) System” (Amendment 282/261)
3. PT/1/A/4350/002B, “Diesel Generator 1B Operability Test” (Rev 107)
4. Technical Specification LCO 3.5.1, “Accumulators” (Amendment 218/200)
5. MCEI -0400-349, “McGuire Cycle 26 Core Operating Limits Report” (Rev 0)
6. OMP 4-3, “Use of Emergency and Abnormal Procedures and FLEX Support Guidelines” (Rev 46)
7. AP/1/A/5500/01, “Steam Leak” (Rev 18)
8. AP/1/A/5500/04, “Rapid Downpower” (Rev 30)
9. AP/1/A/5500/10, “NC System Leakage Within the Capacity of Both NV Pumps” (Rev 23)
10. OP/0/A/6450/011, “Control Area Ventilation/Chilled Water System” (Rev 105)
11. Technical Specification LCO 3.4.13, “RCS Operational Leakage” (Amendment 237/219)
12. SLC 16.9.7, “Standby Shutdown System” (Rev 153)
13. AP/1/A/5500/14, “Rod Control Malfunction” (Rev 16)
14. EP/1/A/5000/E-0, “Reactor Trip or Safety Injection” (Rev 36)
15. EP/1/A/5000/ECA-0.0, “Loss of All AC Power” (Rev 40)
16. EP/1/A/5000/E-3, “Steam Generator Tube Rupture” (Rev 26)
17. EP/1/A/5000/FR-H.1, “Response to Loss of Secondary Heat Sink” (Rev 20)

Validation Time: 112 minutes

Author: David Lazarony, Essential Training & Consulting, LLC

Facility Review: ________________________

Rev. 010418

McGuire 2018 NRC Scenario #1 Objectives:

Given the simulator at an initial condition of 100% power evaluate:

1. the SRO's ability to supervise the control room team during the normal, abnormal, and emergency situations that arise, including compliance with all facility procedures, Technical Specifications, and other commitments.

2. each crew member's ability to effectively communicate as part of a control room team during the normal, abnormal, and emergency situations that arise.

3. the BOP's ability to effectively parallel and load an Emergency Diesel Generator onto an Emergency ESF Bus in accordance with Enclosure 13.2, "1B D/G Fast Start" of PT/1/A/4350/002B, "Diesel Generator 1B Operability Test."

4. each crew member's ability to effectively diagnose a failed open MSR Relief Valve and the RO and BOP's ability to respond to such an event in accordance with AP/1/A/5500/01, "Steam Leak."

5. each crew member's ability to effectively diagnose a Turbine Control System that has failed to MANUAL.

6. each crew member's ability to effectively diagnose a Steam Generator Tube Leak and the RO and BOP's ability to respond to such an event in accordance with AP/1/A/5500/10, "NC System Leakage Within the Capacity of Both NV Pumps;" including the performance of a rapid downpower using manual turbine control in accordance with AP/1/A/5500/04, "Rapid Downpower."

7. each crew member's ability to effectively diagnose a failure of the control rods to move in AUTO during a rapid downpower, and the RO's ability to respond to such an event in accordance with AP/1/A/5500/14, "Rod Control Malfunction," including coordinating manual turbine and rod control during the downpower.

8. each crew member's ability to effectively diagnose a Station Blackout and the RO and BOP's ability to respond to such an event in accordance with EP/1/A/5000/ECA-0.0, "Loss of All AC Power."

9. each crew member's ability to effectively diagnose a Loss of Secondary Heat Sink and the RO and BOP's ability to respond to such an event in accordance with EP/1/A/5000/FR-H.1, "Response to Loss of Secondary Heat Sink."

Facility: **McGuire**	Scenario No.: **1**	Op Test No.: **N18-1**	
Examiners:		Operators:	(SRO)
			(RO)
			(BOP)

Initial Conditions:	The plant is at 100% power (MOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.
Turnover:	The following equipment is Out-Of-Service: The 1B MDCA Pump is OOS due to a Control Power Fuse failure. ACTION has been taken in accordance with Technical Specification LCO 3.7.5 ACTION B.1. The 1B EDG is OOS due to Fuel Pump replacement. ACTION has been taken in accordance with Technical Specification LCO 3.8.1 ACTION B.1, B.2, B.3.1 and B.4. Maintenance has been completed on the 1B EDG, and it has been started for retest. NVP-5230, NCP 1A #1 Seal Differential Pressure indicator, failed last shift (IAE is investigating). MCB Annunciator 1AD-9, C-8, “CONT HI-HI PRESS ALERT,” will not ILLUMINATE (IAE is investigating). The BOP will synch the 1B EDG to 1ETB and complete the post-maintenance testing.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	N-BOP N(TS)-SRO	1B EDG Surveillance/1C Cold Leg Accumulator Boron Concentration Low
2	REM HS0179 MAL DEH008A	C-RO C-BOP C-SRO	MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL
3	MAL SG001A	R-RO C-BOP C(TS)-SRO	Steam Generator Tube Leak
4	MAL IRE009	C-RO C-SRO	Control Rods fail to MOVE in AUTO
5	MAL ISE007A/B EP002A/B DG004B DG001A	M-RO M-BOP M-SRO	Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start
6	MAL CA005	NA	TDCA Pump trips on Overspeed
7	MAL CA004A	C-BOP C-SRO	1A MDCA Pump fails to start

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2018 NRC Scenario #1

The plant is at 100% power (MOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.

The following equipment is Out-Of-Service: The 1B MDCA Pump is OOS due to a Control Power Fuse failure. ACTION has been taken in accordance with Technical Specification LCO 3.7.5 ACTION B.1. The 1B EDG is OOS due to Fuel Pump replacement. ACTION has been taken in accordance with Technical Specification LCO 3.8.1 ACTION B.1, B.2, B.3.1 and B.4. Maintenance has been completed on the 1B EDG, and it has been started for retest. NVP-5230, NCP 1A #1 Seal Differential Pressure indicator, failed last shift (IAE is investigating). MCB Annunciator 1AD-9, C-8, "CONT HI-HI PRESS ALERT," will not ILLUMINATE (IAE is investigating). The BOP will synch the 1B EDG to 1ETB and complete the post-maintenance testing.

Shortly after taking the watch, the operator will continue with Enclosure 13.2, "1B D/G Fast Start" of PT/1/A/4350/002B, "Diesel Generator 1B Operability Test," and parallel the 1B EDG with Bus 1ETB. This test will continue throughout the remainder of the scenario. During this surveillance, Chemistry will call and report the results of a periodic sample of the Cold Leg Accumulators. The 1C Cold Leg Accumulator Boron concentration will be low. The operator will address Technical Specification LCO 3.5.1, "Accumulators."

Following this, MSR Relief Valve 1HS179 will fail open causing a loss of turbine efficiency and an increase in reactor power. The operator will implement AP/1/A/5500/01, "Steam Leak." The operator will recognize the failure, and perform a rapid downpower in accordance with AP/1/A/5500/04, "Rapid Downpower," attempting to, and eventually shutting the valve. Just prior to the downpower being stopped the Turbine Control will fail to MANUAL (This is done to set up RO action on subsequent SGTL).

Subsequently, a 30 gpm Steam Generator Tube Leak will occur (no build-in) on the 1A Steam Generator. The operator will enter AP/1/A/5500/10, "NC System Leakage Within the Capacity of Both NV Pumps." The operator will address Technical Specification LCO 3.4.13, "RCS Operational Leakage," and SLC 16.9.7, "Standby Shutdown System." The crew will be directed by AP/1/A/5500/10 to reduce plant power to Mode 3 within 3 hours. The operator will perform a rapid downpower in accordance with AP/1/A/5500/04, "Rapid Downpower."

During the downpower, the Control Rods fail to move in AUTO. The operator will enter AP/1/A/5500/14, "Rod Control Malfunction," and take manual control of the rods.

After this, a Loss of Off-Site Power will occur, along with an inadvertent Feedwater Isolation Signal. Simultaneously, the 1B EDG will trip on overspeed. The 1A EDG will fail to start both automatically and manually and a station blackout will exist. The operator will enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," and then EP/1/A/5000/ECA-0.0, "Loss of All AC Power;" or enter ECA-0.0 directly. Simultaneously, the TDCA Pump will start but trip on overspeed.

The operator will start the 1A EDG by manually actuating Safety Injection, and power will be restored to Bus 1ETA. However, the 1A MDCA Pump will fail to start (All other equipment will sequence as expected); and the operator will need to manually start the pump. This pump will fail to manually start until the crew has addressed the Red Path on the Heat Sink Critical Safety Function.

With Bus 1ETA re-energized the operator will return to, or go to, EP/1/A/5000/E-0, “Reactor Trip or Safety Injection.” However, shortly after entry and progression through E-0, a Red Path will develop on the Heat Sink Critical Safety Function Status Tree. The operator will implement EP/1/A/5000/FR-H.1, “Response to Loss of Secondary Heat Sink,” and direct evaluation of the 1A MDCA Pump failure and replacement of the breaker. Ultimately, the operator will manually start the 1A MDCA Pump and restore the Secondary Heat Sink.

The scenario will terminate at step 7.e of FR-H.1 after Secondary Heat Sink has been restored.

Critical Tasks:

Energize at least one AC Emergency Bus before proceeding past Step 18 in ECA-0.0.

Safety Significance: Failure to energize an AC Emergency Bus when able to do so constitutes “mis-operation” or incorrect performance which leads to degraded emergency power capacity. Failure to perform the Critical Task may result in a needless challenge and/or degradation of a fission product barrier at the point of the RCP Seals, and will result in the inability to add inventory through the ECCS during a subsequent small break LOCA. Step 18 in ECA-0.0 is chosen as the success threshold because according to the basis of Step 18 of ECA-0.0, until AC power is restored, plant conditions will deteriorate due to NC pump seal leakage. In Steps 15-18 the operator is directed to defeat automatic loading of the emergency bus in order to safely allow local power source restoration. Since the conditions existed to restart the 1A EDG prior to performance of Step 18, and the crew has proceeded beyond this step, the crew has unnecessarily made power restoration more difficult, while plant conditions deteriorate. This threshold provides the examiners with a Measurable Performance Indication.

Restore a Secondary Heat Sink by replacing the breaker and starting the 1A MDCA Pump before establishing NCS Bleed and Feed in FR-H.1.

Safety Significance: Failure to restore a Secondary Heat Sink with AFW flow, when able to do so under the postulated plant conditions, results in “adverse consequence or a significant degradation in the mitigative capability of the plant.” In this case, the minimum required AFW flow rate can be established by manually starting the 1A MDCA Pump (After Breaker Replacement). Therefore, failure to do so represents a failure by the crew to “demonstrate the following abilities: (1) Effectively direct or manipulate engineered safety feature (ESF) controls that would prevent (degraded emergency core cooling system (ECCS) … capacity), (2) Recognize a failure or an incorrect automatic actuation of an ESF system or component, and (3) Take one or more actions that would prevent a challenge to plant safety.”

SIMULATOR OPERATOR INSTRUCTIONS

	Bench Mark	ACTIVITY	DESCRIPTION
☐		**Reset to Temp IC 225** **(Base IC-39 [Swapped to A Train])**	**T = 0 Malfunctions:** **Insert LOA-CA010A=1; (1B MDCA Pump Control Power Racked Out)** **Insert LOA-CA010=1; (1B MDCA Pump Main Breaker Racked Out)** **Insert XMT_NV_INVPT5230 = Fail LO (NCP 1A #1 Seal Differential Pressure indicator Failure)** **Insert OVR-1AD9_C08 = OFF (MCB Annunciator 1AD9/C8)** **Insert MAL-DG001A = 1 (1A EDG Fails to Start)**
☐		**RUN** **Reset all SLIMs**	**Place Tagout/O-Stick on:** • **1B MDCA Pump** • **PNV-5230, NCP 1A #1 Seal Differential Pressure indicator** • **MCB Annunciator 1AD-9, C-8**
☐		**Update** Status Board, **Setup OAC**	**NOTE:** RMWST DO = <1000 ppb.
☐		**Freeze.**	
☐		**Update Fresh Tech. Spec. Log.**	
☐		**Fill out the AO's Available section of Shift Turnover Info.**	
☐	Prior to Crew Briefing	**RUN**	

	Bench Mark	ACTIVITY	DESCRIPTION
☐	**Crew Briefing** 1. Assign Crew Positions based on evaluation requirements 2. Review the Shift Turnover Information with the crew. 3. Provide a copy of Enclosure 13.2 of PT/1/A/4350/002B marked up through Step 2.31. 4. Direct the crew to Review the Control Boards taking note of present conditions, alarms.		
☐	T-0	Begin Familiarization Period	
☐	At direction of examiner	**Execute Simulator Scenario N18-1-1.**	
☐	At direction of examiner	**Event 1** **NA**	1B EDG Surveillance/1C Cold Leg Accumulator Boron Concentration Low
☐	At direction of examiner	**Event 2** **insert REM-HS0179 = 0.5** **insert MAL-DEH008A**	MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL **Note: The Turbine will fail to manual as the downpower is concluding.**
☐	At direction of examiner	**Event 3** **insert MAL-SG001A = 30 ramp=0**	Steam Generator Tube Leak
☐	At direction of examiner	**Event 4** **Insert MAL-IRE009 = FAIL_OF_AUTO**	Control Rods fail to MOVE in AUTO

	Bench Mark	ACTIVITY	DESCRIPTION
☐	At direction of examiner	**Event 5** **Insert:** **MAL-ISE007A** **MAL-ISE007B** **MAL-EP002A** **MAL-EP002B** **MAL-DG004B** **MAL-DG001A**	Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start **NOTE: MALF-DG001A is inserted at T=0.**
☐	Post-Rx Trip	**Event 6** **Insert MAL-CA005=1**	TDCA Pump trips on Overspeed **NOTE: This event will occur on LOOP**
☐	Post-Rx Trip	**Event 7** **Insert:** **MAL-CA004A = 2**	A MDCA Pump fails to start **NOTE: This event will occur on LOOP, MALF-CA004A will be removed after the crew directs that the breaker for the 1A MDCA Pump is replaced and Racked In, in FR-H.1.**
☐	**Terminate the scenario upon direction of Lead Examiner**		

Op Test No.:	N18-1	Scenario #	1	Event #	1	Page	9 of 73
Event Description:	**1B EDG Surveillance/1C Cold Leg Accumulator Boron Concentration Low**						

Shortly after taking the watch, the operator will continue with Enclosure 13.2, "1B D/G Fast Start" of PT/1/A/4350/002B, "Diesel Generator 1B Operability Test," and parallel the 1B EDG with Bus 1ETB. This test will continue throughout the remainder of the scenario. During this surveillance, Chemistry will call and report the results of a periodic sample of the Cold Leg Accumulators. The 1C Cold Leg Accumulator Boron concentration will be low. The operator will address Technical Specification LCO 3.5.1, "Accumulators."
Booth Operator Instructions: **NA**
Indications Available: **NA**

Time	Pos.	Expected Actions/Behavior	Comments
PT/1/A/4350/002 B, DIESEL GENERATOR 1B OPERABILITY TEST ENCLOSURE 13.2, 1B D/G FAST START			
CAUTION Frequency should be maintained less than 64 Hz.			
	BOP	(Step 2.32) Raise frequency by depressing "RAISE" on "1B D/G Gov Cntrl" until mechanical governor takes control. (This will occur between 62 - 64 Hz. D/G speed will reduce to approximately 61 Hz.)	
BOOTH INSTRUCTOR:	**When the BOP has started the EDG Surveillance procedure, as Chemistry Technician, call the Control Room and report that the recently taken samples of the CLA Accumulators indicates that the boron concentration is as follows:** **1A CLA – 2712 ppm** **1B CLA – 2731 ppm** **1C CLA – 2450 ppm** **1D CLA – 2763 ppm**		
			NOTE: The CRS will evaluate this condition. **EXAMINER NOTE:** Examiner following the CRS, proceed to **Page 11** for this evaluation.

Op Test No.:	N18-1	Scenario #	1	Event #	1	Page	10 of 73
Event Description:	**1B EDG Surveillance/1C Cold Leg Accumulator Boron Concentration Low**						

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS may call WCC to address the low boron concentration. If so, **Booth Instructor** acknowledge as WCC.
	BOP	(Step 2.33) Record frequency at which mechanical governor controlling frequency, after it takes control, per M1A1617 (1B D/G Frequency) or local control panel meter if OAC unavailable:	
	BOP	(Step 2.34) IF frequency recorded in Step 2.33 is NOT 60.5 - 61.2 Hz THEN……	
	BOP	(Step 2.35) Ensure frequency 60 Hz using "1B D/G Gov Cntrl".	
	BOP	(Step 2.36) Record 1EQCME1BCAMP (1B D/G Voltage Regulator Control Ammeter) (on 1B D/G Voltage Regulator Panel): ___________ amps.	**NOTE:** The BOP will contact the AO. **Booth Instructor:** as **AO**, acknowledge and report **1.4 AMPs.**
	BOP	(Step 2.37) Check "Line Volts" 3960 - 4360 V.	
	BOP	(Step 2.38) Check 1AD-11, E1 (Seq B In Test) dark.	
	BOP	(Step 2.39) Adjust D/G voltage 50 – 100 V higher than line voltage using "1B D/G Voltage Adjust".	
CAUTION Failure of the Droop Permissive could result in erratic D/G operation while paralleled to the bus.			

Op Test No.: N18-1	Scenario # 1	Event # 1	Page 11 of 73
Event Description:	**1B EDG Surveillance/1C Cold Leg Accumulator Boron Concentration Low**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 2.40) IF OAC available, THEN check M1D3356 (1B D/G Droop Permissive) indicates "COMPLETE".	
	BOP	(Step 2.41) Place "1B D/G Sync" to "ON".	
NOTE As a guide, have synchroscope traveling no faster than one revolution in 20 seconds.			
	BOP	(Step 2.42) Using "1B D/G Gov Cntrl", adjust D/G speed to allow synchroscope to move slowly and smoothly in "FAST" (clockwise) direction.	
NOTE • D/G load should be increased quickly after closing breaker to prevent reverse power condition. If a reverse power condition occurs, the D/G Emergency Breaker will trip open after a short time delay. • Steps 2.43 - 2.44 may be completed and then signed off as time allows.			
	BOP	(Step 2.43) HOLD until synchroscope pointer is within 3 minutes before 12 o'clock position, THEN firmly depress AND release "CLOSE" for "1ETB Emerg Breaker".	
	BOP	(Step 2.44) Perform the following concurrently:	
		• Quickly raise D/G load to 1000 kW using "1B D/G Gov Cntrl"	
		• Maintain power factor 0.90 - 0.92 lagging using "1B Volt Adjust"	
	BOP	(Step 2.45) Place "1B D/G Sync" to "OFF".	

Op Test No.: N18-1	Scenario # 1	Event # 1	Page 12 of 73
Event Description:	**1B EDG Surveillance/1C Cold Leg Accumulator Boron Concentration Low**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 2.46) Record date/time 1B D/G loaded to 1000 kW:	
			NOTE: The CRS will evaluate the 1C Accumulator Boron Concentration.
TECHNICAL SPECIFICATION LCO 3.5.1, ACCUMULATORS			
	CRS	LCO 3.5.1 Four ECCS accumulators shall be OPERABLE.	**NOTE:** According to SR 3.5.1.4 the operator must verify that boron concentration in each accumulator is within the limits specified in the COLR.
			NOTE: According to Section 2.11.1of the COLR, when EFPD is between 250.1 and 300, the minimum CLA boron concentration is 2475 ppm. Since boron concentration has been reported to be 2450 ppm, the 1C boron concentration is too low.
	CRS	APPLICABILITY: MODES 1 and 2, MODE 3 with RCS pressure > 1000 psig.	
	CRS	ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One accumulator inoperable due to boron concentration not within limits.	A.1 Restore boron concentration to within limits.	72 Hours

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will determine that Condition A is required and that ACTION A.1 must be taken.

When the 1B EDG is loaded to 1000kW move to Event #2.

Op Test No.:	N18-1	Scenario #	1	Event #	2	Page	13 of 73
Event Description:	**MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**						

Following this, MSR Relief Valve 1HS179 will fail open causing a loss of turbine efficiency and an increase in reactor power. The operator will implement AP/1/A/5500/01, "Steam Leak." The operator will recognize the failure, and perform a rapid downpower in accordance with AP/1/A/5500/04, "Rapid Downpower," attempting to, and eventually shutting the valve. Just prior to the downpower being stopped the Turbine Control will fail to MANUAL.

Booth Operator Instructions: **insert REM-HS0179 = 0.5**

Indications Available:

- Turbine MWe lowers
- Rx power rises (TPBE)
- Steam pressure starts to lower
- OAC Alarm: 1C1 L/P TURBINE CROSSOVER STEAM TEMP RATE
- OAC Alarm: 1C2 L/P TURBINE CROSSOVER STEAM TEMP RATE

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The crew may diagnose an overpower condition and adjust turbine load per OMP 4-3.
OMP 4-3, USE OF EMERGENCY AND ABNORMAL PROCEDURES AND FLEX SUPPORT GUIDELINES ATTACHMENT 10.1, PRUDENT OPERATOR ACTIONS			
	RO	Transient Load Changes	
		• Manual is preferred - Immediately reduce up to 20 MWe and then reduce as needed to maintain reactor power less than pre-transient condition. After the initial load reduction, the operators should use multiple and diverse indications to determine any additional load reduction.	
		• TPBE on the OAC updates once per minute. Other indications (PR meters and Delta T meters) will indicate reactor response more quickly and will enable the operators to control the plant more precisely. (This combines the Operator Fundamentals of Conservatism and Controlling Plant Evolutions Precisely.)	

Op Test No.:	N18-1	Scenario #	1	Event #	2	Page	14 of 73
Event Description:	**MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**						

Time	Pos.	Expected Actions/Behavior	Comments
		AP/1/A/5500/01, STEAM LEAK	
			NOTE: The CRS may dispatch AOs to look for steam leaks. If so, **Booth Instructor** as AO, respond back in 3-5 minutes per script (See **Page 16**). After 3-5 minutes of Non-investigatory Action, Call as Security and report **Steam Release to atmosphere on U1 TB Roof**.
	RO/ BOP	(Step 1) Monitor Foldout page.	
		Manual Reactor Trip Criteria: (IF any of the following occur: (1) Steam leak is jeopardizing personnel safety or plant equipment, (2) T-Avg is less than 551°F AND going down, or (3) UST level is less than 1 ft – NOT Expected).	
	RO	(Step 2) Reduce turbine load to maintain the following:	**NOTE:** The RO may take the Turbine Control to MANUAL.
		• Excore NI's – LESS THAN OR EQUAL TO 100%	**NOTE:** Per OMP 4-3, the RO has the authority to remove ≈20 Mwe initially, and then additional load as needed to stabilize temperature.
		• NC Loop D/T's – LESS THAN 60ºF D/T	
		• T-Avg – AT T-REF.	
	CRS/ BOP	(Step 3) Check containment entry – IN PROGRESS.	**NOTE:** There is no Containment Entry in progress.
	CRS	(Step 3 RNO) GO TO Step 5.	

Op Test No.:	N18-1	Scenario #	1	Event #	2	Page	15	of	73

Event Description: **MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 5) Check Pzr pressure prior to event – GREATER THAN P-11 (1955 PSIG)	
	BOP	(Step 6) Check Pzr level – STABLE OR GOING UP	**NOTE:** If Pzr level is lowering the crew will perform the RNO prior to performing Step 7.
	CRS	(Step 7) IF AT ANY TIME while in this procedure Pzr level cannot be maintained stable, THEN RETURN TO Step 6.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 8) GO TO Step 12.	
	CRS	(Step 12) Announce occurrence on paging system.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 13) Identify and isolate leak on Unit 1 as follows:	
		• Check SM PORVs – CLOSED.	
		• Check condenser dump valves – CLOSED.	
	BOP	• Check containment conditions – NORMAL:	
		• Containment temperature	
		• Containment pressure	
		• Containment humidity	
		• Containment floor and equipment sump level.	
		• Check TD CA pump – OFF.	
		• Check valves on "STEAM LINE DRAIN VALVES" board (1MC-9) - CLOSED.	**NOTE:** The BOP may need to perform the RNO and close valves.

Op Test No.: N18-1	Scenario # 1	Event # 2	Page 16 of 73
Event Description:	**MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**		

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	• Check opposite Unit (Unit 2) "STEAM HEADER PRESSURE" – GREATER THAN 200 PSIG.	**NOTE:** The CRS will ask U2 RO. If so, **Floor Instructor** acknowledge as U2 RO, and report U2 Steam Header Pressure is ≈1000 psig.
	CRS	• Dispatch operator to check for leaks.	**NOTE:** If not already done, the CRS will dispatch AOs to look for steam leaks. After **2-3 minutes**, **Booth Instructor,** as **AO**, report that **MSR 1C1 Shell Side Relief Valve (1HS179) is lifting.**
	BOP	(Step 14) Check UST level – STABLE OR GOING UP.	**NOTE:** The UST level may be rising or lowering. If rising go to Step 15.
	BOP	(Step 14 RNO) Makeup to UST as required to maintain level.	
	CRS	(Step 15) Evaluate unit shutdown as follows:	
		• Check unit status – IN MODE 1 OR 2.	
		• Determine if unit shutdown or load reduction is warranted based on the following criteria:	
		• Size of leak	
		• Location of leak	
		• Rate of depletion of secondary inventory	
		• IF steam is leaking from a secondary heater relief OR MSR relief valve, THEN reducing turbine load may reduce pressure enough to close relief valve.	**NOTE:** Steam is leaking from an MSR relief valve.

Op Test No.: N18-1	Scenario # 1	Event # 2	Page 17 of 73
Event Description:	MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL		

Time	Pos.	Expected Actions/Behavior	Comments
		• IF turbine trip will isolate steam leak (such as feedwater heater leak or MSR leak), THEN it may be desirable to perform an orderly shutdown of the turbine and maintain reactor power in Mode 1.	**NOTE:** It is NOT necessary to trip the Turbine.
	CRS	• Check unit shutdown or load reduction – REQUIRED.	**NOTE:** It is necessary to reduce load in an attempt to close the lifting relief valve.
	CRS	• Check reactor trip – REQUIRED.	**NOTE:** A reactor trip is NOT required.
	CRS	(Step 15.d RNO) GO TO Step 15.h.	
	CRS	• (Step 15.h) Determine if turbine trip is desired to isolate steam leak:	
		• Check steam leak location – KNOWN TO BE ISOLABLE BY TURBINE TRIP	
		• Turbine trip – DESIRED.	**NOTE:** A turbine trip is NOT desired.
	CRS	(Step 15.h RNO) Perform the following:	
		• Reduce load as necessary PER one of the following:	
		• OP/1/A/6100/003	
		OR	
		• AP/1/A/5500/04 (Rapid Downpower).	**NOTE:** The CRS will transition to AP-4. **Booth Instructor:** If it appears likely that the crew will use the OP rather than the AP, state as the Operations Manager that it is desired to use AP-4.
AP/1/A/5500/04, RAPID DOWNPOWER			

Op Test No.:	N18-1	Scenario #	1	Event #	2	Page	18 of	73

Event Description: **MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	(Step 1) Monitor Foldout page.	
		Uncontrolled Cooldown (If Tavg < 551°F and lowering…..Not Expected)	
		Power Factor (Adjust power factor during load reduction to maintain power factor between 0.9 to 1.0 lagging, using "VOLTAGE ADJUST" pushbutton)	**NOTE:** The RO will adjust MVARS as needed.
		Manual Rx Power Control (< C-5, Not Expected)	
		Turbine Shutdown (Turbine Load < 15 MWe Not Expected)	
	CRS	(Step 2) Announce occurrence on page.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 3) Check turbine control – IN AUTO.	**NOTE:** The Turbine may be in MANUAL. If so, the RO will place the Turbine in AUTO.
	RO	(Step 4) Check “MW LOOP” – IN SERVICE.	**NOTE:** If MW LOOP is NOT in service, the RO will place MW LOOP in service per RNO.
	RO	(Step 4 RNO) Depress "MW IN/MW OUT" pushbutton.	
	CRS	(Step 5) Check shutdown to Mode 3 – DESIRED.	
	CRS	(Step 5 RNO) Observe Note prior to Step 8 and GO TO Step 8.	

Op Test No.:	N18-1	Scenario #	1	Event #	2	Page	19 of 73
Event Description:	**MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**						

Time	Pos.	Expected Actions/Behavior	Comments
NOTE The following table can be used to determine unloading rates. Rates other than specified are acceptable.			
	CRS	(Step 8) Determine the required power reduction rate (MW/min).	**NOTE:** The CRS will reduce load at ≈10-20 MWe/minute.
	BOP	(Step 9) Notify SOC of load reduction (red dispatcher phone).	**Booth Instructor:** as **SOC**, acknowledge.
	RO	(Step 10) Check control rods – IN AUTO.	
	BOP	(Step 11) Borate NC System as follows:	
		• Energize all backup Pzr heaters.	
		• Check unit to be shutdown – VIA REACTOR TRIP FROM 15% POWER.	**NOTE:** It is normal practice to shut down the reactor by driving rods, rather than tripping from 15%.
	CRS	(Step 11.b RNO) GO TO Step 11.d.	
	BOP	(Step 11.d) Determine boration amount based on the following:	
		• Power Reduction Rate (MW/min)	
		• Present NC System Boron Concentration (ppm)	
		• Total Power change (%).	**NOTE:** The total power change will be determined by the CRS, and will affect the amount of boron inserted by the BOP.
		• Record calculated boration amount:	
	RO	• Check auto or manual rod control – AVAILABLE.	

Op Test No.: N18-1	Scenario # 1	Event # 2	Page 20 of 73
Event Description:	**MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**		

Time	Pos.	Expected Actions/Behavior	Comments
NOTE If load reduction of greater than 60% is planned and Unit 1 is to remain in Mode 1, the final (1/4) addition of boron may not be required based on rate of Xenon production and control rod response.			
	BOP	• Perform boration in four equal additions during load reduction PER Enclosure 2 (Emergency Boration).	
			NOTE: The CRS may assign the BOP to perform this action. If so, **BOP Examiner** follow actions of Enclosure 2. **Other Examiners** follow **AP-4** Actions, **Step 12**, on **Page 21**.
AP/1/A/5500/04, RAPID DOWNPOWER **ENCLOSURE 2, EMERGENCY BORATION**			
	BOP	(Step 1) Check OAC - AVAILABLE.	
	BOP	(Step 2) Use OAC point M1P0785 to monitor boric acid gallons added while 1NV-265B (U1 NV Pump Boric Acid Sup Isol) is open.	
	BOP	(Step 3) GO TO Step 5.	
	BOP	(Step 5) Check boric acid transfer pump - RUNNING.	**NOTE:** The 1B Boric Acid Transfer Pump is running.
	BOP	(Step 6) OPEN 1NV-265B (U1 NV Pump Boric Acid Sup Isol).	
	BOP	(Step 7) Do not continue until desired amount of boric acid has been added.	

Op Test No.: N18-1	Scenario # 1	Event # 2	Page 21 of 73
Event Description:	**MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 8) CLOSE 1NV-265B (U1 NV Pump Boric Acid Sup Isol).	
	BOP	(Step 9) IF boric acid transfer pump was started in Step 5 RNO, THEN ….	**NOTE:** The 1B Boric Acid Transfer Pump was running initially.
	BOP	(Step 10) Repeat enclosure as required.	
AP/1/A/5500/04, RAPID DOWNPOWER			
			Examiner NOTE: Examiners following the **CRS/RO** continue **HERE.**
	RO	(Step 12) WHEN boration commenced, THEN initiate turbine load reduction to desired load at desired rate.	
	BOP	(Step 13) Display Rod Insertion Limits on OAC by entering turn on code "RIL."	
NOTE Control Rods may approach rod insertion limits during load reduction.			
	CRS	(Step 14) IF AT ANY TIME "CONTROL ROD BANK LO LO LIMIT" alarm (1AD-2, B-9) is lit, THEN perform one of the following to comply with Tech Spec 3.1.6 (Control Bank Insertion Limits):	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Ensure alarm clears within one hour as Xenon builds in.	
		OR	
		• Initiate boration as necessary within one hour to restore control rods above insertion limits.	

Op Test No.:	N18-1	Scenario #	1	Event #	2	Page	22 of 73
Event Description:	**MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**						

Time	Pos.	Expected Actions/Behavior	Comments
NOTE Unloading rates greater than 55 MW/min will meet C-7A interlock.			
	CRS	(Step 15) IF AT ANY TIME during this procedure C-7A is received, THEN ensure Transient Monitor freeze is triggered.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 16) REFER TO the following:	**NOTE:** The CRS may ask OSM to address. If so, **Floor Instructor** acknowledge as OSM.
		• RP/0/A/5700/000 (Classification of Emergency)	
		• RP/0/A/5700/010 (NRC Immediate Notification Requirements).	
	CRS	(Step 17) Notify Reactor Engineer on duty of load reduction.	**NOTE:** The CRS may call WCC/RE. If so, **Booth Instructor** acknowledge.
	RO	(Step 18) Check target load - LESS THAN 1000 MW.	**NOTE:** The CRS may have selected a target load greater than 1000 MWe. If so, the crew will perform the RNO and wait until target load is reached. If not, continue to Step 19
Booth Operator Instructions:		**Insert REM-HS0179 = 0 (Remove 1HS179 Relief Valve Failure – At direction of Lead Examiner and after the 1st boration is complete.)** **insert MAL-DEH008A**	

Op Test No.:	N18-1	Scenario #	1	Event #	2	Page	23 of 73
Event Description:	**MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**						

Time	Pos.	Expected Actions/Behavior	Comments
			Booth Instructor: as **AO**, report that 1HS179 Relief Valve has reseated.
			NOTE: The CRS will direct the RO to go to HOLD on the Turbine. The BOP may adjust boron concentration as needed to stabilize the plant.
	CRS	(Step 19) Check Unit 2 available to supply aux steam as follows:	**NOTE:** The CRS will ask U2 RO. **Floor Instructor:** As U2 RO report "All these conditions are met."
		• Unit 2 Reactor power - GREATER THAN 15%	
		• Unit 2 2AS-12 (U2 SM to AS Hdr Control Inlet Isol) - OPEN	
		• Unit 2 - AVAILABLE TO SUPPLY AS HEADER.	
	RO	(Step 20) Check SM flow on all S/Gs – GREATER THAN 25%.	
	RO	(Step 21) WHEN all SM flows are less than 75%, THEN ensure the following valves ramp CLOSED:	**NOTE:** This is a conditional step. The CRS will make the RO aware of this action, if NOT already done.
		• 1CF-104AB (1A S/G CF Control Bypass)	
		• 1CF-105AB (1B S/G CF Control Bypass)	
		• 1CF-106AB (1C S/G CF Control Bypass)	
		• 1CF-107AB (1D S/G CF Control Bypass)	**Examiner NOTE:** It may be necessary to allow the crew to stabilize the plant prior to moving to Event 3.

Op Test No.:	N18-1	Scenario #	1	Event #	2	Page	24	of	73
Event Description:		**MSR Relief Valve fails OPEN/Downpower/Turbine Control fails to MANUAL**							

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS may continue beyond this step in AP-4, however, it is expected that the plant will be stabilizing, and Event 3 is imminent.
At the discretion of the Lead Examiner move to Event #3.			

Op Test No.: N18-1 Scenario # 1 Event # 3	Page 25 of 73
Event Description:	**Steam Generator Tube Leak**

Subsequently, a 30 gpm Steam Generator Tube Leak will occur (no build-in) on the 1A Steam Generator. The operator will enter AP/1/A/5500/10, "NC System Leakage Within the Capacity of Both NV Pumps." The operator will address Technical Specification LCO 3.4.13, "RCS Operational Leakage," and SLC 16.9.7, "Standby Shutdown System." The crew will be directed by AP/1/A/5500/10 to reduce plant power to Mode 3 within 3 hours. The operator will perform a rapid downpower in accordance with AP/1/A/5500/04, "Rapid Downpower."

Booth Operator Instructions: **insert MAL-SG001A 30 ramp=0 (S/G 1A Tube Leak)**

Indications Available:

- Pzr level is lowering
- Charging flow starts to rise
- MCB Annunciator 1AD-6/E-7, PZR LO LEVEL DEVIATION
- Trip 2 on EMF 71, 72, 73, and 74
- EMF 24 in Trip 2

Time	Pos.	Expected Actions/Behavior	Comments
AP/1/A/5500/10, NC SYSTEM LEAKAGE WITHIN THE CAPACITY OF BOTH NV PUMPS CASE I, STEAM GENERATOR TUBE LEAKAGE			
	BOP	(Step 1) Check Pzr level – STABLE OR GOING UP.	**NOTE:** Pzr Level will be slowly lowering.
	BOP	(Step 1 RNO) Perform the following as required to maintain level:	
		• Maintain charging flow less than 200 GPM at all times in subsequent steps.	
		• Ensure 1NV-238 (U1 Charging Hdr Control) – OPENING.	**NOTE:** The BOP will take manual control of 1NV-238.
		• OPEN 1NV-241 (U1 Seal Water Inj Flow Control) while maintaining NC pump seal flow greater than 6 GPM.	

Op Test No.: N18-1	Scenario # 1	Event # 3	Page 26 of 73
Event Description:	**Steam Generator Tube Leak**		

Time	Pos.	Expected Actions/Behavior	Comments
		• Reduce or isolate letdown.	**NOTE:** The BOP may reduce letdown flow to 45 gpm.
		• Start additional NV pump.	**NOTE:** The BOP will NOT need to start an additional NV Pump, initially but will after the leak degrades in the Major Event.
		• IF CLAs are isolated, ….	**NOTE:** The CLAs are NOT isolated.
		• IF Pzr level cannot be maintained greater than 4% ….	**NOTE:** The Pzr level is NOT < 4%, or decreasing with maximum Charging flow.
	RO/ BOP	(Step 2) IF AT ANY TIME Pzr level goes down in an uncontrolled manner OR cannot be maintained greater than 4%, THEN perform Step 1.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
NOTE In subsequent steps "affected S/G" is considered the S/G with primary to secondary leakage requiring unit shutdown.			
	RO/ BOP	(Step 3) Identify affected S/G as follows:	
		• Any S/G N/R level – GOING UP IN AN UNCONTROLLED MANNER.	
		OR	
		• Check any of the following EMFs – ABOVE NORMAL:	
		• 1EMF-24 (S/G A Steamline Hi Rad)	**NOTE:** 1EMF-24 is in TRIP 2.
		• 1EMF-25 (S/G B Steamline Hi Rad)	
		• 1EMF-26 (S/G C Steamline Hi Rad)	

Op Test No.:	N18-1	Scenario #	1	Event #	3	Page	27 of 73
Event Description:	**Steam Generator Tube Leak**						

Time	Pos.	Expected Actions/Behavior	Comments
		• 1EMF-27 (S/G D Steamline Hi Rad)	
		• 1EMF-71 (S/G A Leakage Hi Rad)	**NOTE:** This rad monitor will be rising, and could be in either Trip 1 or TRIP 2.
		• 1EMF-72 (S/G B Leakage Hi Rad)	
		• 1EMF-73 (S/G C Leakage Hi Rad)	
		• 1EMF-74 (S/G D Leakage Hi Rad)	
		OR	
		• Check CF Flow – LOWER IN ANY S/G COMPARED TO ALL.	
		OR	
		• Secondary Chemistry or RP has determined affected S/G by sampling or evaluation of available EMF data.	
		OR	
		• Notify RP to frisk all Unit 1 S/G cation columns (CT Lab) to determine if activity level is significantly higher for any S/G.	
	CRS	(Step 4) Announce occurrence on page.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement that AP-10 has been entered. If so, **Floor Instructor** acknowledge as U2 RO.
	CRS	(Step 5) REFER TO the following:	**NOTE:** The CRS may ask OSM to address. If so, **Floor Instructor** acknowledge as OSM.
		• RP/0/A/5700/000 (Classification of Emergency)	

Op Test No.:	N18-1	Scenario #	1	Event #	3	Page	28 of 73
Event Description:	**Steam Generator Tube Leak**						

Time	Pos.	Expected Actions/Behavior	Comments
		• RP/0/A/5700/010 (NRC Immediate Notification Requirements).	
	CRS	(Step 6) IF AT ANY TIME NC leakage exceeds Tech Spec limits, THEN perform the following:	**NOTE:** The CRS will determine that Leakage has exceeded the TS Limits.
		• Ensure Outside Air Pressure Filter train in service PER OP/0/A/6450/011 (Control Area Ventilation/Chilled Water System), Enclosure 4.4 (Control Room Atmosphere Pressurization During Abnormal Conditions).	**NOTE:** The CRS may ask U2 BOP to take this action. If so, **Floor Instructor** acknowledge as U2 BOP (However No Actions Required).
		• Have another SRO evaluate if leakage exceeds SLC 16.9.7 condition C limits and immediately notify security if SSF is inoperable.	**NOTE:** The CRS may ask OSM, STA, or Plant SRO to perform this action. If so, **Floor Instructor** acknowledge accordingly. **Examiner NOTE:** If the CRS does not identify that Security must be notified, follow-up after the scenario **(See Page 33).**
			NOTE: The CRS may assign the BOP to perform this action. If so, **BOP Examiner** follow actions of Enclosure 4.4. **Other Examiners** follow **AP-10** Actions, **Step 7**, on **Page 30**.
OP/0/A/6450/011, CONTROL AREA VENTILATION/CHILLED WATER SYSTEM ENCLOSURE 4.4, CONTROL ROOM ATMOSPHERE PRESSURIZATION DURING ABNORMAL CONDITIONS			
			Examiner NOTE: Follow the actions associated with Enclosure 4.4 if BOP is assigned by CRS to perform.

Op Test No.: N18-1	Scenario # 1	Event # 3	Page 29 of 73
Event Description:	**Steam Generator Tube Leak**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.1) Evaluate all outstanding Clearances that may impact performance of this procedure.	
	BOP	(Step 3.2) Perform the following sections as applicable:	
		• Section 3.3, Pressurize Control Room Using Outside Air Pressure Fans	
		• Section 3.4, Securing Pressurization of Control Room	
	BOP	(Step 3.3) Pressurize Control Room using Outside Air Pressure Fans as follows:	
	BOP	(Step 3.3.1) Ensure at least one of the following groups of intake valves open:	
		• 1VC-1A (VC Outside Air Intake From Unit 1 Isol)	
		• 1VC-2A (VC Outside Air Intake From Unit 1 Isol)	
		• 1VC-3B (VC Outside Air Intake From Unit 1 Isol)	
		• 1VC-4B (VC Outside Air Intake From Unit 1 Isol)	
		OR	
	BOP	• 1VC-9A (VC Outside Air Intake From Unit 2 Isol)	
		• 1VC-10A (VC Outside Air Intake From Unit 2 Isol)	
		• 1VC-11B (VC Outside Air Intake From Unit 2 Isol)	
		• 1VC-12B (VC Outside Air Intake From Unit 2 Isol)	
	BOP	(Step 3.3.2) IF A Train VC/YC operating, place “A Train CR Outside Air Press Fan” to “ON”.	

Op Test No.: N18-1	Scenario # 1	Event # 3		Page 30 of 73	
Event Description:	**Steam Generator Tube Leak**				

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.3.3) IF B Train VC/YC operating, place "B Train CR Outside Air Press Fan" to "ON".	
	BOP	(Step 3.3.4) Depress "MAN" for the following (to ensure fans off):	
		• #1 CRA Otsd Air Fan	
		• #2 CRA Otsd Air Fan	
	BOP	(Step 3.3.5) Depress "OFF" for the following:	
		• CRA-OAD-4 (CR Area Otsd Air Fans Damper)	
		• CRA-OAD-3 (CR Area Otsd Air Fans Damper)	
	RO/ BOP	(Step 3.3.6) Check the following dark:	
		• CRA-OAD-4 (CR Area Otsd Air Fans Damper) "OPEN" light.	
		• CRA-OAD-3 (CR Area Otsd Air Fans Damper) "OPEN" light.	
AP/1/A/5500/10, NC SYSTEM LEAKAGE WITHIN THE CAPACITY OF BOTH NV PUMPS CASE I, STEAM GENERATOR TUBE LEAKAGE			
			Examiner NOTE: Examiners following the **CRS/RO** continue **HERE.**
	BOP	(Step 7) Check if unit shutdown or reactor trip required as follows:	
		• Check VCT makeup – IN PROGRESS.	**NOTE:** A VCT makeup may be in progress.
		• Check VCT level – GOING UP.	

Op Test No.: N18-1	Scenario # 1	Event # 3	Page 31 of 73
Event Description:	**Steam Generator Tube Leak**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	• Check S/G tube leak size – LESS THAN 90 GPM.	**NOTE:** The CRS will determine the SGTL to be about 10-60 gpm.
		• Leakage in one S/G – GREATER THAN 125 GPD (GALLON PER DAY).	
	CRS	• Observe the following limits while reducing load in Step 8:	
		• Ensure reactor power is less than 50% within 1 hour of exceeding 125 GPD.	
		• Be in Mode 3 within 3 hours of exceeding 125 GPD.	

NOTE

If load reduction less than 10 MW/min is planned once below 50% power, the OP below is the optimal procedure to use. If load reduction greater than or equal to 10 MW/min all the way to mode 3 is planned, AP04 is the optimal procedure to use. A more rapid shutdown is prudent for larger leaks.

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 8) Reduce load PER one of the following, while continuing with this AP as time allows beginning at Step 9.	
	CRS	• AP/1/A/5500/04 (Rapid Downpower)	**NOTE:** The CRS will implement AP-4, and may continue with these actions after the downpower is started. **(Examiner Move forward to Page 34)**
		OR	
		• OP/1/A/6100/003 (Controlling Procedure For Unit Operation). Enclosure 4.2 (Power Reduction).	
	RO	(Step 9) Minimize secondary side contamination as follows:	**NOTE:** The following actions are scripted because as the plant power is reduced, the CRS may continue to perform actions within AP-10.

Op Test No.:	N18-1	Scenario #	1	Event #	3	Page	32 of 73
Event Description:	**Steam Generator Tube Leak**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Check affected S/G – IDENTIFIED.	
		• CLOSE the blowdown throttle control valve for affected S/G.	
		• 1A: 1BB-123 (1A S/G Blowdown Throttle Control)	
		• 1B: 1BB-124 (1B S/G Blowdown Throttle Control)	
		• 1C: 1BB-125 (1C S/G Blowdown Throttle Control)	
		• 1D: 1BB-126 (1D S/G Blowdown Throttle Control)	
		• Perform EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 15 (Minimizing Secondary Side Contamination).	**NOTE:** The CRS may ask the U2 BOP to perform this action. If so, **Floor Instructor:** acknowledge as **U2 BOP**.
	RO	(Step 10) Check reactor trip breakers – OPEN.	
	CRS	(Step 10 RNO) Do not continue in the procedure until the reactor is tripped PER Step 8.	
			Examiner NOTE: Based on the transient nature of evaluating this TS, the Examiner may need to question the CRS after the scenario.
TECHNICAL SPECIFICATION 3.4.13, RCS OPERATIONAL LEAKAGE			
	CRS	LCO 3.4.13 RCS operational LEAKAGE shall be limited to:	
		• 389 gallons per day total primary to secondary LEAKAGE through all steam generators (SGs): and	
		• 135 gallons per day primary to secondary LEAKAGE through any one steam generator (SG)	

Op Test No.:	N18-1	Scenario #	1	Event #	3	Page	33 of 73
Event Description:	**Steam Generator Tube Leak**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	APPLICABILITY: MODES 1, 2, 3 and 4	
	CRS	ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met. OR Pressure boundary LEAKAGE exists. OR Primary to secondary LEAKAGE not within limits.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will determine that Condition B is required and that ACTION B.1 and B.2 must be taken.
SELECTED LICENSEE COMMITMENT 16.9.7, STANDBY SHUTDOWN SYSTEM			
	CRS	COMMITMENT The Standby Shutdown System (SSS) shall be operable.	
	CRS	APPLICABILITY: MODES 1, 2, and 3.	
	CRS	REMEDIAL ACTIONS	
		The SRO should ensure that security is notified 10 minutes prior to declaring the SSS inoperable. Immediately upon discovery of the SSS inoperability, Security must be notified to implement compensatory measures within 10 minutes of discovery.	**NOTE:** The CRS may have handed this notification off to another individual during the performance of AP10. If so, the CRS must identify in follow-up questioning, that this notification was required.

Op Test No.:	N18-1	Scenario #	1	Event #	3	Page	34	of 73
Event Description:		Steam Generator Tube Leak						

Time	Pos.	Expected Actions/Behavior	Comments

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Total Unidentified LEAKAGE, Identified LEAKAGE, and reactor coolant pump seal leakoff > 20 gpm. OR Total reactor coolant pump seal leakoff > 16.3 gpm. OR Any reactor coolant pump No. 1 seal leakoff > 4.0 gpm.	C.1 Declare the Standby Makeup Pump inoperable. AND C.2 Enter Condition A.	Immediately
NOTE: Not applicable to the SSS Diesel Generator or 24 V Battery Bank and Charger. A. One or more required SSS components identified in Table 16.9.7-1 non-functional.	A.1 Verify the FUNCTIONALITY of fire detection and suppression systems in the associated areas identified in Table16.9.7-1. AND A.2 Restore the component to FUNCTIONAL status.	1 Hour 7 days

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will determine that Condition C is required and that ACTION C.1 and C.2, as well as A.1 and A.2, must be taken. **NOTE:** Technical Specifications defines IDENTIFIED LEAKAGE as including SG tube leakage.
AP/1/A/5500/04, RAPID DOWNPOWER			
	RO/ BOP	(Step 1) Monitor Foldout page.	
		Uncontrolled Cooldown (If Tavg < 551°F and lowering…..Not Expected)	

Op Test No.:	N18-1	Scenario #	1	Event #	3
Page	35 of 73				
Event Description:	**Steam Generator Tube Leak**				

Time	Pos.	Expected Actions/Behavior	Comments
		Power Factor (Adjust power factor during load reduction to maintain power factor between 0.9 to 1.0 lagging, using "VOLTAGE ADJUST" pushbutton)	**NOTE:** The RO will adjust MVARS as needed.
		Manual Rx Power Control (< C-5, Not Expected)	
		Turbine Shutdown (Turbine Load < 15 MWe Not Expected)	
	CRS	(Step 2) Announce occurrence on page.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement that AP-4 has been entered. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 3) Check turbine control – IN AUTO.	**NOTE:** Turbine Control has failed to MANUAL, and the RO will need to adjust Turbine load in MANUAL.
	CRS	(Step 3 RNO) Perform the following:	
		• IF auto turbine control not available, THEN GO TO Step 5.	
	CRS	(Step 5) Check shutdown to Mode 3 – DESIRED.	**NOTE:** The CRS will determine that TS LCO 3.4.13 requires a plant shutdown.
NOTE • Shutdown via reactor trip from 15% power may be desired if Mode 3 is time critical. This method requires two CA pumps to be functional since CF pumps will go to rollback speed when reactor trip breakers are opened. • If time allows, shutdown via manually inserting control rods is the preferred method since a CF pump will remain in service. It may take approximately 45 minutes to reach Mode 3 once turbine load reduction is complete.			
	CRS	(Step 6) Check if "Shutdown Via Reactor Trip from 15% Power" appropriate:	

Op Test No.:	N18-1	Scenario #	1	Event #	3	Page	36 of 73
Event Description:		**Steam Generator Tube Leak**					

Time	Pos.	Expected Actions/Behavior	Comments
		• Shutdown Via Reactor Trip from 15% Power – DESIRED.	**NOTE:** It is normal practice to shut down the reactor by driving rods, rather than tripping from 15%.
		• At least two CA pumps - FUNCTIONAL	
	BOP	(Step 7) Enter target load of 180 MWE in turbine control panel	
NOTE The following table can be used to determine unloading rates. Rates other than specified are acceptable.			
	CRS	(Step 8) Determine the required power reduction rate (MW/min).	**NOTE:** The CRS will reduce load at ≈10-20 MWe/minute.
	BOP	(Step 9) Notify SOC of load reduction (red dispatcher phone).	**Booth Instructor:** as **SOC**, acknowledge.
	RO	(Step 10) Check control rods – IN AUTO.	
	BOP	(Step 11) Borate NC System as follows:	
		• Energize all backup Pzr heaters.	
		• Check unit to be shutdown – VIA REACTOR TRIP FROM 15% POWER.	**NOTE:** It is normal practice to shut down the reactor by driving rods, rather than tripping from 15%.
	CRS	(Step 11.b RNO) GO TO Step 11.d.	
	BOP	(Step 11.d) Determine boration amount based on the following:	
		• Power Reduction Rate (MW/min)	
		• Present NC System Boron Concentration (ppm)	

Op Test No.:	N18-1	Scenario #	1	Event #	3	Page	37	of 73
Event Description:	**Steam Generator Tube Leak**							

Time	Pos.	Expected Actions/Behavior	Comments
		• Total Power change (%).	**NOTE:** The total power change will be determined by the CRS, and will affect the amount of boron inserted by the BOP.
		• Record calculated boration amount:	
	RO	• Check auto or manual rod control – AVAILABLE.	
NOTE If load reduction of greater than 60% is planned and Unit 1 is to remain in Mode 1, the final (1/4) addition of boron may not be required based on rate of Xenon production and control rod response.			
	BOP	• Perform boration in four equal additions during load reduction PER Enclosure 2 (Emergency Boration).	
			NOTE: The CRS may assign the BOP to perform this action. If so, **BOP Examiner** follow actions of Enclosure 2. **Other Examiners** follow **AP-4** Actions, **Step 12**, on **Page 38**.
AP/1/A/5500/04, RAPID DOWNPOWER ENCLOSURE 2, EMERGENCY BORATION			
	BOP	(Step 1) Check OAC - AVAILABLE.	
	BOP	(Step 2) Use OAC point M1P0785 to monitor boric acid gallons added while 1NV-265B (U1 NV Pump Boric Acid Sup Isol) is open.	
	BOP	(Step 3) GO TO Step 5.	
	BOP	(Step 5) Check boric acid transfer pump - RUNNING.	**NOTE:** The 1B Boric Acid Transfer Pump is running.

Op Test No.: N18-1	Scenario # 1	Event # 3	Page 38 of 73
Event Description:	**Steam Generator Tube Leak**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 6) OPEN 1NV-265B (U1 NV Pump Boric Acid Sup Isol).	
	BOP	(Step 7) Do not continue until desired amount of boric acid has been added.	
	BOP	(Step 8) CLOSE 1NV-265B (U1 NV Pump Boric Acid Sup Isol).	
	BOP	(Step 9) IF boric acid transfer pump was started in Step 5 RNO, THEN …..	**NOTE:** The 1B Boric Acid Transfer Pump is running.
	BOP	(Step 10) Repeat enclosure as required.	
			Examiner NOTE: When the crew recognizes that the rods have failed to move in AUTO, move to Event 4.
		AP/1/A/5500/04, RAPID DOWNPOWER	
			Examiner NOTE: Examiners following the **CRS/RO** continue **HERE**.
	RO	(Step 12) WHEN boration commenced, THEN initiate turbine load reduction to desired load at desired rate.	**NOTE:** Due to a previous failure, the RO will lower Turbine Load in MANUAL.
			Examiner NOTE: The RO should lower Turbine Load 20-40 MWe before moving to Event 4. Once Turbine load has been lowered in MANUAL, and an AUTO Rod signal is present, MOVE to Event 4.
	RO	(Step 13) Display Rod Insertion Limits on OAC by entering turn on code "RIL".	
		NOTE Control Rods may approach rod insertion limits during load reduction.	

Op Test No.:	N18-1	Scenario #	1	Event #	3	Page	39 of 73
Event Description:	**Steam Generator Tube Leak**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 14) IF AT ANY TIME "CONTROL ROD BANK LO LO LIMIT" alarm (1AD-2, B-9) is lit THEN comply with Tech Spec 3.1.6 (Control Bank Insertion Limits):	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
NOTE Unloading rates greater than 55 MW/min will meet C-7A interlock.			
	RO	(Step 15) IF AT ANY TIME during procedure C-7A is received, THEN insure Transient Monitor freeze is triggered.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 16) REFER TO the following:	
		• RP/0/A/5700/000 (Classification of Emergency)	
		• RP/0/A/5700/010 (NRC Immediate Notification Requirements).	**NOTE:** The CRS may ask OSM to address. If so, **Floor Instructor** acknowledge as OSM.
	CRS	(Step 17) Notify Reactor Engineer on duty of load reduction.	**NOTE:** The CRS may call WCC/RE to address the switch position. If so, **Booth Instructor** acknowledge as WCC/RE as appropriate.
	RO	(Step 18) Check target load - LESS THAN 1000 MW.	
	CRS	(Step 19) Check Unit 2 available to supply aux steam as follows:	**NOTE:** The CRS will ask U2 RO. **Floor Instructor:** As U2 RO report "All these conditions are met."
		• Unit 2 Reactor power - GREATER THAN 15%	

Op Test No.:	N18-1	Scenario #	1	Event #	3	Page	40 of 73
Event Description:	**Steam Generator Tube Leak**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Unit 2 2AS-12 (U2 SM to AS Hdr Control Inlet Isol) - OPEN	
		• Unit 2 - AVAILABLE TO SUPPLY AS HEADER.	
	RO	(Step 20) Check SM flow on all S/Gs – GREATER THAN 25%.	
	RO	(Step 21) WHEN all SM flows are less than 75%, THEN ensure the following valves ramp CLOSED:	**NOTE:** This is a conditional step. The CRS will make the RO aware of this action, if NOT already done.
		• 1CF-104AB (1A S/G CF Control Bypass)	
		• 1CF-105AB (1B S/G CF Control Bypass)	
		• 1CF-106AB (1C S/G CF Control Bypass)	
		• 1CF-107AB (1D S/G CF Control Bypass)	
	CRS	(Step 22) WHEN reactor power is less than 60%, THEN dispatch operator to stop G Heater Drain Tank pumps one at a time PER OP/1/B/6250/004 (Feedwater Heater Vents, Drains and Bleed System), Enclosure 4.2 (System Shutdown).	
	RO	(Step 23) Check the following:	**NOTE:** It is most likely that the power level is above 55%.
		• P/R meters indicate reactor power - LESS THAN 55%	
		• All CF flows - LESS THAN 55%	
		• Turbine inlet pressure - LESS THAN 500 PSIG.	
	CRS	(Step 23 RNO) IF target load is less than 55%, THEN perform the following:	
		• Do not continue with this procedure until:	

Op Test No.:	N18-1	Scenario #	1	Event #	3	Page	41	of	73
Event Description:		**Steam Generator Tube Leak**							

Time	Pos.	Expected Actions/Behavior	Comments
		• P/R instruments indicate reactor power is less than 55%	
		• All CF flows are less than 55%	
		• Turbine inlet pressure is less than 500 PSIG.	
		• WHEN all parameters above are met, THEN GO TO Step 24.	
After the RO has lowered Turbine Load by 20-40MWe in MANUAL, AND an AUTO Rod motion signal exists, at the discretion of the Lead Examiner, move to Event #4.			

Op Test No.: N18-1	Scenario # 1	Event # 4	Page 42 of 73
Event Description:	**Control Rods fail to MOVE in AUTO**		

During the downpower, the Control Rods fail to move in AUTO. The operator will enter AP/1/A/5500/14, "Rod Control Malfunction," and take manual control of the rods.

Booth Operator Instructions: **While Control Rods are moving in AUTO insert MAL-IRE009 = FAIL_OF_AUTO**

Indications Available:

- Auto rod motion prematurely stops
- White "RODS IN" Rod Control Status light is LIT
- OAC Alarm M1P1367, U1 TAVG-Tref HI 1.5°F

Time	Pos.	Expected Actions/Behavior	Comments
		AP/1/A/5500/14, ROD CONTROL MALFUNCTION	
	RO	(Step 1) IF two or more rods are either dropped OR misaligned by greater than 24 steps, THEN……	**Immediate Action** **NOTE:** No control rods dropped or misaligned during this event.
	RO	(Step 2) Place control rods in manual.	**Immediate Action** **NOTE:** The RO placed the rods in manual during the downpower when the malfunction occurred.
	RO	(Step 3) Check rod movement – STOPPED.	**Immediate Action**
	RO	(Step 4) Check all rods – ALIGNED WITH ASSOCIATED BANK.	
	RO	(Step 5) Check "ROD CONTROL URGENT FAILURE" alarm (1AD-2, A-10) – DARK.	
	RO	(Step 6) Check "T-AVG/T-REF FAILURE ROD STOP" alarm (1AD-2, B-7) – DARK.	

Op Test No.: N18-1	Scenario # 1	Event # 4	Page 43 of 73
Event Description:	**Control Rods fail to MOVE in AUTO**		

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 7) IF this AP entered due to unwarranted rod insertion or withdrawal, THEN….	**NOTE:** The CRS entered AP14 because the Rods were NOT moving when required.
	CRS	(Step 8) IF this AP entered due to a failure of rods to withdraw or insert when required, THEN GO TO Enclosure 2 (Failure Of Rods To Move On Demand).	
			NOTE: The CRS will transition to AP-14, Enclosure 2.
AP/1/A/5500/14, ROD CONTROL MALFUNCTION ENCLOSURE 2, FAILURE OF RODS TO MOVE ON DEMAND			
	CRS	(Step 1) Announce occurrence on paging system.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 2) Maintain T-Avg within 1°F of T-Ref using any of the following methods:	**NOTE:** The RO will adjust Turbine Load to maintain Temperature and/or perform additional Alternate Dilutions.
		• Borate/dilute NC System	
		OR	
		• Adjust Turbine load.	
	CRS	(Step 3) Notify IAE to investigate problem.	**NOTE:** The CRS may call WCC/IAE to address the Rod Control malfunction. If so, **Booth Instructor** acknowledge as WCC.
	RO	(Step 4) Check if rod control system failure has occurred as follows:	
		• 'ROD CONTROL URGENT FAILURE" alarm (1AD-2, A-10) – LIT.	**NOTE:** The Urgent Failure light is DARK.

Op Test No.:	N18-1	Scenario #	1	Event #	4	Page	44 of 73
Event Description:	**Control Rods fail to MOVE in AUTO**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 4 RNO) Perform the following:	
NOTE There is minimal risk of positioning control rods in manual when "ROD CONTROL URGENT FAILURE" alarm (1AD-2, A-10) is dark.			
		• If Manual Rod Control available, THEN rods can be used to maintain T-avg within 1°F of T-Ref.	**Booth Instructor:** as **IAE**, report that the use of Manual Rod Control ONLY is permitted.
		• IF AT ANY TIME control rods do not move correctly in manual, THEN GO TO Step 5.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	• GO TO Step 8.	
	CRS	(Step 8) Check if reactor control system failure has occurred as follows:	
		• "T-AVG/T-REF FAILURE ROD STOP" alarm (1AD-2, B-7) – LIT.	
	CRS	(Step 8.a RNO) GO TO Step 9.	
	CRS	(Step 9) WHEN rod control problem is repaired, OR Engineering determines that rod control malfunction will not affect auto rod motion, THEN ……	
At the discretion of the Lead Examiner, move to Events #5-7.			

Op Test No.:	N18-1	Scenario #	1	Event #	5, 6 & 7	Page	45 of 73
Event Description:	**Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**						

After this, a Loss of Off-Site Power will occur, along with an inadvertent Feedwater Isolation Signal. Simultaneously, the 1B EDG will trip on overspeed. The 1A EDG will fail to start both automatically and manually and a station blackout will exist. The operator will enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," and then EP/1/A/5000/ECA-0.0, "Loss of All AC Power;" or enter ECA-0.0 directly. Simultaneously, the TDCA Pump will start but trip on overspeed. The operator will start the 1A EDG by manually actuating Safety Injection, and power will be restored to Bus 1ETA. However, the 1A MDCA Pump will fail to start (All other equipment will sequence as expected); and the operator will need to manually start the pump. This pump will fail to manually start until the crew has addressed the Red Path on the Heat Sink Critical Safety Function. With Bus 1ETA re-energized the operator will return to, or go to, EP/1/A/5000/E-0, "Reactor Trip or Safety Injection." However, shortly after entry and progression through E-0, a Red Path will develop on the Heat Sink Critical Safety Function Status Tree. The operator will implement EP/1/A/5000/FR-H.1, "Response to Loss of Secondary Heat Sink," and direct evaluation of the 1A MDCA Pump failure and replacement of the breaker. Ultimately, the operator will manually start the 1A MDCA Pump and restore the Secondary Heat Sink. The scenario will terminate at step 7.e of FR-H.1 after Secondary Heat Sink has been restored.

Booth Operator Instructions: **Insert MAL-ISE007A, MAL-ISE007B, MAL-EP002A, MAL-EP002B, MAL-DG004B and MAL-DG001A**

Indications Available:

- Main Control Room lights DIM
- 1SI-14 Status Light for ETB LOSS/UNDERVOLTAGE PHASE X is LIT
- 1SI-14 Status Light for ETB LOSS/UNDERVOLTAGE PHASE Y is LIT
- 1SI-14 Status Light for ETB LOSS/UNDERVOLTAGE PHASE Z is LIT
- 1A EDG not running
- 1B EDG not running
- Both Trains of DRPI DARK

Time	Pos.	Expected Actions/Behavior	Comments
			Examiner NOTE: The CRS may enter ECA-0.0 directly. If so, proceed to **Page 47.**
		EP/1/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION	
	RO/ BOP	(Step 1) Monitor Foldout page.	**NOTE:** Crew will carry out Immediate Actions of E-0, prior to the CRS addressing the EP.

Op Test No.: N18-1 Scenario # 1 Event # 5, 6 & 7	Page 46 of 73
Event Description:	**Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
		NC Pump Trip Criteria (Not expected)	
		CA Suction Sources (CA storage tank (water tower) goes below 1.5 ft – Not expected)	
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	**NOTE:** The BOP will monitor these conditions.
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	
		Ruptured S/G Aux Feedwater Isolation Criteria (Not Expected)	
		Faulted S/G Aux Feedwater Isolation Criteria (Not Expected)	
	RO	(Step 2) Check Reactor Trip:	**Immediate Action**
		• All rod bottom lights – LIT	
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 3) Check Turbine Trip:	**Immediate Action**
		• All throttle valves – CLOSED.	
	BOP	(Step 4) Check 1ETA and 1ETB – ENERGIZED.	**Immediate Action**
	BOP	(Step 4 RNO) Perform the following after allowing time for D/G(s) to energize bus(s) and sequencer(s) to apply loads:	
		• IF both busses de-energized, THEN GO TO EP/1/A/5000/ECA-0.0 (Loss of All AC Power).	

Op Test No.: N18-1	Scenario # 1	Event # 5, 6 & 7			Page 47 of 73		

Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
EP/1/A/5000/ECA-0.0, LOSS OF ALL AC POWER			
	CRS	(Step 1) CSF Status trees should be monitored for information only. EPs referenced by them should not be implemented.	**NOTE:** The crew will carry out Immediate Actions of ECA-0.0, prior to the CRS addressing the EP.
	RO	(Step 2) Check Reactor Trip:	**IMMEDIATE ACTION**
		• All rod bottom lights – LIT	**NOTE:** DRPI is NOT available on the LOOP.
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 2 RNO) Trip reactor.	**IMMEDIATE ACTION** **NOTE:** other indications are used to determine that the reactor has tripped.
	RO	(Step 3) Check Turbine Trip:	**IMMEDIATE ACTION**
		• All throttle valves – CLOSED.	
	CRS	(Step 4) Establish NC pump seal injection from the SSF as follows:	
	CRS	• Immediately dispatch operator to SSF to perform the following:	**NOTE:** The CRS will dispatch an AO to complete Enclosure 1. **Floor/Booth Instructor** acknowledge as appropriate, however, do not take actions (It is expected that these directions will be subsequently stopped).

Op Test No.: N18-1	Scenario # 1	Event # 5, 6 & 7	Page 48 of 73

Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
		• Obtain Brown Folder at SSF and complete Enclosure 2 (Unit 1 SSF - ECA-0.0 Actions).	
NOTE The fastest pathway to 1ETA room is to emergency egress into the aux bldg from the Unit 1 MG set room.			
	CRS	• Dispatch operator to 1ETA room as follows:	
		• Check if operator will enter aux bldg – FROM MG SET ROOM.	
	CRS	(Step 4.b.1 RNO) Perform the following:	
		• Dispatch operator to obtain Brown Folder at 1EMXA4 (north wall of 1ETA room) and complete Enclosure 3 (Unit 1 ETA And ETB Rooms - ECA-0.0 Actions).	**NOTE:** The CRS will dispatch an AO to complete Enclosure 3. **Floor/Booth Instructor** acknowledge as appropriate, however, do not take actions (It is expected that these directions will be subsequently stopped).
		• GO TO Step 4.c.	
	CRS	• Use any of the following to notify security to immediately dispatch officer with key to SSF to ensure operator can access SSF:	**NOTE:** The CRS will dispatch a Security Officer to the SSF. **Booth Instructor:** Acknowledge as Security.
		• Security ringdown phone (located on Unit 2 SRO desk)	
		• 1941 (same line as ringdown phone)	
		• 4900.	**Floor Instructor:** If asked, U2 does NOT have normal power, and both DGs are running.

Op Test No.:	N18-1	Scenario #	1	Event #	5, 6 & 7	Page	49 of 73

Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	(Step 5) Monitor Foldout Page.	
		Alternate Low Pressure Feedwater (applies after Step 8 in body of the procedure):	
		Loss of Vital Instrumentation or Control Power:	
		Low Decay Heat Temperature Control:	
		CA Suction Sources (applies after Step 11 in body of the procedure):	
	BOP	(Step 6) Check NC System – ISOLATED:	
		• Check the following letdown orifice isolation valves – CLOSED.	
		• 1NV-458A (U1 75 GPM L/D Orifice Outlet Cont Isol).	
		• 1NV-457A (U1 45 GPM L/D Orifice Outlet Cont Isol).	
		• 1NV-35A (U1 Variable L/D Orifice Outlet Cont Isol).	
		• CLOSE the following valves:	
		• 1NV-1A (U1 NC L/D Isol To Regenerative Hx)	
		• 1NV-2A (U1 NC L/D Isol To Regenerative Hx).	
		• Check Pzr PORVs – CLOSED.	
		• Check the following excess letdown isolation valves – CLOSED:	
		• 1NV-24B (1C NC Loop To Excess L/D Hx Isol)	
		• 1NV-25B (1C NC Loop To Excess L/D Hx Isol).	
		• Check 1NV-121 (U1 ND Letdown Control) – CLOSED.	

Op Test No.:	N18-1	Scenario #	1	Event #	5, 6 & 7	Page	50	of	73

Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 7) Check total CA flow – GREATER THAN 450 GPM.	
	RO	(Step 7 RNO) Perform the following:	
		• Ensure TD CA pump on.	**NOTE:** The TDCA Pump is NOT running.
		• IF flow is less than 450 GPM due to operator action to control CA flow, THEN…	**NOTE:** CA flow is NOT <450 gpm due to operator action.
		• Ensure all TD CA pump flow control valves are fully OPEN.	
		• IF "TD CA PUMP STOP VLV NOT OPEN" alarm (1AD-5, F-3) is lit, THEN dispatch operator to reset stop valve PER EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 24 (Resetting TD CA Stop Valve).	**NOTE:** The CRS will dispatch an AO. **Floor Instructor:** Acknowledge as AO. **Booth Instructor:** Wait **five minutes** and **report back** that the **TDCA Turbine has overspeed and will NOT reset**.
		• IF CA flow is less than 450 GPM AND reason not known, THEN…..	**NOTE:** CA flow is <450 gpm because there are no CA Pumps operating.
	BOP	(Step 8) Try to restore power to 1ETA or 1ETB as follows:	
		• Check both D/Gs – RUNNING.	**NOTE:** Neither D/G is running.
	BOP	(Step 8.a RNO) Perform the following:	
		• Initiate S/I	**NOTE:** Upon actuation of SI the A EDG will start.
		• Notify Unit 2 to immediately ensure flow path for 2B RN pump PER Enclosure 5 (Unit 2 Actions).	**NOTE:** The CRS will notify U2. **Floor Instructor:** Acknowledge as U2 RO.

Op Test No.:	N18-1	Scenario #	1	Event #	5, 6 & 7	Page	51 of 73
Event Description:	**Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	• IF at least one D/G starts, THEN GO TO Step 8.b.	
	BOP	• (Step 8.b). Check D/G sequencer for all running D/G(s) - AUTOMATICALLY LOADING BUS.	**NOTE:** The 1A Sequencer will be applying loads automatically, however, the 1A MDCA Pump will fail to start.
			NOTE: The CRS may dispatch an AO to the 1A MDCA Pump and/or breaker. **If so, Floor/Booth Instructor:** Acknowledge as AO. After **Two Minutes** report: • **Pump off for no apparent reason.** • **Pump Breaker Charging Motor is continuously running and the Charging Springs are NOT indicating charged.** **NOTE:** The CRS may call WCC/IAE to address the failed Pump. If so, **Booth Instructor** acknowledge as WCC/IAE.
		• Notify dispatched operators at 1EMXA-4 and SSF to stop where they are at.	**NOTE:** The CRS will contact both previously dispatched AOs. **Booth Instructor:** Acknowledge as AOs.
		• Check status of the following local actions:	

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
Critical Task: **Energize at least one AC Emergency Bus before proceeding past Step 18 in ECA-0.0.** Safety Significance: Failure to energize an AC Emergency Bus when able to do so constitutes "mis-operation" or incorrect performance which leads to degraded emergency power capacity. Failure to perform the Critical Task may result in a needless challenge and/or degradation of a fission product barrier at the point of the RCP Seals, and will result in the inability to add inventory through the ECCS during a subsequent small break LOCA. Step 18 in ECA-0.0 is chosen as the success threshold because according to the basis of Step 18 of ECA-0.0, until AC power is restored, plant conditions will deteriorate due to NC pump seal leakage. In Steps 15-18 the operator is directed to defeat automatic loading of the emergency bus in order to safely allow local power source restoration. Since the conditions existed to restart the 1A EDG prior to performance of Step 18, and the crew has proceeded beyond this step, the crew has unnecessarily made power restoration more difficult, while plant conditions deteriorate. This threshold provides the examiners with a Measurable Performance Indication.			
		• SSF D/G - OFF	
		• 1 EMXA-4 normal incoming breaker – CLOSED.	
		• Notify dispatched operators that actions at SSF and 1EMXA-4 are not required.	**NOTE:** The CRS will contact both previously dispatched AOs. **Booth Instructor:** Acknowledge as AOs.
	CRS	• Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
	CRS	• RETURN TO procedure and step in effect.	
			NOTE: The CRS will transition to E-0.
EP/1/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION			

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
			Examiner NOTE: It is expected that during the performance of E-0, a **Red Path Condition** will develop on the Heat Sink Critical Safety Function. When this occurs, follow the actions of **Step 1 of FR-H.1** on **Page 61.**
	RO/ BOP	(Step 1) Monitor Foldout page.	**NOTE:** Crew will carry out Immediate Actions of E-0, prior to the CRS addressing the EP.
		NC Pump Trip Criteria (Not expected)	
		CA Suction Sources (CA storage tank (water tower) goes below 1.5 ft – Not expected)	
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	**NOTE:** The BOP will monitor these conditions.
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	
		Ruptured S/G Aux Feedwater Isolation Criteria (Not Expected)	
		Faulted S/G Aux Feedwater Isolation Criteria (Not Expected)	
	RO	(Step 2) Check Reactor Trip:	**Immediate Action**
		• All rod bottom lights – LIT	
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 3) Check Turbine Trip:	**Immediate Action**

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
		• All throttle valves – CLOSED.	
	BOP	(Step 4) Check 1ETA and 1ETB – ENERGIZED.	**Immediate Action**
	BOP	(Step 4 RNO) Perform the following:	
		• IF both busses de-energized, THEN…..	
		• WHEN time allows, THEN try to restore power to de-energized bus PER AP/1/A/5500/07 (Loss of Electrical Power) while continuing with this procedure.	**NOTE:** 1ETB is de-energized and the crew will address AP-07 as able.
	RO/ BOP	(Step 5) Check if S/I is actuated:	**Immediate Action**
		• "SAFETY INJECTION ACTUATED" status light (1SI-18) – LIT.	
		• Both LOCA Sequencer Actuated status lights (1SI-14) – LIT.	
	CRS	(Step 6) Announce "Unit 1 Safety Injection".	**NOTE:** The CRS may ask U2 RO to make Plant Announcement that a U1 Safety Injection has occurred. If so, **Floor Instructor** acknowledge as U2 RO.
	BOP	(Step 7) Check all Feed Water Isolation status lights (1SI-4) – LIT.	
	BOP	(Step 8) Check Phase A "RESET" lights – DARK.	
	BOP	(Step 9) Check ESF Monitor Light Panel on Energized train(s):	

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
		• Groups 1, 2, 5 – DARK.	
		• Group 3 – LIT.	
		• Group 4 – LIT AS REQUIRED.	
		• Group 6 – LIT.	
	CRS	• GO TO Step 10.	
	RO/ BOP	(Step 10) Check proper CA pump status:	
		• MD CA pumps – ON.	**NOTE:** The 1B MDCA is OOS, and the 1A MDCA Pump is NOT running.
			NOTE: The CRS may dispatch an AO to the 1A MDCA Pump and/or breaker. **If so, Floor/Booth Instructor:** Acknowledge as AO. After **Two Minutes** report: • **Pump off for no apparent reason.** • **Pump Breaker Charging Motor is continuously running and the Charging Springs are NOT indicating charged.** **NOTE:** The CRS may call WCC/IAE to address the failed Pump. If so, **Booth Instructor** acknowledge as WCC/IAE.

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	(Step 10.a RNO) Start pumps.	**NOTE:** The RO/BOP will attempt to start the pump, however, it will not start. **NOTE:** The CRS may call WCC/IAE to address the failed pump. If so, **Booth Instructor** acknowledge as WCC.
	RO/ BOP	• (Step 10.b) N/R level in at least 3 S/Gs – GREATER THAN 17%.	
	BOP	(Step 11) Check all KC pumps – ON.	
	BOP	(Step 11.a RNO) Perform the following:	
		Start pumps.	**NOTE:** The Train B KC Pumps do NOT have power.
		IF all KC pumps running, THEN….	
		IF any NC pump KC low flow annunciator lit on 1AD-6, THEN….	
	BOP	(Step 12) Check both RN pumps – ON.	**NOTE:** The Train B RN Pump does NOT have power.
	BOP	(Step 12.a RNO) IF any RN pump off, THEN perform the following:	
		IF 1A RN pump is off, THEN …..	**NOTE:** The 1A RN Pump is running.
		IF affected train is deenergized, AND its D/G is off, THEN GO TO Step 13.	**NOTE:** 1ETB is de-energized and the 1B EDG is OFF.
	CRS	(Step 13) Notify Unit 2 to perform the following:	**Floor Instructor:** As U2 RO report "2A RN Pump is running."

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
		• Start 2A RN pump.	
		• THROTTLE Unit 2 RN flow to minimum for existing plant condition.	**Booth Instructor:** **insert LOA-RN087 (Start 2A RN Pump)** **insert LOA-RN083 8050.000000 delay=0 ramp=10 (Unit 2 Train A Demand Flow)**
	RO	(Step 14) Check all S/G pressures – GREATER THAN 775 PSIG.	
	BOP	(Step 15) Check Containment Pressure – HAS REMAINED LESS THAN 3 PSIG.	**NOTE:** Containment Pressure is normal.
	BOP	(Step 16) Check S/I flow:	
		• Check "NV PMPS TO COLD LEG FLOW" gauge – INDICATING FLOW.	
		• Check NC pressure – LESS THAN 1600 PSIG.	
	BOP	(Step 16b RNO) Perform the following:	
		• Ensure ND pump miniflow valve on running pump(s) OPEN:	
		• 1ND-68A (1A ND Pump & Hx Mini Flow Isol)	
	CRS	• IF valve(s) open on all running ND pumps, THEN GO TO Step 17.	
	CRS	(Step 17) Notify OSM or other SRO to perform EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 22 (OSM Actions Following an S/I) within 10 minutes.	**NOTE:** The CRS may ask OSM to address. If so, **Floor Instructor** acknowledge as OSM.

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Event Description:	**Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	(Step 18) Check CA flow:	
		• Total CA flow – GREATER THAN 450 GPM.	**NOTE:** There is no CA flow.
			NOTE: The CRS may dispatch an AO to the 1A MDCA Pump and/or breaker. **If so, Floor/Booth Instructor:** Acknowledge as AO. After **Two Minutes** report: • **Pump off for no apparent reason.** • **Pump Breaker Charging Motor is continuously running and the Charging Springs are NOT indicating charged.** **NOTE:** The CRS may call WCC/IAE to address the failed Pump. If so, **Booth Instructor** acknowledge as WCC/IAE.
	RO/ BOP	(Step 18.a RNO) Perform the following:	
		• IF N/R level in all S/Gs is less than 11% (32% ACC), THEN…..	
		• IF N/R level in all S/Gs is less than 11% (32% ACC) AND feed flow greater than 450 GPM cannot be established, THEN…..	
	BOP	• (Step 18.b) Check VI header pressure – GREATER THAN 60 PSIG.	

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	• WHEN each S/G N/R level is greater than 11% (32% ACC), THEN control CA flow to maintain that S/G N/R level between 11% (32% ACC) and 50%.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	RO	(Step 19) Check NC temperatures:	
		• IF all NC pumps off, THEN check NC T-Colds - STABLE OR TRENDING TO 557°F.	**NOTE:** All NCPs are OFF.
			NOTE: It is most likely that the cooldown will be under control. If NOT, the CRS will assign the RO (BOP) to perform Enclosure 3 (Not Scripted), and continue the performance of E-0 with the BOP (RO).
	BOP (RO)	(Step 20) Check Pzr PORV and spray valves:	
		• All Pzr PORVs – CLOSED.	
		• Normal Pzr spray valves – CLOSED.	**NOTE:** It is most likely that the Normal Pzr spray valves are OPEN.
	BOP (RO)	(Step 20.b RNO) IF Pzr pressure is less than 2100 PSIG, THEN…….	**NOTE:** It is most likely that the Pzr Pressure is greater than 2100 psig.
	BOP (RO)	• (Step 20.c) At least one Pzr PORV isolation valve-OPEN.	
	BOP (RO)	(Step 21) Check NC subcooling based on core exit T/Cs – GREATER THAN 0°F.	
	BOP (RO)	(Step 22) Check if main steamlines intact:	

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
		• All S/G pressures – STABLE OR GOING UP	
		• All S/Gs – PRESSURIZED.	
	BOP (RO)	(Step 23) Check if S/G tubes intact:	**NOTE:** A 30 gpm SGTL is occurring in the 1A SG.
		• The following secondary EMFs – NORMAL:	
		• 1EMF-33 (Condenser Air Ejector Exhaust)	
		• 1EMF-34(L) (S/G Sample (Lo Range))	**NOTE:** 1EMF-34 is in TRIP 2.
		• 1EMF-24 (S/G A)	**NOTE:** 1EMF-24 is in TRIP 2.
		• 1EMF-25 (S/G B)	
		• 1EMF-26 (S/G C)	
		• 1EMF-27 (S/G D).	
		• S/G levels – STABLE OR GOING UP IN A CONTROLLED MANNER.	
	CRS	(Step 23 RNO) IF S/G levels going up in an uncontrolled manner OR any EMF abnormal, THEN perform the following:	**NOTE:** A 30 gpm SGTL is occurring in the 1A SG.
		• Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
		• GO TO EP/1/A/5000/E-3 (Steam Generator Tube Rupture).	
			Examiner NOTE: The CRS may transition to E-3. However, it is expected that a Red Path Condition will exist on the Heat Sink Critical Safety Function, shortly. When this occurs, continue below.

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
EP/1/A/5000/FR-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK			
			NOTE: The CRS may dispatch an AO to the 1A MDCA Pump and/or breaker. **If so, Floor/Booth Instructor:** Acknowledge as AO. After **Two Minutes** report: • **Pump off for no apparent reason.** • **Pump Breaker Charging Motor is continuously running and the Charging Springs are NOT indicating charged.** **NOTE:** The CRS may call WCC/IAE to address the failed Pump. If so, **Booth Instructor** acknowledge as WCC/IAE.
	CRS	(Step 1) IF total feed flow is less than 450 GPM due to operator action, THEN…	**NOTE:** This condition is NOT met, and the crew will remain in FR-H.1.
CAUTION If a non-faulted S/G is available, then feed flow should only be established to non-faulted S/G(s) in subsequent steps.			
	RO/ BOP	(Step 2) Check if secondary heat sink is required:	
		• NC pressure – GREATER THAN ANY NON-FAULTED S/G PRESSURE.	
		• Any NC T-Hot – GREATER THAN 350°F (347°F ACC).	**NOTE:** A Secondary Heat Sink is required.

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Event Description:	**Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**		

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	(Step 3) Monitor Foldout Page.	
		NC System Feed and Bleed Criteria (Applies after Step 2 in the body of the procedure) (3 S/Gs goes below 24% (36% ACC) – Not expected)	
		Cold Leg Recirc Switchover Criteria (FWST level reaches 95 inches – Not expected)	
		CA Suction Sources (CA storage tank (water tower) goes below 1.5 ft – Not expected)	
	BOP	(Step 4) Check at least one of the following NV pumps – AVAILABLE:	
		• 1A NV pump	
		OR	
		• 1B NV pump.	
	RO	(Step 5) Check if NC System feed and bleed should be initiated:	
		• Check W/R level in at least 3 S/Gs – LESS THAN 24% (36% ACC).	
	RO/ BOP	(Step 5.a RNO) Perform the following:	
		• Monitor feed and bleed initiation criteria.	
		• WHEN criteria satisfied, THEN GO TO Step 22.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	• GO TO Step 6.	

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 6) Ensure S/G BB and NM valves CLOSED PER Enclosure 3 (S/G BB and Sampling Valve Checklist).	**Examiner NOTE:** The CRS may assign the BOP (RO) to perform this action. If so, **BOP (RO) Examiner** follow actions of **Enclosure 3**. **Others** should move ahead to Step 7 on **Page 64** to continue in FR-H.1.
EP/1/A/5000/FR-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK ENCLOSURE 3, S/G BB AND SAMPLING VALVE CHECKLIST			
	BOP (RO)	(Step 1) Check the following valves – CLOSED.	**Examiner NOTE:** Follow the actions associated with Enclosure 3 if BOP is assigned by CRS to perform.
		• 1BB-1B (1A S/G Blowdown Cont Outside Isol Control) - CLOSED	
		• 1BB-2B (1B S/G Blowdown Cont Outside Isol Control) - CLOSED	
		• 1BB-3B (1C S/G Blowdown Cont Outside Isol Control) - CLOSED	
		• 1BB-4B (1D S/G Blowdown Cont Outside Isol Control) - CLOSED	
		• 1BB-5A (A S/G BB Cont Inside Isol) - CLOSED	
		• 1BB-6A (B S/G BB Cont Inside Isol) - CLOSED	
		• 1BB-7A (C S/G BB Cont Inside Isol) - CLOSED	
		• 1BB-8A (D S/G BB Cont Inside Isol) - CLOSED	
		• 1NM-187A (1A S/G Upper Shell Sample Cont Inside Isol) - CLOSED	

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP (RO)	• 1NM-190A (1A S/G Blowdown Sample Cont Inside Isol) - CLOSED	
		• 1NM-201A (1B S/G Blowdown Sample Hdr Cont Outside Isol) - CLOSED	
		• 1NM-207A (1C S/G Upper Shell Sample Cont Inside Isol) - CLOSED	
		• 1NM-210A (1C S/G Blowdown Sample Cont Inside Isol) - CLOSED	
		• 1NM-221A (1D S/G Blowdown Sample Hdr Cont Outside Isol) - CLOSED	
		• 1NM-191B (1A S/G Blowdown Sample Hdr Cont Outside Isol) - CLOSED	
		• 1NM-197B (1B S/G Upper Shell Sample Cont Inside Isol) - CLOSED	
		• 1NM-200B (1B S/G Blowdown Sample Cont Inside Isol) - CLOSED	
		• 1NM-211B (1C S/G Blowdown Sample Hdr Cont Outside Isol) - CLOSED	
		• 1NM-217B (1D S/G Upper Shell Sample Cont Inside Isol) - CLOSED	
		• 1NM-220B (1D S/G Blowdown Sample Cont Inside Isol) - CLOSED	
EP/1/A/5000/FR-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK			
	RO (BOP)	(Step 7) Attempt to establish CA flow to at least one S/G as follows:	**Examiner NOTE:** Examiners NOT following BOP (RO) actions in Enclosure 3, continue **HERE**.
		• Check power to both MD CA pumps – AVAILABLE.	**NOTE:** The 1B MDCA Pump is OOS, and the 1A MDCA Pump has failed upon Auto Start.

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS may dispatch an AO to the 1A MDCA Pump and/or breaker. **If so, Floor/Booth Instructor:** Acknowledge as AO. After **Two Minutes** report: • **Pump off for no apparent reason.** • **Pump Breaker Charging Motor is continuously running and the Charging Springs are NOT indicating charged.** **NOTE:** The CRS may call WCC/IAE to address the failed Pump. If so, **Booth Instructor** acknowledge as WCC/IAE.
	RO (BOP)	(Step 7.a RNO) Perform the following:	
		• IF 1ETA OR 1ETB deenergized, THEN restore power to the affected essential bus PER AP/1/A/5500/07 (Loss of Electrical Power).	**NOTE:** 1ETB is de-energized and the crew will address AP-07 as able.
		• IF the essential bus is energized, THEN dispatch operator to determine cause of breaker failure.	**NOTE:** The CRS will dispatch an AO. **Floor/Booth Instructor:** as **AO**, acknowledge.

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
	RO (BOP)	• Ensure control room CA valves aligned PER Enclosure 4 (CA Valve Alignment).	**Examiner NOTE:** The CRS may assign the RO (BOP) to perform this action. If so, RO (**BOP) Examiner** follow actions of **Enclosure 4**. **Others** should move ahead to Step 7.c on **Page 69** to continue in FR-H.1.
EP/1/A/5000/FR-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK ENCLOSURE 4, CA VALVE ALIGNMENT			
			Examiner NOTE: Follow the actions associated with Enclosure 4 if RO (BOP) is assigned by CRS to perform.
	RO (BOP)	(Step 1) Check the following valves - OPEN	
		• 1CA-66AC (U1 TD CA Pump Disch To 1A S/G Isol) - OPEN	
		• 1CA-62A (1A CA Pump Disch To 1A S/G Isol) - OPEN	
		• 1CA-54AC (U1 TD CA Pump Disch To 1B S/G Isol) - OPEN	
		• 1CA-58A (1A CA Pump Disch To 1B S/G Isol) - OPEN	
		• 1CA-50B (U1 TD CA Pump Disch To 1C S/G Isol) - OPEN	
		• 1CA-46B (1B CA Pump Disch To 1C S/G Isol) - OPEN	
		• 1CA-38B (U1 TD CA Pump Disch To 1D S/G Isol) - OPEN	
		• 1CA-42B (1B CA Pump Disch To 1D S/G Isol) - OPEN	

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Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
	RO (BOP)	(Step 2) Check the following valves - OPEN	
		• 1CA-64AB (U1 TD CA Pump Disch To 1A S/G Control) – OPEN	
		• 1CA-60A (1A CA Pump Disch To 1A S/G Control) - OPEN	
		• 1CA-52AB (U1 TD CA Pump Disch To 1B S/G Control) - OPEN	
		• 1CA-56A (1A CA Pump Disch To 1B S/G Control) - OPEN	
		• 1CA-48AB (U1 TD CA Pump Disch To 1C S/G Control) - OPEN	
		• 1CA-44B (1B CA Pump Disch To 1C S/G Control) - OPEN	
		• 1CA-36AB (U1 TD CA Pump Disch To 1D S/G Control) - OPEN	
		• 1CA-40B (1B CA Pump Disch To 1D S/G Control) - OPEN	
	RO (BOP)	(Step 3) Check CA Storage Tank (water tower) level – GREATER THAN 1.5 FT.	
	RO (BOP)	(Step 4) Check the following valves - CLOSED	
		• 1RN-69A (1A RN Assured Supply TO U1 CA Isol) - CLOSED	
		• 1CA-86A (U1 TD CA Pump Suction From 1A RN Isol) - CLOSED	
		• 1CA-15A (1A CA Pump Suction From 1A RN Isol) - CLOSED	
		• 1RN-162B (1B RN Assured Supply To U1 CA Isol) - CLOSED	
		• 1CA-116B (U1 TD CA Pump Suction From 1B RN Isol) - CLOSED	
		• 1CA-18B (1B CA Pump Suction From 1B RN Isol) - CLOSED	

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Event Description:	**Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO (BOP)	(Step 5) Check the following valves – OPEN:	
		• 1CA-11A (1A CA Pump Suction Isol) - OPEN	
		• 1CA-7AC (U1 TD CA Pump Suction Isol) - OPEN	
		• 1CA-9B (1B CA Pump Suction Isol) - OPEN	
	RO (BOP)	(Step 6) GO TO Step 8.	
	RO (BOP)	(Step 8) Check the following valves - OPEN:	
		• 1CA-2 (U1 CA Pumps Suct From CA Storage Tank Isol)	
		• 1CA-6 (U1 CA Pumps Suct From CACST Isol).	
	RO (BOP)	(Step 9) Check CA pump suction from UST and CA Condensate Storage Tank (service bldg roof tank) valves – CLOSED:	
		• 1CS-18 (U1 UST To CA Pump Suct Hdr Isol) - CLOSED	
		• 1CA-4 (U1 CA Pumps Suct From SUT Isol) - CLOSED	
EP/1/A/5000/FR-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK			
			Examiner NOTE: Examiners NOT following RO (BOP) actions in Enclosure 4, continue **HERE**.

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Event Description:	**Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP (RO)	(Step 7.c) Start all available CA pumps.	**NOTE:** The crew may attempt to start the 1A CA Pump. If so, it will NOT start. **NOTE:** If the CRS has not previously dispatched an AO to the 1A MDCA Pump, an AO will be dispatched now. **Floor/Booth Instructor:** as **AO**, acknowledge **Booth Instructor:** If the CRS has **previously called WCC/IAE** to address the failed pump, report that the **1A MDCA Pump Breaker Charging Motor is continuously running and the Charging Springs are NOT indicating charged**. Report that **a spare breaker can be placed into the 1A MDCA Pump at Bus 1ETA**. If the **CRS agrees**, perform the following: • **Insert LOA-CA009A=1** • **WAIT Four Minutes** • **DEL MAL-CA004A** • **Insert LOA-CA009A=0** **NOTE:** If the CRS has NOT previously called the WCC/IAE to address the failed pump, the CRS will call. If so, **Booth Instructor** acknowledge as WCC/IAE, wait two minutes and follow the Cue above.

Op Test No.:	N18-1	Scenario #	1	Event #	5, 6 & 7	Page	70	of	73

Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
			Examiner NOTE: The CRS will continue in FR-H.1 while waiting for the actions associated with the 1A MDCA Pump to occur.
	BOP (RO)	(Step 7.d) Check TD CA pump – RUNNING.	**NOTE:** The TDCA Pump is NOT running.
	BOP (RO)	(Step 7.d RNO) Perform the following as necessary:	
		• IF 1SA-48BC (SM From S/G C To TD CA Pump Isol) is closed, THEN…	**NOTE:** 1SA-48BC indicates OPEN.
		• IF 1SA-49AB (SM From S/G B to TD CA Pump Isol) is closed, THEN…	**NOTE:** 1SA-49AB indicates OPEN.
	CRS	• IF “TD CA PUMP STOP VLV NOT OPEN” alarm (1AD-5, F-3) is lit, THEN dispatch operator to reset 1SA-3 (Unit 1 TD CA Pump Turb Stop Valve) PER EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 24 (Resetting TD CA Stop Valve).	**NOTE:** The CRS will dispatch an AO. **Booth Instructor:** Acknowledge as AO. Wait **five minutes** and **report back** that the **TDCA Turbine has overspeed and will NOT reset**.
	CRS	• IF reason for loss of steam supply to TD CA pump not determined,…	**NOTE:** The CRS will determine from the AO report that the TDCA Pump is unavailable.
	RO/ BOP	(Step 7.e) Check total flow to S/G(s) – GREATER THAN 450 GPM.	**Examiner NOTE:** If the 1A MDCA Pump has been started, 450 gpm will exist, and the CRS will continue with **Step 7.f on Page 72**. If NOT, the CRS will continue with the Step 7.e RNO FR-H.1.
	RO/ BOP	(Step 7.e RNO 1) IF only one MD CA pump is on, ……	**NOTE:** No MDCA Pump is running.

Op Test No.:	N18-1	Scenario #	1	Event #	5, 6 & 7	Page	71	of	73

Event Description: **Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	(Step 7.e RNO 2) IF any CA pump is running,….	**NOTE:** No MDCA Pump is running.
	RO/ BOP	(Step 7.e RNO 3) IF any feed flow to at least one S/G is indicated, THEN…..	**NOTE:** No Feed flow is indicated.
	RO/ BOP	(Step 7.e RNO 4) IF no feed flow indicated, THEN perform the following:	
		• IF no CA pump can be started, THEN dispatch operator and maintenance to CA pumps to try to restore one CA pump to service.	**NOTE:** The CRS will dispatch an AO and Maintenance. **Floor/Booth Instructor:** as **AO/Maintenance**, acknowledge; and perform cue shown on **Page 69**.
		• Dispatch operator to ensure CA valves aligned PER Enclosure 6 (Local CA Valve Alignment).	**NOTE:** The CRS will dispatch an AO. **Floor/Booth Instructor:** as **AO, acknowledge.**
		• IF AT ANY TIME CA pump is restored, THEN RETURN TO Step 7.e.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• GO TO Step 8.	**Examiner NOTE:** The CRS may continue beyond Step 7 (Not Scripted). Actions are in place to restore the 1A MDCA Pump. Wait here until the 1A MDCA Pump is started, and then continue.

Op Test No.:	N18-1	Scenario #	1	Event #	5, 6 & 7	Page	72	of	73
Event Description:	**Inadvertent FWIS/Loss of Offsite Power/1B EDG Trips/1A EDG fails to start/TDCA Pump trips on Overspeed/1A MDCA Pump fails to start**								

Time	Pos.	Expected Actions/Behavior	Comments
Critical Task: **Restore a Secondary Heat Sink by replacing the breaker and starting the 1A MDCA Pump before establishing NCS Bleed and Feed in FR-H.1.** Safety Significance: Failure to restore a Secondary Heat Sink with AFW flow, when able to do so under the postulated plant conditions, results in "adverse consequence or a significant degradation in the mitigative capability of the plant." In this case, the minimum required AFW flow rate can be established by manually starting the 1A MDCA Pump (After Breaker Replacement). Therefore, failure to do so represents a failure by the crew to "demonstrate the following abilities: (1) Effectively direct or manipulate engineered safety feature (ESF) controls that would prevent (degraded emergency core cooling system (ECCS) … capacity), (2) Recognize a failure or an incorrect automatic actuation of an ESF system or component, and (3) Take one or more actions that would prevent a challenge to plant safety."			
	RO/ BOP	(Step 7.f) Check feed and bleed - ESTABLISHED PER STEPS 23 through 27.	**NOTE:** The Bleed and Feed steps have NOT been implemented.
	CRS	(Step 7.f RNO) RETURN TO procedure and step in effect.	
			NOTE: The CRS will transition to E-0.
At the discretion of the Lead Examiner terminate the exam.			

UNIT 1 STATUS:

Power Level: 100% NCS [B] 955 ppm Pzr [B]: 955 ppm Xe: Per OAC

Power History: At this power level for 78 days Core Burnup: 251 EFPDs

UNIT 2 STATUS:

Power Level: 100%

CONTROLLING PROCEDURE:

- OP/1/A/6100/003 (Controlling Procedure for Unit Operation)
- Enclosure 13.2 (1B Fast Start) of PT/1/A/4350/002B (Diesel Generator 1B Operability Test)

OTHER INFORMATION NEEDED TO ASSUME THE SHIFT:

- The B EDG is undergoing post-maintenance testing. Enclosure 13.2 (1B Fast Start) of PT/1/A/4350/002B (Diesel Generator 1B Operability Test) is complete through Step 2.31. The B EDG is running and ready for loading. The Licensed operator performing this surveillance needed to be excused for personal reasons. The BOP must continue with this procedure.
- PT/1/A/4350/025, Essential Auxiliary Power System Power Source Verification, (SR 3.8.1.1) was completed two hours ago.
- The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift.

The following equipment is Out-Of-Service:

- The 1B MDCA Pump is OOS due to a Control Power Fuse failure. ACTION has been taken in accordance with Technical Specification LCO 3.7.5 ACTION B.1.
- The 1B EDG is OOS due to Fuel Pump replacement. ACTION has been taken in accordance with Technical Specification LCO 3.8.1 ACTION B.1, B.2, B.3.1 and B.4. Maintenance has been completed on the 1B EDG, and it has been started for retest.
- NVP-5230, NCP 1A #1 Seal Differential Pressure indicator, failed last shift (IAE is investigating).
- MCB Annunciator 1AD-9, C-8, "CONT HI-HI PRESS ALERT," will not ILLUMINATE (IAE is investigating).

Crew Directions:

- The BOP will continue with Enclosure 13.2, "1B D/G Fast Start" of PT/1/A/4350/002B, "Diesel Generator 1B Operability Test," and parallel the B EDG with Bus 1ETB, starting with Step 2.32.

Work Control SRO/Offsite Communicator **Jim**

Plant SRO **Joe (FB)**

AO's AVAILABLE

<u>Unit 1</u>	**<u>Unit 2</u>**
Aux Bldg. John	**Aux Bldg. Chris**
Turb Bldg. Bob (FB)	**Turb Bldg. Mike (FB)**
5th Rounds. Carol	

Extra(s) Bill (FB) Ed (FB) Wayne (FB) Tanya Gus (RW)

Facility:	**McGuire**	Scenario No.: **2**	Op Test No.: **N18-1**
Examiners:	____________	Operators:	____________ (SRO)
	____________		____________ (RO)
	____________		____________ (BOP)

Initial Conditions:	The plant is at 75% power (MOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.
Turnover:	The following equipment is Out-Of-Service: The 1B NS Pump is OOS due to a Main Breaker failure. ACTION has been taken in accordance with Technical Specification LCO 3.6.6 ACTION A.1. CAP-5320, CA Condensate Storage Tank Level Indicator, failed last shift (IAE is investigating). MCB Annunciator 1AD-10, B-1, "NCDT HX OUTLET HI FLO," has failed ILLUMINATED (IAE is investigating). It is planned to raise power on this shift to 100%.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	R-RO N-BOP N-SRO	Power Increase w/Dilute
2	MAL IRE003A	C-RO C-SRO	Control Rods insert uncontrollably in AUTO
3	MAL DCSSLIM 07D/G	C-BOP C(TS)-SRO	Pzr Spray Valve Controller fails to FULL OUTPUT (Valve Open)
4	MAL RN007B	C-BOP C(TS)-SRO	1B RN Pump Trip
5	MAL DCSSLIM 21E/G	C-RO C-SRO	SG 1D FCV Controller fails to MANUAL/FCV Bypass Valve fails fully OPEN
6	MAL CF004D	M-RO M-BOP M-SRO	1D Feedline Break in Containment
7	MAL ISE007A ISE007B	C-BOP C-SRO	FWIS fails to AUTO ACTUATE

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2018 NRC Scenario #2

The plant is at 75% power (MOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.

The following equipment is Out-Of-Service: The 1B NS Pump is OOS due to a Main Breaker failure. ACTION has been taken in accordance with Technical Specification LCO 3.6.6 ACTION A.1. CAP-5320, CA Condensate Storage Tank Level Indicator, failed last shift (IAE is investigating). MCB Annunciator 1AD-10, B-1, "NCDT HX OUTLET HI FLO," has failed ILLUMINATED (IAE is investigating). It is planned to raise power on this shift to 100%.

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.36.11 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation." The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.3, "Dilute," of OP/1/A/6150/009, "Boron Concentration Control," and raise Turbine load in accordance with OP/1/A/6300/001 A, "Turbine-Generator Load Change." During the load change, an AO will report that the operating-air line to the 1B S/G PORV has been damaged requiring that the instrument air isolation valve be closed. The operator will address Technical Specification LCO 3.7.4, "Steam Generator Power Operated Relief Valves (SG PORVs)."

During the power change, the Control Rods will fail such that they continuously insert in AUTO. The operator will enter AP/1/A/5500/14, "Rod Control Malfunction," and take manual control of the rods.

Following this, the Pzr Spray Valve Controller, 1NC-29C B Spray, demand will fail to full output. The operator will enter AP/1/A/5500/11, "Pressurizer Pressure Anomalies." The operator will address Technical Specification LCO 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits."

Subsequently, the 1B RN Pump will trip on overcurrent. The operator will enter AP/1/A/5500/20, "Loss of RN." The operator will address Technical Specification LCO 3.7.7, "Nuclear Service Water System (NSWS)," Technical Specification LCO 3.8.1, "AC Sources-Operating," and SLC 16.9.9, "Boration Systems – Flow Path (Operating)."

Next, the 1D SG FCV Controller will fail to MANUAL and the FCV Bypass valve will fail fully open resulting in the Feedwater Control Valve for the 1D SG closing and causing SG Level to lower. The operator will respond in accordance with AP/1/A/5500/06, "S/G Feedwater Malfunction," and control the 1D SG Level manually.

After this, a catastrophic Feedline Break will occur on the 1D Main Feedline inside the Containment. The operator will enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection." Simultaneously the Feedwater Isolation Signal will fail to automatically actuate. The operator will need to take manual action to isolate the Main Feedwater System to the SGs.

Upon completion of E-0, the operator will transition to EP/1/A/5000/E-2, "Faulted Steam Generator Isolation," to isolate the flow into and out of the 1D Steam Generator. The operator will then transition to EP/1/A/5000/ES-1.1, "Safety Injection Termination."

The scenario will terminate at Step 8.a of ES-1.1, after the crew has established charging flow and is attempting to stabilize Pressurizer Level.

Critical Tasks:

Manually close the Failed OPEN Pzr Spray Valve before an automatic Reactor Protection System actuation occurs.

Safety Significance: failure to close the Spray Valve and stop the pressure transient, under the postulated plant conditions, results in an unnecessary transient to the plant and challenge to the Reactor Protection System. Performance of the critical task would stabilize the pressure transient. A failure to stabilize the pressure transient, when able to do so, constitutes a mis-operation or incorrect crew performance which leads to incorrect NCS pressure control.

After a failure of the 1D SG FCV Controller in AUTO, manually control and stabilize the 1D SG Narrow Level before an automatic Reactor Protection System actuation occurs.

Safety Significance: failure to manually control and stabilize the SG Narrow Level before a Reactor Protection System actuation occurs, under the postulated plant conditions, results in an unnecessary transient to the plant and challenge to the Reactor Protection System. Performance of the critical task would stabilize the SG Narrow Level. A failure to stabilize the SG Narrow Range Level, when able to do so, constitutes a mis-operation or incorrect performance which could lead to incorrect NCS temperature control and an unnecessary challenge to the NCS Heat Sink Critical Safety Function.

Isolate AFW flow and main feed flow to the 1D SG; and manually close the 1D MSIV before transition out of E-2.

Safety Significance: Failure to isolate a Faulted SG that can be isolated causes challenges to the Critical Safety Functions that would not otherwise occur. Failure to isolate flow could result in an unwarranted Orange or Red Path condition on NC Integrity and/or Subcriticality (if cooldown is allowed to continue uncontrollably).

PROGRAM: McGuire Operations Training

MODULE: Initial License Operator Training Class ILT 18-1

TOPIC: NRC Simulator Exam

Scenario N18-1-2

REFERENCES:

1. Technical Specification LCO 3.6.6, “Containment Spray System” (Amendment 285/264)
2. OP/1/A/6100/003, “Controlling Procedure for Unit Operation” (Rev 201)
3. OP/1/A/6150/009, “Boron Concentration Control” (Rev 134)
4. OP/1/A/6300/001 A, “Turbine-Generator Load Change” (Rev 13)
5. Technical Specification LCO 3.7.4, “Steam Generator Power Operated Relief Valves (SG PORVs)” (Amendment 221/203)
6. AP/1/A/5500/14, “Rod Control Malfunction” (Rev 16)
7. AP/1/A/5500/11, “Pressurizer Pressure Anomalies” (Rev 11)
8. Technical Specification LCO 3.4.1, “RCS Pressure, Temperature and Flow Departure From Nucleate Boiling (DNB) Limits” (Amendment 219/201)
9. MCEI -0400-349, “McGuire Cycle 26 Core Operating Limits Report” (Rev 0)
10. AP/1/A/5500/20, “Loss of RN” (Rev 36)
11. Technical Specification LCO 3.7.7, “Nuclear Service Water System (NSWS)” (Amendment 282/261)
12. Technical Specification LCO 3.8.1, “AC Sources-Operating” (Amendment 221/203)
13. SLC 16.9.9, “Boration Systems – Flow Path (Operating)” (Rev 154)
14. AP/1/A/5500/06, “S/G Feedwater Malfunction” (Rev 20)
15. EP/1/A/5000/E-0, “Reactor Trip or Safety Injection” (Rev 36)
16. EP/1/A/5000/E-2, “Faulted Steam Generator Isolation” (Rev 10)
17. EP/1/A/5000/ES-1.1, “Safety Injection Termination” (Rev 29)

Validation Time: 96 minutes

Author: David Lazarony, Essential Training & Consulting, LLC

Facility Review: ________________________

Rev. 010418

McGuire 2018 NRC Scenario #2 Objectives:

Given the simulator at an initial condition of 75% power with a normal power increase planned evaluate:

1. the SRO's ability to supervise the control room team during the normal, abnormal, and emergency situations that arise, including compliance with all facility procedures, Technical Specifications, and other commitments.

2. each crew member's ability to effectively communicate as part of a control room team during the normal, abnormal, and emergency situations that arise.

3. the RO and BOP's ability to effectively raise power in accordance with Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation."

4. each crew member's ability to effectively diagnose an uncontrolled insertion of the Control Rods when operating in AUTO, and the RO's ability to respond to such an event in accordance with AP/1/A/5500/14, "Rod Control Malfunction."

5. each crew member's ability to effectively diagnose a failure of a Pressurizer Spray Valve controller when operating in AUTO, and the BOP's ability to respond to such an event in accordance with AP/1/A/5500/11, "Pressurizer Pressure Anomalies."

6. each crew member's ability to effectively diagnose a failure of an RN Pump, and the BOP's ability to respond to such an event in accordance with AP/1/A/5500/20, "Loss of RN."

7. each crew member's ability to effectively diagnose a failure of an FCV Controller, and the RO's ability to respond to such an event in accordance with AP/1/A/5500/06, "S/G Feedwater Malfunction."

8. each crew member's ability to effectively diagnose a catastrophic Main Feedwater Line Break inside Containment and the RO and BOP's ability to respond to such an event in accordance with EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," and EP/1/A/5000/E-2, "Faulted Steam Generator Isolation."

9. each crew member's ability to effectively diagnose a failure of the Feedwater Isolation Signal to Auto actuate when called upon to do so and the RO and/or BOP's ability to actuate it when required.

10. each crew member's ability to effectively determine when Safety Injection can be terminated during implementation of the EOP network; and the RO and BOP's ability to effectively terminate Safety Injection in accordance with EP/1/A/5000/ES-1.1, "Safety Injection Termination."

Facility: **McGuire**	Scenario No.: **2**	Op Test No.: **N18-1**	
Examiners:	Operators:		(SRO)
			(RO)
			(BOP)

Initial Conditions:	The plant is at 75% power (MOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.
Turnover:	The following equipment is Out-Of-Service: The 1B NS Pump is OOS due to a Main Breaker failure. ACTION has been taken in accordance with Technical Specification LCO 3.6.6 ACTION A.1. CAP-5320, CA Condensate Storage Tank Level Indicator, failed last shift (IAE is investigating). MCB Annunciator 1AD-10, B-1, "NCDT HX OUTLET HI FLO," has failed ILLUMINATED (IAE is investigating). It is planned to raise power on this shift to 100%.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	R-RO N-BOP N-SRO	Power Increase w/Dilute
2	MAL IRE003A	C-RO C-SRO	Control Rods insert uncontrollably in AUTO
3	MAL DCSSLIM 07D/G	C-BOP C(TS)-SRO	Pzr Spray Valve Controller fails to FULL OUTPUT (Valve Open)
4	MAL RN007B	C-BOP C(TS)-SRO	1B RN Pump Trip
5	MAL DCSSLIM 21E/G	C-RO C-SRO	SG 1D FCV Controller fails to MANUAL/FCV Bypass Valve fails fully OPEN
6	MAL CF004D	M-RO M-BOP M-SRO	1D Feedline Break in Containment
7	MAL ISE007A ISE007B	C-BOP C-SRO	FWIS fails to AUTO ACTUATE

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2018 NRC Scenario #2

The plant is at 75% power (MOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.

The following equipment is Out-Of-Service: The 1B NS Pump is OOS due to a Main Breaker failure. ACTION has been taken in accordance with Technical Specification LCO 3.6.6 ACTION A.1. CAP-5320, CA Condensate Storage Tank Level Indicator, failed last shift (IAE is investigating). MCB Annunciator 1AD-10, B-1, "NCDT HX OUTLET HI FLO," has failed ILLUMINATED (IAE is investigating). It is planned to raise power on this shift to 100%.

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.36.11 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation." The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.3, "Dilute," of OP/1/A/6150/009, "Boron Concentration Control," and raise Turbine load in accordance with OP/1/A/6300/001 A, "Turbine-Generator Load Change." During the load change, an AO will report that the operating-air line to the 1B S/G PORV has been damaged requiring that the instrument air isolation valve be closed. The operator will address Technical Specification LCO 3.7.4, "Steam Generator Power Operated Relief Valves (SG PORVs)."

During the power change, the Control Rods will fail such that they continuously insert in AUTO. The operator will enter AP/1/A/5500/14, "Rod Control Malfunction," and take manual control of the rods.

Following this, the Pzr Spray Valve Controller, 1NC-29C B Spray, demand will fail to full output. The operator will enter AP/1/A/5500/11, "Pressurizer Pressure Anomalies." The operator will address Technical Specification LCO 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits."

Subsequently, the 1B RN Pump will trip on overcurrent. The operator will enter AP/1/A/5500/20, "Loss of RN." The operator will address Technical Specification LCO 3.7.7, "Nuclear Service Water System (NSWS)," Technical Specification LCO 3.8.1, "AC Sources-Operating," and SLC 16.9.9, "Boration Systems – Flow Path (Operating)."

Next, the 1D SG FCV Controller will fail to MANUAL and the FCV Bypass valve will fail fully open resulting in the Feedwater Control Valve for the 1D SG closing and causing SG Level to lower. The operator will respond in accordance with AP/1/A/5500/06, "S/G Feedwater Malfunction," and control the 1D SG Level manually.

After this, a catastrophic Feedline Break will occur on the 1D Main Feedline inside the Containment. The operator will enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection." Simultaneously the Feedwater Isolation Signal will fail to automatically actuate. The operator will need to take manual action to isolate the Main Feedwater System to the SGs.

Upon completion of E-0, the operator will transition to EP/1/A/5000/E-2, "Faulted Steam Generator Isolation," to isolate the flow into and out of the 1D Steam Generator. The operator will then transition to EP/1/A/5000/ES-1.1, "Safety Injection Termination."

The scenario will terminate at Step 8.a of ES-1.1, after the crew has established charging flow and is attempting to stabilize Pressurizer Level.

<u>Critical Tasks:</u>

Manually close the Failed OPEN Pzr Spray Valve before an automatic Reactor Protection System actuation occurs.

Safety Significance: failure to close the Spray Valve and stop the pressure transient, under the postulated plant conditions, results in an unnecessary transient to the plant and challenge to the Reactor Protection System. Performance of the critical task would stabilize the pressure transient. A failure to stabilize the pressure transient, when able to do so, constitutes a mis-operation or incorrect crew performance which leads to incorrect NCS pressure control.

After a failure of the 1D SG FCV Controller in AUTO, manually control and stabilize the 1D SG Narrow Level before an automatic Reactor Protection System actuation occurs.

Safety Significance: failure to manually control and stabilize the SG Narrow Level before a Reactor Protection System actuation occurs, under the postulated plant conditions, results in an unnecessary transient to the plant and challenge to the Reactor Protection System. Performance of the critical task would stabilize the SG Narrow Level. A failure to stabilize the SG Narrow Range Level, when able to do so, constitutes a mis-operation or incorrect performance which could lead to incorrect NCS temperature control and an unnecessary challenge to the NCS Heat Sink Critical Safety Function.

Isolate AFW flow and main feed flow to the 1D SG; and manually close the 1D MSIV before transition out of E-2.

Safety Significance: Failure to isolate a Faulted SG that can be isolated causes challenges to the Critical Safety Functions that would not otherwise occur. Failure to isolate flow could result in an unwarranted Orange or Red Path condition on NC Integrity and/or Subcriticality (if cooldown is allowed to continue uncontrollably).

SIMULATOR OPERATOR INSTRUCTIONS

	Bench Mark	ACTIVITY	DESCRIPTION
☐		**Reset to Temp IC 226** **(Base IC-37)**	**T = 0 Malfunctions:** **Insert LOA-NS006 = 1; (Rackout of the 1B NS Pump Breaker)** **Insert LOA-NS006A = 1; (Rackout of the 1B NS Pump Control Power Breaker)** **insert XMT-CA_0CALT5320 = 0 (CA Condensate Storage Tank Level Indicator Failure)** **insert OVR-1AD10_B01 = ON (1) (MCB Annunciator 1AD10/B1)** **Insert:** • **MAL-ISE007A = 3** • **MAL-ISE007B = 3** **(FWIS fails to Auto Actuate)**
☐		**RUN** **Reset all SLIMs**	**Place Tagout/O-Stick on:** • **1B NS Pump** • **CA_0CALT5320, CA Condensate Storage Tank Level Indicator** • **MCB Annunciator 1AD-10, B-1**
☐		**Update** Status Board, **Setup OAC**	**NOTE:** RMWST DO = >1000 ppb.
☐		**Freeze.**	
☐		**Update Fresh Tech. Spec. Log.**	
☐		**Fill out the AO's Available section of Shift Turnover Info.**	
☐	Prior to Crew Briefing	**RUN**	

	Bench Mark	ACTIVITY	DESCRIPTION
☐	**Crew Briefing** 1. Assign Crew Positions based on evaluation requirements 2. Provide the crew with a marked up copy of Enclosure 4.1 (Through Step 3.36.10), a copy of Enclosure 4.3 of OP/1/A/6150/009 marked up through step 3.5, and a blank copy of OP/1/A/6300/001 A. 3. Direct the crew to Review the Control Boards taking note of present conditions, alarms.		
☐	T-0	Begin Familiarization Period	
☐	At direction of examiner	**Execute Simulator Scenario N18-1-2.**	
☐	At direction of examiner	**Event 1**	Power Increase w/Dilute
☐	At direction of examiner (When Control Rods are Moving in AUTO)	**Event 2** **Insert MAL-IRE003A = IN**	Control Rods insert uncontrollably in AUTO **NOTE: If needed (i.e. No current Rod Demand) insert MAL-DCS1213 =TRUE**
☐	At direction of examiner	**Event 3** **Insert MAL-DCSSLIM07G BUTTON_DEPRESSED** **Insert MAL-DCSSLIM07D BUTTON_DEPRESSED** **Delete MAL-DCSSLIM07G = 2, delay 10 seconds** **DeleteMAL-DCSSLIM07D = 2, delay = 30 seconds**	Pzr Spray Valve Controller fails to FULL OUTPUT (Valve Open)
☐	At direction of examiner	**Event 4** **Insert MAL-RN007B = TRUE**	1B RN Pump Trip

	Bench Mark	ACTIVITY	DESCRIPTION
☐	At direction of examiner	**Event 5** **Insert MAL-DCSSLIM21G BUTTON_ DEPRESSED** **Delete 1A MAL-DCSSLIM21G = 2 (1 second delayed)** **Insert MAL-DCSSLIM21E BUTTON_ DEPRESSED** **Delete 1A MAL-DCSSLIM21E = 2 (1 second delayed)** **Insert REM-CF0106AB = 1**	SG 1D FCV Controller fails to MANUAL/FCV Bypass Valve fails fully OPEN
☐	At direction of examiner	**Event 6** **insert MAL-CF004D =2.2E+7**	1D Feedline Break in Containment
☐	Post-Rx Trip during depress.	**Event 7** **Insert:** **MAL-ISE007A = 3** **MAL-ISE007B = 3**	FWIS fails to AUTO ACTUATE **NOTE: This event is inserted at T=0 and will occur on Rx Trip**
☐	**Terminate the scenario upon direction of Lead Examiner**		

Op Test No.:	N18-1	Scenario #	2	Event #	1	Page	9 of 59
Event Description:	**Power Increase w/Dilute**						

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.36.11 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation." The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.3, "Dilute," of OP/1/A/6150/009, "Boron Concentration Control," and raise Turbine load in accordance with OP/1/A/6300/001 A, "Turbine-Generator Load Change." During the load change, an AO will report that the operating-air line to the 1B S/G PORV has been damaged requiring that the instrument air isolation valve be closed. The operator will address Technical Specification LCO 3.7.4, "Steam Generator Power Operated Relief Valves (SG PORVs)."
Booth Operator Instructions: **NA**
Indications Available: **NA**

Time	Pos.	Expected Actions/Behavior	Comments
		OP/1/A/6100/003, CONTROLLING PROCEDURE FOR UNIT OPERATION ENCLOSURE 4.1, POWER INCREASE	
	CRS	(Step 3.36.11) Prior to increasing to greater than 75% RTP, check all governor valves open.	**NOTE:** The power increase will be at 2 MWe/minute.
	RO/ BOP	(Step 3.36.12) WHEN 77-80% RTP, THEN enable OTDT DCS alarming as follows:	**NOTE:** Based on the extent of the power increase, this action may or may not be taken.
		• On DCS graphics, select "MAINTENANCE MENU".	
		• Select "TAVG, DELTA T INPUTS & ALARM CHECKING" graphic.	
		• Select "ON" for the following:	
		• NCAA 5422	
		• NCAA 5462	
		• NCAA 5502	
		• NCAA 5542	
		• OTDELTAT-FAIL	

Op Test No.:	N18-1	Scenario #	2	Event #	1	Page	10 of 59
Event Description:	**Power Increase w/Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
		(Step 3.36.13) IF startup from refueling outage…..	
		(Step 3.36.14) IF performing Generator/Automatic Voltage Regulator (AVR) testing at 78% RTP…	
OP/1/A/6150/009, BORON CONCENTRATION CONTROL ENCLOSURE 4.3, DILUTE			
	BOP	(Step 3.5) Determine amount of reactor makeup water needed to obtain desired boron concentration using McGuire Data Book, OAC, Reactor Group Guidance, or plant parameters (T-Ave. Steam Pressure, Xenon worth, etc.). (R.M.)	**NOTE:** The BOP will add 400 gallons of MU Water.
		• Total Reactor Makeup Water:	
	BOP	(Step 3.6) Ensure the following reset to zero: (R.M.)	
		• Total Make Up Flow Counter	
		• Boric Acid Flow Counter	
	BOP	(Step 3.7) Set Total Make Up Flow Counter to value determined in Step 3.5.	
	BOP	(Step 3.8) Select "DILUTE" on "NC Sys M/U Controller".	
NOTE Rapidly changing reactor makeup water flow can cause a Rx Makeup Flow Deviation Annunciator Alarm.			
	BOP	(Step 3.9) IF AT ANY TIME it is desired to adjust reactor makeup water flow, adjust "Rx M/U Water Flow Control" setpoint to achieve desired flowrate.	**NOTE:** Typically, it is NOT desired to adjust reactor makeup water flow.

Op Test No.:	N18-1	Scenario #	2	Event #	1	Page	11	of 59
Event Description:		**Power Increase w/Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.10) IF AT ANY TIME it is desired to manually adjust reactor makeup water flow, perform the following:	
		• Place “Rx M/U Water Flow Control” in manual.	
		• Adjust “Rx M/U Water Flow Control” output to control reactor makeup water flowrate.	
NOTE IF desired to dilute with a constant flow rate as advised by engineering to minimize VCT temperature decrease, it is preferred to allow 1NV-137A (U1 NC Filter Otlt to VCT 3-Way Diversion Cntrl) to auto divert on high level.			
	BOP	(Step 3.11) IF AT ANY TIME it is desired to lower VCT level, perform the following:	
		• Monitor Letdown Pressure.	
NOTE An increase in Letdown Pressure greater than 20 psig during diverts may be indicative of excessive NB Feed Filter DP. {NCR 01597088}			
		• Select “HUT” on 1NV-137A (U1 NC Filter Otlt to VCT 3-Way Diversion Cntrl).	**NOTE:** The BOP may do this at any time to lower VCT level.
		• IF Letdown Pressure increases greater than 20 psig, notify CRS.	
		• AFTER desired level achieved, select “AUTO” on 1NV-137A (U1 NC Filter Otlt to VCT 3-Way Diversion Cntrl).	
NOTE Steps 3.12 - 3.20 may be completed and then checked off as time allows.			

Op Test No.:	N18-1	Scenario #	2	Event #	1	Page	12 of 59
Event Description:	**Power Increase w/Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.12) IF AT ANY TIME plant parameters require termination of dilution, perform the following:	
		• Place “NC System Make Up” to “STOP”. (R.M.)	
		• IF 1NV-137A (U1 NC Filter Otlt to VCT 3-Way Diversion Cntrl) placed to HUT, place to “AUTO”.	
	BOP	(Step 3.13) Momentarily select “START” on “NC System Make Up”. (R.M.)	
	BOP	(Step 3.14) Check “NC System Make Up” red light lit.	
BOOTH INSTRUCTOR:		**AFTER the BOP has started the dilution, as an AO, call the Control Room and report that the operating-air line to the 1B S/G PORV has been damaged requiring that the instrument air isolation valve be closed.**	
			NOTE: The CRS will evaluate this condition. Although the 1B S/G PORV is inoperable, TS LCO 3.7.4 is met.
			NOTE: The CRS may call WCC/IAE to address the valve failure. If so, **Booth Instructor** acknowledge as WCC.
	BOP	(Step 3.15) Check 1NV-171A (U1 Boric Acid Blender to VCT Inlet Control) open.	
	BOP	(Step 3.16) Check 1NV-252A (Rx M/U Water Supply To U1 BA Blender Cntrl) open or throttled as required.	

Op Test No.:	N18-1	Scenario #	2	Event #	1	Page	13	of	59
Event Description:	**Power Increase w/Dilute**								

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.17) Check Rx M/U Water Pump start.	
	BOP	(Step 3.18) Monitor Total Make Up Flow Counter. (R.M.)	
	BOP	(Step 3.19) HOLD until one of the following occurs:	
		• Amount of reactor makeup recorded per Step 3.5 added	
		OR	
		• Reactor makeup water addition manually terminated	
	BOP	(Step 3.20) Ensure dilution terminated as follows: (R.M.)	
		• IF in “AUTO”, ensure the following off:	
		• 1A Rx M.U Water Pump	
		• 1B Rx M/U Water Pump	
		• Ensure the following closed:	
		• 1NV-171A (U1 Boric Acid Blender to VCT Inlet Control)	
		• 1NV-252A (Rx M/U Water Supply To U1 BA Blender Cntrl)	
	BOP	(Step 3.21) Ensure “Rx M/U Water Flow Control” in auto. (R.M.)	

NOTE

- OAC point M1P5614 (Unit 1 Effective Boron Concentration) may be used as the desired boron concentration in the following calculations. Use of Effective Boron Concentration will account for B-10 depletion. {NCR 01641629}
- Results of Boron Concentration makeups have been consistently lower than desired. To compensate it may be necessary to use actual Boron Concentration (instead of Effective Boron Concentration) or adjustment of the "desired" Boron Concentration to obtain a desired resultant Boron Concentration. {NCR 01682204}

Op Test No.: N18-1 Scenario # 2 Event # 1 Page 14 of 59

Event Description: **Power Increase w/Dilute**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.22) IF "Rx M/U Water Flow Control" adjusted per Step 3.9 OR Step 3.10…	**NOTE:** Typically, the Rx M.U Water Flow Control was NOT adjusted.
	BOP	(Step 3.23) Ensure 1NV-137A (U1 NC Filter Otlt to VCT 3-Way Diversion Cntrl) in "AUTO".	
NOTE CRS concurrence required if flush of blender NOT performed.			
	BOP	(Step 3.24) IF desired to flush blender, go to…	**NOTE:** The BOP will likely request that the flush NOT be performed because additional dilutions are expected during the power increase.
	BOP	(Step 3.25) Select "AUTO" for "NC Sys M/U Controller".	
	BOP	(Step 3.26) Momentarily select "START" on "NC System Make Up".	
	BOP	(Step 3.27) Check "NC System Make Up" red light lit.	
	BOP	(Step 3.28) Ensure the following reset to zero:	
		• Total Make Up Flow Counter	
		• Boric Acid Flow Counter	
	BOP	(Step 3.29) Record in Narrative Log that final blender content is Rx Makeup Water.	

Op Test No.:	N18-1	Scenario #	2	Event #	1	Page	15 of 59
Event Description:	**Power Increase w/Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The BOP may repeat this task as needed during the power increase.
OP/1/A/6300/001A, TURBINE-GENERATOR STARTUP/SHUTDOWN ENCLOSURE 4.1, TURBINE-GENERATOR LOAD CHANGE			
NOTE If reducing power to a level greater than 50%, it is preferable to reduce power at a rate less than 12% per hour in order to minimize sodium peaks. [NCR01574291]			
	RO	(Step 3.4.1) IF Turbine in "OPERATOR AUTO", perform the following:	
		(Step 3.4.1.1) Ensure desired change within "Calculated Capability Curve".	
		(Step 3.4.1.2) IF turbine load will increase or decrease more than 10 MWs, notify Dispatcher of expected load change.	
		(Step 3.4.1.3) IF desired to change the load rate, THEN perform the following:	
		• Depress "LOAD RATE".	
		• Enter desired load rate in "VARIABLE DISPLAY".	**NOTE:** the RO will select 2 MWe/Min loading rate.
		• Depress "ENTER".	
		(Step 3.4.1.4) IF desired to change desired load, THEN perform the following:	
		• Depress "REFERENCE".	
		• Enter desired load in "VARIABLE DISPLAY".	
		• Depress "ENTER".	
		• Depress "GO"	
		(Step 3.4.1.5) IF desired to pause load change, THEN perform the following:	
		• Depress "HOLD".	
		• WHEN desired to resume load change, THEN depress "GO".	

Op Test No.:	N18-1	Scenario #	2	Event #	1	Page	16 of 59
Event Description:	**Power Increase w/Dilute**						

Time	Pos.	Expected Actions/Behavior	Comments
OP/1/A/6100/003, CONTROLLING PROCEDURE FOR UNIT OPERATIONS ENCLOSURE 4.1, POWER INCREASE			
	CRS	(Step 3.36.15) Continue power increase to 95% RTP.	**NOTE:** The power increase will be at 2 MWe/minute.
At the discretion of the Lead Examiner move to Event #2.			

Op Test No.:	N18-1	Scenario #	2	Event #	2	Page	17 of 59
Event Description:	**Control Rods insert uncontrollably in AUTO**						

During the power change, the Control Rods will fail such that they continuously insert in AUTO. The operator will enter AP/1/A/5500/14, "Rod Control Malfunction," and take manual control of the rods.	
Booth Operator Instructions:	**insert MAL-IRE003A (IN)** **NOTE: If needed (i.e. No current Rod Demand) insert MAL-DCS1213 =TRUE**
Indications Available: • Control Rods are moving inward in AUTO without a proper signal.	

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The RO may place the Turbine in HOLD.
		AP/1/A/5500/14, ROD CONTROL MALFUNCTION	
	RO	(Step 1) IF two or more rods are either dropped OR misaligned by greater than 24 steps…	**Immediate Action** **NOTE:** No Rods have dropped in this event.
	RO	(Step 2) Place control rods in manual.	**Immediate Action** **NOTE:** The RO will place the rods in MANUAL.
	RO	(Step 3) Check rod movement – STOPPED.	**Immediate Action** **NOTE:** When the RO places the Rods to MANUAL, continual inward Rod Motion will stop.
	RO	(Step 4) Check all rods – ALIGNED WITH ASSOCIATED BANK.	
	RO	(Step 5) Check "ROD CONTROL URGENT FAILURE" alarm (1AD-2, A-10) – DARK.	

Op Test No.: N18-1	Scenario # 2	Event # 2	Page 18 of 59
Event Description:	**Control Rods insert uncontrollably in AUTO**		

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 6) Check "T-AVG/T-REF FAILURE ROD STOP" alarm (1AD-2, B-7) – DARK.	
	CRS	(Step 7) IF this AP entered due to unwarranted rod insertion or withdrawal, THEN GO TO Enclosure 3 (Response To Continuous Rod Movement).	**NOTE:** The CRS will transition to Enclosure 3 of AP-14.
ROD CONTROL MALFUNCTION ENCLOSURE 3 – RESPONSE TO CONTINUOUS ROD MOVEMENT			
	CRS	(Step 1) Announce occurrence on paging system.	**NOTE:** CRS may ask U2 RO to make Plant Announcement that AP-14 has been entered. If so, **Floor Instructor** acknowledge as U2 RO.
	CRS	(Step 2) Notify IAE to investigate problem.	**NOTE:** The CRS may call WCC/IAE to address the switch position. If so, **Booth Instructor** acknowledge as WCC.
	CRS	(Step 3) Evaluate the following prior to any control rod withdrawal:	
		• Ensure no inadvertent mode change will occur.	
		• Ensure control rods are withdrawn in a deliberate manner, while closely monitoring the reactor's response.	
	RO	(Step 4) Check T-Ref indication - NORMAL	
	CRS/ RO	(Step 5) Do not move rods until IAE determines rod motion in permissible.	**Booth Instructor:** after **2 minutes,** as **IAE**, report that MANUAL rod control only is permissible.

Op Test No.:	N18-1	Scenario #	2	Event #	2	Page	19 of 59
Event Description:	**Control Rods insert uncontrollably in AUTO**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 6) Maintain T-Avg within 1°F of T-Ref as follows:	
		• Adjust Turbine load	
		OR	
		• Borate/dilute NC System.	
	RO	(Step 7) IF AT ANY TIME a runback occurs while in this procedure,…	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	RO/ BOP	(Step 8) IF AT ANY TIME while in this procedure a unit shutdown is required AND rods cannot be moved, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Borate as required during shutdown to maintain T-Avg at T-Ref.	
		• Monitor AFD during load reduction.	
		• IF AT ANY TIME AFD reaches Tech Spec limit AND reactor power is greater than 50%, …	
		• IF entry into Mode 3 is desired, THEN perform the following:	
		• WHEN the turbine is tripped OR at desired power level, THEN perform the following:	
		• Trip Reactor.	
		• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	
	CRS	(Step 9) WHEN problem is repaired…	
			NOTE: The CRS will likely conduct a Focus Brief.
At the discretion of the Lead Examiner move to Event #3.			

Op Test No.:	N18-1	Scenario #	2	Event #	3	Page	20 of 59
Event Description:	**Pzr Spray Valve Controller fails to FULL OUTPUT (Valve Open)**						

Following this, the Pzr Spray Valve Controller, 1NC-29C B Spray, demand will fail to full output. The operator will enter AP/1/A/5500/11, "Pressurizer Pressure Anomalies." The operator will address Technical Specification LCO 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits."

Booth Operator Instructions:

insertMAL-DCSSLIM07G BUTTON_DEPRESSED

insertMAL-DCSSLIM07D BUTTON_DEPRESSED

deleteMAL-DCSSLIM07G = 2, delay 10 seconds

deleteMAL-DCSSLIM07D = 2, delay 30 seconds

Indications Available:

- NCS/Pzr pressure lowers
- OAC Alarm: U1 PZR PRESS I through IV
- 1NC-29C SLIMs LS indication 50 or 100%
- MCB Annunciator 1AD6/C-6 PZR LO PRESS CONTROL

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The BOP may take all the necessary actions in the Immediate Actions, before CRS reads AOP.
		AP/1/A/5500/11, PRESSURIZER PRESSURE ANOMALIES	
	BOP	(Step 1) Check Pzr pressure – HAS GONE DOWN.	**Immediate Action**
	BOP	(Step 2) Check Pzr PORVs – CLOSED.	**Immediate Action**
	BOP	(Step 3) Check Pzr spray valves - CLOSED	**Immediate Action** **NOTE:** 1NC-29C is OPEN.
	BOP	(Step 3 RNO) CLOSE Pzr spray valve(s).	

Op Test No.:	N18-1	Scenario #	2	Event #	3	Page	21 of 59
Event Description:	**Pzr Spray Valve Controller fails to FULL OUTPUT (Valve Open)**						

Time	Pos.	Expected Actions/Behavior	Comments
Critical Task: **Manually close the Failed OPEN Pzr Spray Valve before an automatic Reactor Protection System actuation occurs.** Safety Significance: failure to close the Spray Valve and stop the pressure transient, under the postulated plant conditions, results in an unnecessary transient to the plant and challenge to the Reactor Protection System. Performance of the critical task would stabilize the pressure transient. A failure to stabilize the pressure transient, when able to do so, constitutes a mis-operation or incorrect crew performance which leads to incorrect NCS pressure control.			
	BOP	(Step 4) Check Pzr PORVs – CLOSED.	
	BOP	(Step 5) Check Pzr spray valves – CLOSED.	**NOTE:** IF the BOP has already used the EMERG SWITCH, the CRS may answer YES, and continue to Step 6. If NOT, the Step 5 RNO will be performed.
	BOP	(Step 5 RNO) IF NC pressure below desired pressure, THEN perform the following:	
		• Ensure Pzr spray emergency close switch on 1MC-10 is in the "CLOSE" position for failed spray valve.	
		• IF Pzr spray valve closed, THEN GO TO Step 6.	
	CRS	(Step 6) Announce occurrence on page.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	BOP	(Step 7) Check 1NV-21A (NV Spray to PZR Isol) – CLOSED.	
	BOP	(Step 8) Check the following Pzr heaters – ON:	

Op Test No.:	N18-1	Scenario #	2	Event #	3	Page	22	of	59
Event Description:		**Pzr Spray Valve Controller fails to FULL OUTPUT (Valve Open)**							

Time	Pos.	Expected Actions/Behavior	Comments
		• 1A	
		• 1B	
		• 1D	
	BOP	(Step 9) Check 1C Pzr heaters – ON.	
	BOP	(Step 10) Check “PZR PRESS MASTER” – IN AUTO.	
	BOP	(Step 11) Check “1NC-27 PRESSURIZER SPRAY EMERGENCY CLOSE” switch – SELECTED TO “NORMAL”.	
	BOP	(Step 12) Check “1NC-29 PRESSURIZER SPRAY EMERGENCY CLOSE” switch – SELECTED TO “NORMAL”.	**NOTE:** In order to close the malfunctioning Spray Valve, the BOP had to take the EMERG SWITCH to CLOSE.
	CRS	(Step 12 RNO) Notify station management to ensure switch restored to “NORMAL” once spray valve is repaired.	**NOTE:** The CRS may call WCC/Station Management to address the switch position. If so, **Booth Instructor** acknowledge as WCC.
	BOP	(Step 13) Check Pzr pressure – GOING UP TO DESIRED PRESSURE.	
	CRS	(Step 14) Exit this procedure.	**NOTE:** The CRS may call WCC/IAE to address the valve failure. If so, **Booth Instructor** acknowledge as WCC.
			NOTE: The CRS will likely conduct a Focus Brief.
TECHNICAL SPECIFICATION 3.4.1, RCS PRESSURE, TEMPERATURE, AND FLOW DEPARTURE FROM NUCLEATE BOILING (DNB) LIMITS			

Op Test No.:	N18-1	Scenario #	2	Event #	3	Page	23 of 59
Event Description:	**Pzr Spray Valve Controller fails to FULL OUTPUT (Valve Open)**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	LCO 3.4.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be within the limits specified in Table 3.4.1-1.	**NOTE:** According to Table 3.4.1-1, Parameter 2, indicated Pressurizer Pressure will be ≥ The limit specified in the COLR.
	CRS	APPLICABILITY: MODE 1.	**NOTE:** According to Table 4 of the COLR, indicated Pressurizer Pressure (with four channels available) must be ≥ 2212.3 psig via the meter indication and ≥ 2209.1 psig via the OAC. During this failure Pressurizer Pressure will lower below these values.
	CRS	ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressurizer pressure or RCS average temperature DNB parameters not within limits.	A.1 Restore DNB parameter(s) to within limit.	2 hours

			NOTE: When Pressurizer Pressure drops to < 2209.1 psig (OAC) on the failure, the CRS will determine that Condition A is required and that ACTION A.1 must be taken.

At the discretion of the Lead Examiner, move to Event #4.

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	24 of 59
Event Description:	**1B RN Pump Trip**						

Subsequently, the 1B RN Pump will trip on overcurrent. The operator will enter AP/1/A/5500/20, "Loss of RN." The operator will address Technical Specification LCO 3.7.7, "Nuclear Service Water System (NSWS)," Technical Specification LCO 3.8.1, "AC Sources-Operating," and SLC 16.9.9, "Boration Systems – Flow Path (Operating)."

Booth Operator Instructions: **insert MAL-RN007B = TRUE (1B RN Pump trips)**

Indications Available:

- 1B RN Pump Motor breaker Green status light is LIT
- 1B RN Pump Motor amps indicating 0
- MCB Annunciator 1AD-12/A-3 A RN PMP DISCHARGE LO PRESS
- MCB Annunciator 1AD-12/A-4 B RN PMP DISCHARGE LO PRESS

Time	Pos.	Expected Actions/Behavior	Comments
		AP/1/A/5500/20, LOSS OF RN **CASE I, LOSS OF OPERATING RN TRAIN**	
	BOP	(Step 1) Check both D/Gs - OFF.	
	BOP	(Step 2) Check for potential loss of LLI as follows:	
		• Check Unit 2 RN pump(s) that are aligned to LLI – OPERATING PROPERLY.	**Floor Instructor:** If asked, As **U2 RO** report "2B RN Pump is running properly."
		• Check suction flowpath – AVAILABLE.	
	CRS	(Step 3) Announce occurrence on page.	**NOTE:** CRS may ask U2 RO to make Plant Announcement that AP-20 has been entered. If so, **Floor Instructor** acknowledge as U2 RO.
	BOP	(Step 4) Check any RN pump - ON.	**NOTE:** Both RN Pumps are OFF.
	CRS	(Step 4 RNO) Perform the following:	

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	25 of 59
Event Description:		**1B RN Pump Trip**					

Time	Pos.	Expected Actions/Behavior	Comments
		• IF strainer fouling has not occurred, THEN GO TO Step 7.	**NOTE:** Strainer fouling has NOT occurred, the operating RN Pump has tripped.
	BOP	(Step 7) Place RN train in service as follows:	
		• Check both RN pumps - OFF.	
		• Check RN train – AVAILABLE TO START.	
		• Start one train of RN as follows:	
		• To start 1A RN pump perform the following:	
		• Ensure flowpath available.	
		• Place manual loader for 1RN-89A (RN to A KC Hx Control) to 10% OPEN.	
		• Start 1A RN pump.	**NOTE:** The BOP will start the 1A RN Pump. **NOTE:** The BOP/CRS may dispatch an AO. **Floor/Booth Instructor:** After 5 minutes, as AO, report that the pump is operating normally.
		• Ensure the following valve for train being started – OPEN.	
		• 1RN-86A (A KC Hx Inlet Isol).	
		• Check the following cross-tie valves – OPEN:	
		• 1RN-40A (Train A To Non Ess Hdr Isol)	
		• 1RN-41B (Train B TO Non Ess Hdr Isol)	
		• 1RN-43A (Train B To Non Ess Hdr Isol).	
		• Ensure malfunctioning RN pump is off.	

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	26	of	59
Event Description:	**1B RN Pump Trip**								

Time	Pos.	Expected Actions/Behavior	Comments
		• Check if local venting of RN pump has been performed PER one of the following:	**NOTE:** Local venting of RN pump has NOT been performed.
		• Enclosure 5 (1A RN Pump Venting)	
		OR	
		• Enclosure 6 (1B RN Pump Venting).	
	CRS	(Step 7.f RNO) GO TO Step 7.i.	
	BOP	• (Step 7.i) Check Enclosure 7 (NV Pump Cooling Via Gravity Drain To Sump) – HAS BEEN PERFORMED.	**NOTE:** Enclosure 7 has NOT been performed.
	CRS	(Step 7.i RNO) GO TO Step 7.k.	
	BOP	• (Step 7.k) Check Case II (Loss of Low Level or RC Supply Crossover) – HAS BEEN IMPLEMENTED.	**NOTE:** Case II has NOT been performed.
	CRS	(Step 7.k RNO) GO TO Step 8.	
	BOP	(Step 8) Ensure cooling to KC as follows:	
		• Check 1A KC pump(s) – RUNNING.	**NOTE:** The B Train of KC is operating.
	CRS	(Step 8.a RNO) GO TO Step 8.h.	
	BOP	• (Step 8.h) Check 1B KC pump(s) – RUNNING.	
	BOP	• Ensure 1B KC pumps aligned to reactor bldg non essential header as follows:	
		• OPEN the following valves:	

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	27 of 59
Event Description:	**1B RN Pump Trip**						

Time	Pos.	Expected Actions/Behavior	Comments
		• 1KC-18B (Trn B Rx Bldg Non Ess Ret Isol).	
		• 1KC-228B (Trn B Rx Bldg Non Ess Sup Isol).	
		• CLOSE the following valves:	
		• 1KC-230A (Trn A Rx Bldg Non Ess Sup Isol).	
		• 1KC-3A (Trn A Rx bldg Non Ess Ret Isol).	
	BOP	• Check 1B RN pump – OFF.	
	BOP	• Check 1RN-187B (B KC Hx Inlet Isol) – LOCALLY THROTTLED DURING THIS PROCEDURE.	**NOTE:** 1RN-187B has NOT been locally throttled.
	BOP	(Step 8.k RNO) Perform the following:	
		• IF VI header pressure is less than 60 PSIG, THEN…..	**NOTE:** VI Header pressure is > 60 psi.
		• Place 1RN-187B “MODE SELECT” switch to manual.	
		• OPEN 1RN-187B (B KC Hx Inlet Isol).	
		• THROTTLE 1RN-89A (RN to A KC Hx Control) to maintain 1A RN pump discharge pressure greater than 50 PSIG.	
		• IF 1A RN pump discharge pressure is greater than 50 PSIG, THEN GO TO Step 9.	
	BOP	(Step 9) Maintain RN flow within operating limits as follows:	
		• Check VI header pressure - GREATER THAN 60 PSIG.	**NOTE:** VI Header pressure is > 60 psi.

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	28 of 59
Event Description:	1B RN Pump Trip						

Time	Pos.	Expected Actions/Behavior	Comments
		• Check 1A RN pump - RUNNING.	**NOTE:** If not previously done, the BOP/CRS may dispatch an AO. **Floor/Booth Instructor:** After 5 minutes, as AO, report that the pump is operating normally.
		• THROTTLE 1RN-89A (RN to A KC Hx Control) to maintain 1A RN pump discharge pressure greater than 50 PSIG.	
		• Check 1A RN pump flow – LESS THAN 14,000 GPM.	
		• Check 1B RN pump - RUNNING.	**NOTE:** The 1B RN Pump has tripped.
	CRS	(Step 9.e RNO) GO TO Step 10.	
	BOP/ CRS	(Step 10) Investigate reason for loss of RN train as follows:	
		• Dispatch operator to check RN pump.	**NOTE:** The BOP/CRS will dispatch an AO. **Floor/Booth Instructor:** After 5 minutes, as AO, report that the pump is off and the motor casing is hot to the touch.
		• Dispatch operator to check RN pump breaker.	**NOTE:** The BOP/CRS will dispatch an AO. **Booth Instructor:** After 5 minutes, as AO, report that the 51 Relay on the 1B RN Pump breaker has operated.
		• Check suction flowpath alignment.	

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	29 of 59
Event Description:	**1B RN Pump Trip**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Check discharge flowpath alignment.	**NOTE:** The CRS may call WCC/IAE to address the Pump malfunction. If so, **Booth Instructor** acknowledge as WCC.
	CRS	(Step 11) Ensure Control Room Area Chiller in service PER Enclosure 2 (VC/YC Operation).	**NOTE:** The CRS may assign the **RO** to perform this action, or have the **BOP** perform these actions prior to continuing with Step 11. If actions are performed in parallel, **Appropriate Examiner** follow actions of Enclosure 2. **Other Examiners** follow **AP-20** Actions, **Step 12**, below.
AP/1/A/5500/20, LOSS OF RN ENCLOSURE 2, VC/YC OPERATION			
			Examiner NOTE: Follow the actions associated with Enclosure 3 if RO is assigned by CRS to perform.
	RO/ BOP	(Step 1) Check train selected Control Room Area Chiller – ON.	**NOTE:** The Chiller is expected to be ON. If not, the RO/BOP will take action per the RNO to restart the Chiller.
AP/1/A/5500/20, LOSS OF RN CASE I, LOSS OF OPERATING RN TRAIN			
			Examiner NOTE: Examiners following the **CRS/BOP** continue **HERE.**
	BOP	(Step 12) Align operating train of equipment with running RN pump as follows:	
		• Check 1A RN pump – ON.	
		• Check the following equipment – ON:	

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	30 of 59
Event Description:	**1B RN Pump Trip**						

Time	Pos.	Expected Actions/Behavior	Comments
		• 1A1 and 1A2 KC pumps - ON	
	CRS	(Step 12.b RNO) GO TO Step 12.i	
	BOP	(Step 12.i) Perform one of the following as necessary to align operating RN train with train of equipment cooled by RN:	
		• Swap operating equipment to opposite train as follows:	
		• IF desired to swap KC trains, THEN perform Enclosure 1 (Shifting KC Trains).	
			NOTE: The CRS will transition to Enclosure 1.
AP/1/A/5500/20, LOSS OF RN ENCLOSURE 1, SHIFTING KC TRAINS			
	BOP	(Step 1) Limit KC flow to 4000 GPM per operating KC pump in subsequent steps.	
	BOP	(Step 2) Check the following:	
		• 1RN-40A (Train A To Non Ess Hdr Isol) - OPEN	
		• 1RN-41B (Train B To Non Ess Hdr Isol) - OPEN	
		• 1RN-43A (Train B To Non Ess Hdr Isol) - OPEN	
		• Any KC pump – RUNNING.	**NOTE:** The B Train KC Pumps are operating.
	CRS	(Step 3) GO TO Step 5.	
	BOP	(Step 5) Check both ND pumps - OFF.	
	CRS	(Step 6) Perform the following:	

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	31 of 59
Event Description:	**1B RN Pump Trip**						

Time	Pos.	Expected Actions/Behavior	Comments
		• IF shifting from 1A KC Train to 1B KC Train,…	**NOTE:** The crew will be shifting from 1B KC Train to 1A KC Train.
		OR	
		• IF shifting from 1B KC Train to 1A KC Train, THEN GO TO Step 22.	
	BOP	(Step 22) THROTTLE OPEN 1RN-89A (RN to A KC Hx Control) to establish desired flow to 1A KC Hx, while maintaining 1A RN pump discharge pressure greater than 50 PSIG.	
	BOP	(Step 23) Place control switch for 1KC-51A (Train A Recirc Isol) in the "AUTO" position.	
	BOP	(Step 24) Ensure 1KC-51A OPENS.	
	BOP	(Step 25) Start 1A1 KC pump.	**NOTE:** The BOP/CRS may dispatch an AO. **Floor/Booth Instructor:** After 5 minutes, as AO, report that the KC pumps are operating normally.
	BOP	(Step 26) Start 1A2 KC pump.	
	BOP	(Step 27) Align Reactor Bldg header to 1A Train as follows:	
		• OPEN the following valves:	
		• 1KC-3A (Trn A Rx Bldg Non Ess Ret Isol)	
		• 1KC-230A (Trn A Rx Bldg Non Ess Sup Isol).	
		• CLOSE the following valves:	
		• 1KC-228B (Trn B Rx Bldg non Ess Sup Isol)	

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page 32 of 59
Event Description:	1B RN Pump Trip					

Time	Pos.	Expected Actions/Behavior	Comments
		• 1KC-18B (Trn B Rx Bldg Non Ess Ret Isol).	
	BOP	(Step 28) Check both ND pumps – OFF.	
	BOP	(Step 29) Place 1RN-187B "MODE SELECT" switch to auto.	
	BOP	(Step 30) Check 1RN-187B (B KC Hx Inlet Isol) – CLOSED.	
	BOP	(Step 31) WHEN RN flow through the 1B KC Hx begins to go down, THEN THROTTLE OPEN 1RN-89A (RN to A KC Hx Control) to achieve desired flow rate while maintaining the following:	
		• 1A RN pump discharge pressure - GREATER THAN 50 PSIG	
		• 1A RN pump flow - LESS THAN 14,000 GPM.	
	BOP	(Step 32) Place 1KC-54B (Train B Recirc Isol) in "CLOSE".	
	BOP	(Step 33) Ensure 1KC-54B is CLOSED.	
	BOP	(Step 34) Stop the following pumps:	**NOTE:** The BOP/CRS may dispatch an AO. **Floor/Booth Instructor:** After 5 minutes, as AO, report that the R Train KC pumps shutdown.
		• 1B1 KC pump	
		• 1B2 KC pump.	

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	33 of 59
Event Description:	**1B RN Pump Trip**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 35) Ensure NC pump thermal barrier isolation valves are OPEN.	
	BOP	(Step 36) RETURN TO step in effect in body of this procedure.	
			NOTE: The CRS will return to the main body of AP-20. **Examiner NOTE:** Because there are still AP-related actions to take with this procedure, the CRS may NOT address the TS at the time. Consequently, it may be necessary to move to next event, and address the TS after the scenario.
TECHNICAL SPECIFICATION 3.7.7, NUCLEAR SERVICE WATER SYSTEM			
	CRS	LCO 3.7.7 Two NSWS trains shall be OPERABLE.	
	CRS	APPLICABILITY: MODES 1, 2, 3, and 4.	
	CRS	ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	34 of 59
Event Description:	**1B RN Pump Trip**						

Time	Pos.	Expected Actions/Behavior	Comments
A. One NSWS train inoperable.		Notes: • Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources— Operating," for emergency diesel generator made inoperable by NSWS. • Enter applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops—MODE 4," for residual heat removal loops made inoperable by NSWS. A.1 Restore NSWS train to OPERABLE status.	72 hours
			NOTE: The CRS will determine that Condition A is required and that ACTION A.1 must be taken; and that TS LCO 3.8.1 must be evaluated for the 1B EDG.
TECHNICAL SPECIFICATION 3.8.1, AC SOURCES - OPERATING			
	CRS	3.8.1 AC Source - Operating	
	CRS	LCO 3.8.1 The following AC electrical sources shall be OPERABLE:	
		• Two qualified circuits between the offsite transmission network and the Onsite Essential Auxiliary Power System AND • Two diesel generators (DGs) capable of supplying the Onsite Essential Auxiliary Power Systems AND • The automatic load sequencers for Train A and Train B shall be OPERABLE.	

Op Test No.: N18-1	Scenario # 2	Event # 4	Page 35 of 59
Event Description:	1B RN Pump Trip		

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	APPLICABILITY: MODES 1, 2, 3, and 4.	
	CRS	ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One DG inoperable.	B.1 Perform SR 3.8.1.1 for the offsite circuit(s). AND B.2 Declare required feature(s) supported by the inoperable DG inoperable when its required redundant feature(s) is inoperable. AND B.3.1 Determine OPERABLE DG is not inoperable due to common cause failure. OR B.3.2 Perform SR 3.8.1.2 for OPERABLE DG. AND B.4 Restore DG to OPERABLE status.	1 hour AND Once per 8 hours thereafter 4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s) 24 hours 24 hours 72 hours AND 6 days from discovery of failure to meet LCO

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will determine that Condition B is required and that ACTION B.1, B.2, B3.1 or B.3.2, and B.4 must be taken.
SELECTED LICENSEE COMMITMENT 16.9.9, BORATION SYSTEMS – FLOW PATH (OPERATING)			

Op Test No.:	N18-1	Scenario #	2	Event #	4	Page	36 of 59
Event Description:	**1B RN Pump Trip**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	16.9.9 Boration Systems – Flow Path (Operating)	
	CRS	Commitment Two of the following three boron injection flow paths shall be OPERABLE:	
		• The flow path from a boric acid tank via a boric acid transfer pump and a charging pump to the reactor coolant system, and • Two flow paths from the refueling water storage tank via charging pumps to the reactor coolant system. Note: An OPERABLE charging pump used to satisfy OPERABILITY requirements of one boration flow path may not be used to satisfy OPERABILITY requirements for a second boration flow path.	
	CRS	APPLICABILITY: MODES 1, 2, and 3.	
	CRS	ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required boron injection flow path inoperable.	A.1 Restore the required boron injection flow path to OPERABLE status.	72 hours

			NOTE: The CRS will determine that Condition A is required and that ACTION A.1 must be taken.

At the discretion of the Lead Examiner, move to Event #5.

Op Test No.:	N18-1	Scenario #	2	Event #	5	Page	37 of 59
Event Description:	**SG 1D FCV Controller fails to MANUAL/FCV Bypass Valve fails fully OPEN**						

Next, the 1D SG FCV Controller will fail to MANUAL and the FCV Bypass valve will fail fully open resulting in the Feedwater Control Valve for the 1D SG closing and causing SG Level to lower. The operator will respond in accordance with AP/1/A/5500/06, “S/G Feedwater Malfunction,” and control the 1D SG Level manually.

Booth Operator Instructions:

Insert MAL-DCSSLIM21G BUTTON_ DEPRESSED
Delete 1A MAL-DCSSLIM21G = 2
Insert MAL-DCSSLIM21E BUTTON_DEPRESSED
Delete 1A MAL-DCSSLIM21E = 2
Insert REM-CF0106AB = 1

Indications Available:

- DCS Computer Alarm: S/G D FCV IN MANUAL MODE
- 1D SG Feed Flow rises
- 1D FCV starts to open
- 1D FCV Bypass Valve fully opens

Time	Pos.	Expected Actions/Behavior	Comments
		AP/1/A/5500/06, S/G FEEDWATER MALFUNCTION	
	RO	(Step 1) Check all CF control and bypass valves – OPERATING PROPERLY.	**NOTE:** The 1D FCV is NOT operating properly in AUTO.
	RO	(Step 1 RNO) IF valve has failed, THEN perform the following:	**NOTE:** The RO will place the 1D FCV in MANUAL and restore level to program.
		• Place affected valve(s) in manual.	
		• Restore S/G level to program.	
		• IF CF control bypass valve has failed closed…..	**NOTE:** The 1D FCV Bypass Valve has fully opened.

Op Test No.: N18-1	Scenario # 2	Event # 5	Page 38 of 59
Event Description:	**SG 1D FCV Controller fails to MANUAL/FCV Bypass Valve fails fully OPEN**		

Time	Pos.	Expected Actions/Behavior	Comments
Critical Task: **After a failure of the 1D SG FCV Controller in AUTO, manually control and stabilize the 1D SG Narrow Level before an automatic Reactor Protection System actuation occurs.** Safety Significance: failure to manually control and stabilize the SG Narrow Level before a Reactor Protection System actuation occurs, under the postulated plant conditions, results in an unnecessary transient to the plant and challenge to the Reactor Protection System. Performance of the critical task would stabilize the SG Narrow Level. A failure to stabilize the SG Narrow Range Level, when able to do so, constitutes a mis-operation or incorrect performance which could lead to incorrect NCS temperature control and an unnecessary challenge to the NCS Heat Sink Critical Safety Function.			
	RO	(Step 2) Check both CF pumps – OPERATING PROPERLY.	
	RO	(Step 3) Check unit status as follows:	
		• Reactor trip breakers - CLOSED	
		• Pzr pressure – GREATER THAN P-11 (1955 PSIG).	
	CRS	(Step 4) IF AT ANY TIME S/G N/R level approaches 17% OR 83%, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Trip reactor	
		• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	
	CRS	(Step 5) Announce occurrence on page.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 6) Check reactor power – GREATER THAN 3%.	

Op Test No.:	N18-1	Scenario #	2	Event #	5	Page	39 of 59
Event Description:	**SG 1D FCV Controller fails to MANUAL/FCV Bypass Valve fails fully OPEN**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 7) Check CM/CF – PRESENTLY FEEDING S/Gs.	
NOTE W/R S/G level indication will indicate changes in actual level trends before N/R level.			
	RO	(Step 8) Check S/G levels – STABLE OR TRENDING TO PROGRAM LEVEL.	
	RO	(Step 9) Check NC temperature as follows:	
		• IF any NC pump on, THEN check NC T-Avg – STABLE OR TRENDING TO DESIRED TEMPERATURE.	
	RO	(Step 10) Check all S/G CF control valves – IN AUTO.	**NOTE:** The 1D FCV will be in MANUAL.
	CRS	(Step 10 RNO) Perform the following:	
		• IF CF control valve has failed AND will not respond in manual, THEN……	**NOTE:** The 1D FCV will respond in MANUAL.
		• WHEN automatic control desired AND affected S/G level(s) at program level, THEN place affected CF control valve(s) in automatic.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	RO	(Step 11) Check all S/G CF control bypass valves – IN AUTO.	**NOTE:** Although failed OPEN, the 1D FCV Bypass Valve is likely in AUTO. If the RO places the valve in MANUAL, the RNO may be attempted, however, the valve will NOT move from the OPEN position.
	RO	(Step 12) Check the following on running CF pumps:	

Op Test No.: N18-1	Scenario # 2	Event # 5	Page 40 of 59

Event Description: **SG 1D FCV Controller fails to MANUAL/FCV Bypass Valve fails fully OPEN**

Time	Pos.	Expected Actions/Behavior	Comments
		• On DCS workstation, Feedpump Overview graphic, check "AUTO" (located below "AUTO/SPD" select button on running CF pump(s)) - INDICATED	
		• CF pump low pressure governor control - • IN AUTO	
		• CF pump high pressure governor control • - IN AUTO.	
	RO	(Step 13) Check all CA pumps - OFF.	
			NOTE: The CRS may call WCC/IAE to address the failed controller. If so, **Booth Instructor** acknowledge as WCC.
			NOTE: The CRS will likely conduct a Focus Brief.
At the discretion of the Lead Examiner move to Events #6-7.			

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	41 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

After this, a catastrophic Feedline Break will occur on the 1D Main Feedline inside the Containment. The operator will enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection." Simultaneously the Feedwater Isolation Signal will fail to automatically actuate. The operator will need to take manual action to isolate the Main Feedwater System to the SGs. Upon completion of E-0, the operator will transition to EP/1/A/5000/E-2, "Faulted Steam Generator Isolation," to isolate the flow into and out of the 1D Steam Generator. The operator will then transition to EP/1/A/5000/ES-1.1, "Safety Injection Termination." The scenario will terminate at Step 8.a of ES-1.1, after the crew has established charging flow and is attempting to stabilize Pressurizer Level.

Booth Operator Instructions: **insert MAL-CF004D = 2.2E+7**

Indications Available:

- Containment pressure rises to > 1 psig
- Automatic Rx Trip occurs
- Automatic Safety Injection occurs

Time	Pos.	Expected Actions/Behavior	Comments
		EP/1/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION	
	RO/ BOP	(Step 1) Monitor Foldout page.	**NOTE:** Crew will carry out Immediate Actions of E-0, prior to the CRS addressing the EP.
		NC Pump Trip Criteria (Not expected)	
		CA Suction Sources (CA storage tank (water tower) goes below 1.5 ft – Not expected)	
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	**NOTE:** The BOP will monitor these conditions.
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	
		Ruptured S/G Aux Feedwater Isolation Criteria (Not expected)	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	42 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

Time	Pos.	Expected Actions/Behavior	Comments
		Faulted S/G Aux Feedwater Isolation Criteria (Expected)	**NOTE:** The BOP will monitor these conditions, and isolate CA flow to the 1D SG when met.
		• IF all of the following conditions met, THEN stop CA flow to affected S/G:	
		• S/G pressure going down in an uncontrolled manner or completely depressurized	
		• Only one S/G is diagnosed as faulted	
		• Secondary heat sink:	
		• N/R level in at least one S/G - GREATER THAN 11%(32% ACC)	
		OR	
		• Total feed flow to S/Gs - GREATER THAN 450 GPM.	
	RO	(Step 2) Check Reactor Trip:	**Immediate Action**
		• All rod bottom lights – LIT	
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 3) Check Turbine Trip:	**Immediate Action**
		• All throttle valves – CLOSED.	
	BOP	(Step 4) Check 1ETA and 1ETB – ENERGIZED.	**Immediate Action**
	RO/ BOP	(Step 5) Check if S/I is actuated:	**Immediate Action**
		• “SAFETY INJECTION ACTUATED” status light (1SI-18) – LIT.	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	43 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Both LOCA Sequencer Actuated status lights (1SI-14) – LIT.	
	CRS	(Step 6) Announce “Unit 1 Safety Injection”.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement that a U1 Safety Injection has occurred. If so, **Floor Instructor** acknowledge as U2 RO.
	BOP	(Step 7) Check all Feed water Isolation status lights (1SI-4) – LIT.	**NOTE:** FWIS has failed to AUTO Actuate.
	RO/ BOP	(Step 7 RNO) Initiate Feedwater Isolation.	
	BOP	(Step 8) Check Phase A “RESET” lights – DARK.	
	BOP	(Step 9) Check ESF Monitor Light Panel on Energized train(s):	
		• Groups 1, 2, 5 – DARK.	
		• Group 3 – LIT.	
		• Group 4 – LIT AS REQUIRED.	
		• Group 6 – LIT.	
	CRS	• GO TO Step 10.	
	RO	(Step 10) Check proper CA pump status:	
		• MD CA pumps – ON.	
		• N/R level in at least 3 S/Gs – GREATER THAN 17%.	
	BOP	(Step 11) Check all KC pumps – ON.	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	44 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 12) Check both RN pumps – ON.	**NOTE:** The 1B RN Pump has previously failed.
	BOP	(Step 12 RNO) Perform the following:	
		• Start pump(s).	**NOTE:** The 1B RN Pump cannot be started.
		• IF any RN pump off, THEN perform the following:	
		• IF 1A RN pump is off, THEN …...	**NOTE:** The 1A RN Pump is running.
		• IF affected train is deenergized, AND its D/G is off, THEN…..	**NOTE:** The 1B EDG is running.
		• Reset the following on affected train:	
		• S/I.	
		• Sequencer.	
		• Dispatch operator to stop affected D/G using emergency stop pushbutton.	**NOTE:** The CRS will dispatch an AO. **Floor/Booth Instructor: Acknowledge** as **AO** and after **two minutes insert OVR-XDGB_047_1=1.**
		• Monitor affected RN cooled components and shut down as necessary.	
	CRS	(Step 13) Notify Unit 2 to perform the following:	**Floor Instructor:** As U2 RO report "2A RN Pump is running."
		• Start 2A RN pump.	
		• THROTTLE Unit 2 RN flow to minimum for existing plant condition.	**Booth Instructor:** **insert LOA-RN087 (Start 2A RN Pump)** **insert LOA-RN083 8050.000000 delay=0 ramp=10 (Unit 2 Train A Demand Flow)**

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	45 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 14) Check all S/G pressures – GREATER THAN 775 PSIG.	
	RO	(Step 14 RNO) Perform the following:	**NOTE:** 1D SG Pressure is decreasing uncontrollably.
		• Check the following valves closed:	
		• All MSIVs	
		• All MSIV Bypass Valves	
		• All SM PORVs	
		• If any valve open,…..	**NOTE:** All valves are CLOSED.
	RO/ BOP	(Step 15) Check containment pressure – HAS REMAINED LESS THAN 3 PSIG.	**NOTE:** Containment Pressure is > 3 psig.
	BOP	(Step 15 RNO) Perform the following:	
		• Check Monitor Light Panel Group 7 lit.	
		• IF Group 7 window is dark on energized train(s)…	**NOTE:** Group 7 status lights are LIT.
		• Stop all NC pumps while maintaining seal injection flow.	
		• Ensure all RV pumps are in manual and off.	
		• Energize H_2 Igniters by depressing “ON” and “OVERRIDE”.	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	46 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	• Dispatch operator to stop all Unit 1 NF AHUs PER EP/1/A/5000/G-1 (Generic Enclosures) Enclosure 28 (De-energizing Ice Condenser AHUs).	**NOTE:** The CRS will dispatch AO. **Floor/Booth Instructor:** Acknowledge as appropriate. **Booth Instructor:** **insert LOA-NF016 STOP (Ice Condenser AHU Start/Stop)** And then, report as AO that **breakers are closed**.
	BOP	• WHEN time allows, THEN check Phase B HVAC equipment PER Enclosure 2 (Phase B HVAC Equipment).	**NOTE:** The CRS may ask U2 BOP to address. If so, **Floor Instructor** acknowledge as U2 BOP. **Examiner NOTE:** The CRS may assign the RO (BOP) to perform this action. If so, **RO (BOP) Examiner** follow actions of Enclosure 2. **Other Examiners** follow **E-0** Actions, **Step 16**, on **Page 47**.
E-0, REACTOR TRIP OR SAFETY INJECTION ENCLOSURE 2, PHASE B HVAC EQUIPMENT			
			Examiner NOTE: Follow the actions associated with Enclosure 2 if RO (BOP) is assigned by CRS to perform.
	RO/ BOP	(Step 1) Check VE System in operation as follows:	
		• VE Fans - ON.	
		• Ensure all damper mode select switches in "AUTO":	
		• 1AVS-D-7 Mode Select	
		• 1AVS-D-8 Mode Select	
		• 1AVS-D-2 Mode Select	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	47	of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**							

Time	Pos.	Expected Actions/Behavior	Comments
		• 1AVS-D-3 Mode Select	
		• Annulus pressure being maintained - NEGATIVE.	
	RO/ BOP	(Step 2) Check VX System in operation as follows:	
		• Time since Phase B actuation - GREATER THAN 10 MINUTES.	**NOTE:** It is likely that 10 minutes has NOT elapsed since the Phase B actuation.
	RO/ BOP	(Step 2 RNO) WHEN 10 minutes has expired, THEN perform rest of this enclosure.	
	RO/ BOP	(Step 2.b) Check the following dampers - OPEN:	
		• 1RAF-D-4 (1B Cont Air Ret Fan To Lwr Cont Test A)	
		• 1VX-2B (1B H2 Skimmer Fan Isol Test A)	
		• 1RAF-D-2 (1A Cont Air Ret Fan To Lwr Cont Test A)	
		• 1VX-1A (1A H2 Skimmer Fan Isol Test A).	
	RO/ BOP	(Step 2.c) Check Containment Air Return fans - ON	
	RO/ BOP	(Step 2.d) Check H_2 Skimmer fans - ON.	
E-0, REACTOR TRIP OR SAFETY INJECTION			
			Examiner NOTE: Examiners following the **CRS/BOP (RO)** continue **HERE**.
	BOP	(Step 16) Check S/I flow:	
		• Check “NV PMPS TO COLD LEG FLOW” gauge – INDICATING FLOW.	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	48 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Check NC pressure – LESS THAN 1600 PSIG.	
	BOP	(Step 16.b RNO) Perform the following:	
		• Ensure ND pump miniflow valve on running pump(s) OPEN:	
		• 1ND-68A (1A ND Pump & Hx Mini Flow Isol)	
		• 1ND-67B (1B ND Pump & Hx Mini Flow Isol).	
	CRS	• IF valve(s) open on all running ND pumps, THEN GO TO Step 17.	
	CRS	(Step 17) Notify OSM or other SRO to perform EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 22 (Shift Manager Actions Following an S/I) within 10 minutes.	**NOTE:** The CRS may ask OSM to address. If so, **Floor Instructor** acknowledge as OSM.
	RO/ BOP	(Step 18) Check CA flow:	
		• Total CA flow – GREATER THAN 450 GPM.	
	BOP	• Check VI header pressure – GREATER THAN 60 PSIG.	
	RO	• WHEN each S/G N/R level is greater than 11% (32% ACC), THEN control CA flow to maintain that S/G N/R level between 11% (32% ACC) and 50%.	**NOTE:** Adverse Containment numbers will need to be used. **NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	RO	(Step 19) Check NC temperatures:	
		• IF all NC pumps off, THEN check NC T-Colds – STABLE OR TRENDING TO 557°F.	**NOTE:** All NC Pumps will be OFF.
		OR	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	49 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

Time	Pos.	Expected Actions/Behavior	Comments
		• IF all NC pumps off, THEN check NC T-Colds - STABLE OR TRENDING TO 557°F.	
		(Step 19 RNO) Perform the following based on plant conditions:	
		• IF temperature less than 557°F AND going down, THEN attempt to stop cooldown PER Enclosure 3 (Uncontrolled NC System Cooldown).	**Examiner NOTE:** The CRS may assign the RO to perform this action. If so, **RO Examiner** follow actions of **Enclosure 3**. **Others** should move ahead to Step 20 on **Page 50** to continue in E-0.
E-0, REACTOR TRIP OR SAFETY INJECTION **ENCLOSURE 3, UNCONTROLLED NC SYSTEM COOLDOWN**			
	RO	(Step 1) Check steam dump valves – CLOSED.	**Examiner NOTE:** Follow the actions associated with Enclosure 3 if RO is assigned by CRS to perform.
	RO	(Step 2) Check all SM PORVs – CLOSED.	
	RO	(Step 3) Check MSR "RESET" light – LIT.	
	RO	(Step 4) Check any NC pump – ON.	**NOTE:** All NC Pumps will be OFF.
	RO	(Step 4 RNO) Perform the following:	
		• IF any NC T-Cold is still going down, THEN GO TO Step 6.	
		• IF cooldown stopped, THEN exit this enclosure.	
	RO	(Step 6) Control feed flow as follows:	

Op Test No.: N18-1	Scenario # 2	Event # 6 & 7	Page 50 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**		

Time	Pos.	Expected Actions/Behavior	Comments
		• IF S/G N/R level is less than 11% (32% ACC) in all S/Gs, THEN THROTTLE feed flow to achieve the following:	**NOTE:** Adverse Containment numbers will need to be used.
		• Minimize cooldown	
		• Maintain total feed flow greater than 450 GPM.	
		• WHEN N/R level is greater than 11% (32% ACC) in at least one S/G, THEN THROTTLE feed flow further to:	**NOTE:** Adverse Containment numbers will need to be used.
		• Minimize cooldown	
		• Maintain at least one S/G N/R level greater than 11% (32% ACC).	**NOTE:** The RO may stop feed flow to 1D SG.
	RO	(Step 7) Check MSIVs – ANY OPEN.	**NOTE:** All MSIVs will be closed.
	RO	(Step 7 RNO) Perform the following:	
		• Close MSIV bypass valves.	
		• Exit this enclosure.	
E-0, REACTOR TRIP OR SAFETY INJECTION			
			Examiner NOTE: Examiners NOT following RO actions in Enclosure 3, continue **HERE**.
	BOP	(Step 20) Check Pzr PORV and spray valves:	
		• All Pzr PORVs – CLOSED.	**NOTE:** With VI isolated to the Containment, the Pzr Safety Valves may be lifting.
		• Normal Pzr spray valves – CLOSED.	
		• At least one Pzr PORV isolation valve – OPEN.	

Op Test No.: N18-1	Scenario # 2	Event # 6 & 7	Page 51 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 21) Check NC subcooling based on core exit T/Cs – GREATER THAN 0°F.	
	BOP	(Step 22) Check if main steamlines intact:	
		• All S/G pressures – STABLE OR GOING UP	**NOTE:** The 1D SG is Faulted.
		• All S/Gs – PRESSURIZED.	
	BOP	(Step 22 RNO) IF any S/G is faulted, THEN perform the following:	
	CRS	• Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
	CRS	• GO TO EP/1/A/5000/E-2 (Faulted Steam Generator Isolation).	
			NOTE: The CRS will transition to E-2.
EP/1/A/5000/E-2, FAULTED STEAM GENERATOR ISOLATION			
	RO/ BOP	(Step 1) Monitor Foldout page.	
		Cold Leg Switchover Criteria (< 95 INCHES in FWST – Not expected)	
		CA Suction Sources (<1.5 feet – Not expected)	
		Position Criteria for 1NV-150B and 1NV-151A (NV Pumps Recirculation)	
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	**NOTE:** The BOP will monitor these conditions.
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	52 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 2) Maintain any faulted S/G or secondary break isolated during subsequent recovery actions unless needed for NC System cooldown.	
	RO	(Step 3) Check the following – CLOSED:	
		• All MSIVs	
		• All MSIV bypass valves.	
	RO	(Step 4) Check at least one S/G pressure – STABLE OR GOING UP.	**NOTE:** Although all SG pressures may be decreasing slowly, the operator will report stable based on plant conditions (i.e. faulted SG). Otherwise a transition to ECA-2.1 will be made.
	RO/ BOP	(Step 5) Identify faulted S/G(s):	**NOTE:** The 1D SG is Faulted.
		• Any S/G pressure – GOING DOWN IN AN UNCONTROLLED MANNER	
		OR	
		• Any S/G – DEPRESSURIZED.	
	RO	(Step 6) Maintain at least one S/G available for NC System cooldown in subsequent steps.	
	RO	(Step 7) Check faulted S/G(s) SM PORV – CLOSED.	
	BOP	(Step 8) Reset CA modulating valves.	
	RO/ BOP	(Step 9) Isolate faulted S/G(s) as follows:	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	53 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

Time	Pos.	Expected Actions/Behavior	Comments
		• For 1D S/G:	
		• Check "S/G D FDW ISOLATED" status light (1SI-4) – LIT.	**NOTE:** The 1D FCV Bypass Valve is still OPEN.
	RO/ BOP	(Step 9.d.1 RNO) Perform the following:	
		• Ensure the following valve(s) - CLOSED:	
		• CLOSE 1CF-26AB (1D S/G CF Cont Outside Isol).	
		• CLOSE 1CF-17AB (1D S/G CF Control).	
		• CLOSE 1CF-107AB (1D S/G CF Control Bypass).	
		• CLOSE 1CF-129B (1D S/G CF To CA Nozzle Isol).	
		• IF more than one Feedwater Isolation valve above is open, AND…….	
	RO/ BOP	• (Step 9.d.2) CLOSE 1CA-38B (U1 TD CA Pump Disch To 1D S/G Isol).	
		• CLOSE 1CA-42B (1B CA Pump Disch To 1D S/G Isol).	
		• Check BB valves – CLOSED:	
		• 1BB-4B (1D S/G Blowdown Cont Outside Isol Control).	
		• 1BB-8A (D S/G BB Cont Inside Isol).	
		• Close 1SM-101 (D SM Line Drain Isol).	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	54	of	59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**								

Time	Pos.	Expected Actions/Behavior	Comments
Critical Task: **Isolate AFW flow and main feed flow to the 1D SG; and manually close the 1D MSIV before transition out of E-2.** Safety Significance: Failure to isolate a Faulted SG that can be isolated causes challenges to the Critical Safety Functions that would not otherwise occur. Failure to isolate flow could result in an unwarranted Orange or Red Path condition on NC Integrity and/or Subcriticality (if cooldown is allowed to continue uncontrollably).			
	RO	(Step 10) Close 1AS-12 (U1 SM To AS Hdr Control Inlet Isol).	
	RO/ BOP	(Step 11) Check S/G tubes intact as follows:	
		• Check the following EMF's – NORMAL:	
		• 1EMF-33 (Condenser Air Ejector Exhaust)	
		• 1EMF-24 (S/G A)	
		• 1EMF-25 (S/G B)	
		• 1EMF-26 (S/G C)	
		• 1EMF-27 (S/G D).	
		• IF any S/G has previously been identified as ruptured…..	**NOTE:** There have been no SGTRs identified.
		• Notify RP to perform the following:	**NOTE:** The CRS may call RP to perform surveys. If so, **Booth Instructor** acknowledge as RP.
		• IF S/G(s) fault known to be outside containment, THEN monitor area of steam fault for radiation.	
		• Frisk all Unit 1 S/G cation columns to determine if activity level is significantly higher for any S/G.	
		• Notify Control Room of any abnormal radiation conditions.	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	55	of	59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**								

Time	Pos.	Expected Actions/Behavior	Comments
		• WHEN activity results reported, THEN notify station management to evaluate S/G activity.	
	RO/ BOP	(Step 12) Check S/I termination criteria:	
		• NC subcooling based on core exit T/Cs – GREATER THAN 0°F.	
		• Secondary heat sink:	
		• N/R level in at least one intact S/G – GREATER THAN 11% (32% ACC)	**NOTE:** Adverse Containment numbers will need to be used.
		OR	
		• Total feed flow to intact S/Gs – GREATER THAN 450 GPM.	
		• NC pressure – STABLE OR GOING UP.	
		• Pzr level – GREATER THAN 11% (29% ACC).	**NOTE:** Adverse Containment numbers will need to be used.
	CRS	(Step 12.d RNO) GO TO Step 13.	**Examiner NOTE:** Because of the Adverse Containment condition, the crew may NOT meet the Pzr Level threshold to terminate SI. If **NOT**, the crew will go to **E-1**, continue to refill the PZR, and will transition to ES-1.1.
	CRS	(Step 12.e) GO TO EP/1/A/5000/ES-1.1 (Safety Injection Termination).	**NOTE:** The crew may NOT meet the Pzr Level threshold to terminate SI. If so, the CRS will transition to E-1, and then ES-1.1 (Either directly at Step 7.e or based on Continuous Action Step 7.f) when the SI Termination criteria are met.

Op Test No.: N18-1	Scenario # 2	Event # 6 & 7	Page 56 of 59				
Event Description:	1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE						

Time	Pos.	Expected Actions/Behavior	Comments
EP/1/A/5000/ES-1.1, SAFETY INJECTION TERMINATION			
	RO/ BOP	(Step 1) Monitor Foldout page.	
		S/I Reinitiation Criteria (Applies after Step 10 in body of this procedure) (Not expected)	
		Secondary Integrity Criteria (Not expected)	
		Cold Leg Switchover Criteria (< 95 INCHES in FWST – Not expected)	
		CA Suction Sources (<1.5 feet – Not expected)	
	BOP	(Step 2) Reset the following:	
		• S/I.	
		• Sequencers.	
		• Phase A Isolation.	
		• Phase B Isolation.	
		• IF AT ANY TIME a B/O signal occurs, THEN restart S/I equipment previously on.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	BOP	(Step 3) Establish VI to containment as follows:	
		• Open the following valves:	
		• 1VI-129B (VI Supply to A Cont Ess VI Hdr Outside Isol)	
		• 1VI-160B (VI Supply to B Cont Ess Hdr Outside Isol)	
		• 1VI-150B (Lwr Cont Non-Ess Cont Outside Isol).	
		• Check VI header pressure – GREATER THAN 85 PSIG.	
	BOP	(Step 4) Stop all but one NV pump.	

Op Test No.:	N18-1	Scenario #	2	Event #	6 & 7	Page	57 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 5 Check NC pressure – STABLE OR GOING UP.	
	BOP	(Step 6) Isolate NV S/I flowpath as follows:	
		• Check the following valves – OPEN:	
		• 1NV-221A (U1 NV Pumps Suct From FWST Isol)	
		• 1NV-222B (U1 NV Pumps Suct From FWST Isol)	
		• Check the following valves - OPEN	**NOTE:** Both valves are open.
		• 1NV-150B (U1 NV Pump Recirc Isol)	
		• 1NV-151A (U1 NV Pump Recirc Isol).	
	BOP	• CLOSE the following valves:	
		• 1NI-9A (NC Cold Leg Inj From NV)	
		• 1NI-10B (NC Cold Leg Inj From NV).	
	BOP	(Step 7) Establish charging as follows:	
		• Check NC pump seal injection flow - GREATER THAN OR EQUAL TO 6 GPM TO EACH NC PUMP.	
		• Check VI header pressure - GREATER THAN 60 PSIG.	
		• THROTTLE 1NV-238 (U1 Charging Hdr Control) to maintain 6-10 GPM seal injection flow to each NC pump.	
		• CLOSE 1NV-241 (U1 Seal Water Inj Flow Control).	
		• Check one of the following valves - OPEN:	
		• 1NV-13B (U1 NV Supply To 1A NC Loop Isol)	
		OR	

Op Test No.: N18-1	Scenario # 2	Event # 6 & 7	Page 58 of 59
Event Description:	**1D Feedline Break in Containment/FWIS fails to AUTO ACTUATE**		

Time	Pos.	Expected Actions/Behavior	Comments
		• 1NV-16A (U1 NV Supply To 1D NC Loop Isol).	
		• Check 1NV-21A (U1 NV Supply to U1 Aux PZR Spray Isol) - CLOSED.	
		• OPEN the following valves:	
		• 1NV-244A (U1 Charging Hdr Cont Outside Isol)	
		• 1NV-245B (U1 Charging Hdr Cont Outside Isol).	
		• WHEN controlling NV flow in subsequent steps, THEN maintain flow within the following limits while THROTTLING charging and seal injection control valves:	
		• Charging flow - LESS THAN 200 GPM	
		• Seal injection flow to each NC pump - 6-10 GPM.	
	BOP	(Step 8.a) Control charging flow as follows:	
		• Control charging flow as required to maintain Pzr level stable.	
At the discretion of the Lead Examiner terminate the exam.			

UNIT 1 STATUS:

Power Level: 75%   NCS [B] 1061 ppm   Pzr [B]: 1061 ppm   Xe: Per OAC

Power History: At this power level for 24 hours   Core Burnup: 251 EFPDs

UNIT 2 STATUS:

Power Level: 100%

CONTROLLING PROCEDURE: OP/1/A/6100/003 Controlling Procedure for Unit Operation

OTHER INFORMATION NEEDED TO ASSUME THE SHIFT:

- The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift.

The following equipment is Out-Of-Service:

- The 1B NS Pump is OOS due to a Main Breaker failure. ACTION has been taken in accordance with Technical Specification LCO 3.6.6 ACTION A.1.
- CAP-5320, CA Condensate Storage Tank Level Indicator, failed last shift (IAE is investigating.
- MCB Annunciator 1AD-10, B-1, “NCDT HX OUTLET HI FLO,” has failed ILLUMINATED (IAE is investigating).

Crew Directions:

- The crew will raise power to 100% after taking the shift, starting from Step 3.36.11 of Enclosure 4.1 of OP/1/A/6100/003.
- Raise power at 2MWe/minute.
- The RE recommends 100% Control Rod position of 216 steps on Control Bank D.
- The RE recommends that the BOP perform a 400 gallon Dilute to initiate the power increase.
- RMWST Dissolved O_2 is greater than 1000 ppb.
- Blender content is Reactor Makeup Water.

Work Control SRO/Offsite Communicator   **Jim**

Plant SRO   **Joe (FB)**

AO's AVAILABLE

Unit 1	**Unit 2**
Aux Bldg. John	**Aux Bldg. Chris**
Turb Bldg. Bob (FB)	**Turb Bldg. Mike (FB)**
5th Rounds. Carol	

Extra(s)   Bill (FB)   Ed (FB)   Wayne (FB)   Tanya   Gus (RW)

Facility: **McGuire**	Scenario No.: **3**	Op Test No.: **N18-1**	
Examiners: ____________		Operators: ____________	(SRO)
____________		____________	(RO)
____________		____________	(BOP)

Initial Conditions:	The plant is at 55% power (BOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.
Turnover:	The following equipment is Out-Of-Service: The 1B ND Pump is OOS due to an oil leak. ACTION has been taken in accordance with Technical Specification LCO 3.5.2 ACTION A.1. 1EMF46A, Train A KC Radiation Monitor, failed last shift (IAE is investigating) and MCB Annunciator 1AD-12, C-3, "A RN PUMP SUCTION LO PRESS," will not ILLUMINATE (IAE is investigating). It is planned to raise power on this shift to 100%.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	R-RO N-BOP N(TS)-SRO	Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low
2	MALF IRE006H8	C-RO C(TS)-SRO	Dropped Control Rod (H-8)
3	XMT LF TSI4-6, 8 & 4	C-BOP C-SRO	1A Feedpump Hi Vibrations
4	REM NV0035A	C-BOP C-SRO	Letdown Valve 1NV-35A fails CLOSED
5	MALF IRE006M4	C-RO C-SRO	2nd Dropped Control Rod (M-4)
6	REM NC0034A MALF NC002B	M-RO M-BOP M-SRO	Pzr PORV 1NC-34A fails OPEN/Block Valve fails OPEN
7	MAL DEH003A	C-RO C-SRO	Turbine fails to Automatically Trip
8	MAL NI009AB NI001A/B ND012A	C-BOP C-SRO	SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips
9	DEL REM NC0034A	NA	Pzr PORV 1NC-34A reseats

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2018 NRC Scenario #3

The plant is at 55% power (BOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.

The following equipment is Out-Of-Service: The 1B ND Pump is OOS due to an oil leak. ACTION has been taken in accordance with Technical Specification LCO 3.5.2 ACTION A.1. 1EMF46A, Train A KC Radiation Monitor, failed last shift (IAE is investigating) and MCB Annunciator 1AD-12, C-3, "A RN PUMP SUCTION LO PRESS," will not ILLUMINATE (IAE is investigating). It is planned to raise power on this shift to 100%.

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.36.10 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation." The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.4, "Alternate Dilute," of OP/1/A/6150/009, "Boron Concentration Control," and raise Turbine load in accordance with OP/1/A/6300/001 A, "Turbine-Generator Load Change." During the power increase, Chemistry will call and report the results of a periodic sample of the Spent Fuel Boron concentration. The operator will address Technical Specification LCO 3.7.14, "Spent Fuel Pool Boron Concentration."

During the power increase, one Control Bank D Control Rod will drop into the core. The operator will respond in accordance with ARP1AD-2/D-9, "RPI at Bottom Rod Drop" and will implement AP/1/A/5500/14, "Rod Control Malfunction." The operator will address Technical Specification LCO 3.1.4, "Rod Group Alignment Limits." IAE will determine that manual rod movement is available. Because Xenon is building-in, the operator will need to manually adjust control rod position throughout the remainder of the scenario, to maintain Tavg-Tref within the allowable band.

Subsequently, the 1A CF pump will develop high vibrations on its shaft bearings. The operator will use Enclosure 4.3, "CF Pump(s) Shutdown," of OP/1/A/6250/001, "Condensate and Feedwater System," to remove the pump from service.

When the 1A CF Pump is tripped and power is stabilized, 1NV-35, Variable Flow Letdown Orifice Isolation Valve, will fail Closed. The operator will enter AP/1/A/5500/12, "Loss of Letdown, Charging or Seal Injection," and establish Excess Letdown.

When the plant is stabilized, a second Control Rod will drop into the core. The operator will re-enter AP-14, manually trip the reactor, and go to EP/1/A/5000/E-0, "Reactor Trip or Safety Injection."

On the reactor trip, the turbine will fail to automatically trip, requiring the operator to manually trip the turbine. Additionally, Pressurizer PORV 1NC-34A will open and stick fully open. When the operator attempts to close the Block Valve, the Block Valve will fail to move.

The operator will perform the Immediate Actions of EP/1/A/5000/E-0, "Reactor Trip or Safety Injection." Eventually Safety Injection (SI) will actuate, however, NC Cold Leg Injection Valves from NV, 1NI-9/10, will fail to automatically open; and the operator will need to manually open at least one of these valves. Additionally, both the 1A and 1B NI Pumps will fail to automatically start and the operator will need to manually start these pumps. Finally, the 1A ND Pump will trip.

At the E-0 Step 20.a RNO, when the operator aligns nitrogen to Pressurizer PORV 1NC-34A, the valve will re-seat. The operator will continue in E-0 until an SI reduction is initiated. Eventually, the

operator will transition to Step 9 of EP/1/A/5000/ES-1.1, “Safety Injection Termination,” and complete the SI termination.

The scenario will terminate at Step 14.I of ES-1.1 when the operator determines that Excess Letdown must be established.

Critical Tasks:

Trip the Reactor within 60 Seconds of the second dropped rod.

Safety Significance: Multiple dropped control rods are a significant reactivity transient that can have a serious effect on plant parameters under certain operating conditions, and may result in power distribution limits being exceeded. According to Technical Specification LCO 3.1.4 Bases, if more than one rod is found to be misaligned, the unit conditions fall outside of the accident analysis assumptions. The guidance to trip the reactor is a conservative action to prevent the plant form challenging the Pzr low pressure trip setpoint, etc.; and is consistent with the conservative nature of the industry. PT/0/A/4600/113, Enclosure 13.18 states that it is a management expectation that the operator trip the reactor within 30 seconds of a second dropped rod if the plant is stable and 1 minute if the plant is in a transient. The Transient Limit is applied in this situation since in the past 60-90 minutes the plant has undergone a controlled up-power, and three malfunctions requiring the implementation of an AOP or removal from operation of large components.

Close the failed open PORV before exiting E-0.

Safety Significance: Failure to close a failed Pzr PORV using the nitrogen supply system in the Step 20 of E-0, when able to do so, when coupled with a failure of Safety Injection to automatically actuate, constitutes a degraded fission product barrier that would not have otherwise occurred if the task were performed correctly (Performance of the task will effectively stop the on-going LOCA). The inaction by the operator constitutes a significant reduction of safety margin beyond that irreparably introduced by the scenario.

PROGRAM: McGuire Operations Training

MODULE: Initial License Operator Training Class ILT 18-1

TOPIC: NRC Simulator Exam

Scenario N18-1-3

REFERENCES:

1. Technical Specification LCO 3.5.2, “ECCS-Operating” (Amendment 282/261)
2. OP/1/A/6100/003, “Controlling Procedure for Unit Operation” (Rev 201)
3. OP/1/A/6150/009, “Boron Concentration Control” (Rev 134)
4. OP/1/A/6300/001 A, “Turbine-Generator Load Change” (Rev 13)
5. Technical Specification LCO 3.7.14, “Spent Fuel Pool Boron Concentration” (Amendment 261/241)
6. MCEI-0400-349, “Unit 1 Cycle 26 Core Operating Limits Report” (Rev 0)
7. AP/1/A/5500/14, “Rod Control Malfunction” (Rev 16)
8. Technical Specification LCO 3.1.4, “Rod Group Alignment Limits” (Amendment 184/166)
9. OP/1/A/6250/001, “Condensate and Feedwater System” (Rev 210)
10. AP/1/A/5500/12, “Loss of Letdown, Charging or Seal Injection” (Rev 24)
11. EP/1/A/5000/E-0, “Reactor Trip or Safety Injection” (Rev 36)
12. EP/1/A/5000/ES-1.1, “Safety Injection Termination” (Rev 29)

Validation Time: 120 minutes

Author: David Lazarony, Essential Training & Consulting, LLC

Facility Review: ________________________

Rev. 010818

McGuire 2018 NRC Scenario #3 Objectives:

Given the simulator at an initial condition of 55% power with a normal power increase planned evaluate:

1. the SRO's ability to supervise the control room team during the normal, abnormal, and emergency situations that arise, including compliance with all facility procedures, Technical Specifications, and other commitments.

2. each crew member's ability to effectively communicate as part of a control room team during the normal, abnormal, and emergency situations that arise.

3. the RO and BOP's ability to effectively raise power in accordance with Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation."

4. each crew member's ability to effectively diagnose a dropped Control Rod, and the RO's ability to respond to such an event in accordance with AP/1/A/5500/14, "Rod Control Malfunction."

5. each crew member's ability to effectively diagnose high vibrations on a Main Feedwater Pump, and the RO and BOP's ability to respond to such an event in accordance with OP/1/A/6250/001, "Condensate and Feedwater System."

6. each crew member's ability to effectively diagnose an inadvertent closure of 1NV-35, Variable Flow Letdown Orifice Isolation Valve, and the BOP's ability to respond to such an event in accordance with AP/1/A/5500/12, "Loss of Letdown, Charging or Seal Injection."

7. each crew member's ability to effectively diagnose a Dropped Control Rod after one has previously dropped (i.e. 2nd Dropped Rod), and the RO's ability to respond to such an event in accordance with AP/1/A/5500/14, "Rod Control Malfunction."

8. each crew member's ability to effectively diagnose a Pressurizer Steam Space Small Break LOCA and the RO and BOP's ability to respond to such an event in accordance with EP/1/A/5000/E-0, "Reactor Trip or Safety Injection."

9. each crew member's ability to effectively diagnose a failure of the Main Turbine to automatically trip when called upon to do so and the RO's ability to manually trip it when required.

10. each crew member's ability to effectively diagnose a failure of the NC Cold Leg Injection Valves from NV to automatically open when called upon to do so and the BOP's ability to open one or both when required.

11. each crew member's ability to effectively diagnose failure of both NI Pumps to automatically start when called upon to do so and the BOP's ability to start one or both when required.

12. each crew member's ability to effectively determine when Safety Injection can be terminated during implementation of the EOP network; and the RO and BOP's ability to effectively terminate Safety Injection in accordance with EP/1/A/5000/ES-1.1, "Safety Injection Termination."

Facility:	McGuire	Scenario No.:	3	Op Test No.:	N18-1
Examiners:	____________	Operators:		____________	(SRO)
	____________			____________	(RO)
	____________			____________	(BOP)

Initial Conditions:	The plant is at 55% power (BOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.
Turnover:	The following equipment is Out-Of-Service: The 1B ND Pump is OOS due to an oil leak. ACTION has been taken in accordance with Technical Specification LCO 3.5.2 ACTION A.1. 1EMF46A, Train A KC Radiation Monitor, failed last shift (IAE is investigating) and MCB Annunciator 1AD-12, C-3, "A RN PUMP SUCTION LO PRESS," will not ILLUMINATE (IAE is investigating). It is planned to raise power on this shift to 100%.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	R-RO N-BOP N(TS)-SRO	Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low
2	MALF IRE006H8	C-RO C(TS)-SRO	Dropped Control Rod (H-8)
3	XMT LF TSI4-6, 8 & 4	C-BOP C-SRO	1A Feedpump Hi Vibrations
4	REM NV0035A	C-BOP C-SRO	Letdown Valve 1NV-35A fails CLOSED
5	MALF IRE006M4	C-RO C-SRO	2nd Dropped Control Rod (M-4)
6	REM NC0034A MALF NC002B	M-RO M-BOP M-SRO	Pzr PORV 1NC-34A fails OPEN/Block Valve fails OPEN
7	MAL DEH003A	C-RO C-SRO	Turbine fails to Automatically Trip
8	MAL NI009AB NI001A/B ND012A	C-BOP C-SRO	SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips
9	DEL REM NC0034A	NA	Pzr PORV 1NC-34A reseats

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2018 NRC Scenario #3

The plant is at 55% power (BOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.

The following equipment is Out-Of-Service: The 1B ND Pump is OOS due to an oil leak. ACTION has been taken in accordance with Technical Specification LCO 3.5.2 ACTION A.1. 1EMF46A, Train A KC Radiation Monitor, failed last shift (IAE is investigating) and MCB Annunciator 1AD-12, C-3, “A RN PUMP SUCTION LO PRESS,” will not ILLUMINATE (IAE is investigating). It is planned to raise power on this shift to 100%.

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.36.10 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, “Controlling Procedure for Unit Operation.” The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.4, “Alternate Dilute,” of OP/1/A/6150/009, “Boron Concentration Control,” and raise Turbine load in accordance with OP/1/A/6300/001 A, “Turbine-Generator Load Change.” During the power increase, Chemistry will call and report the results of a periodic sample of the Spent Fuel Boron concentration. The operator will address Technical Specification LCO 3.7.14, “Spent Fuel Pool Boron Concentration.”

During the power increase, one Control Bank D Control Rod will drop into the core. The operator will respond in accordance with ARP1AD-2/D-9, “RPI at Bottom Rod Drop” and will implement AP/1/A/5500/14, “Rod Control Malfunction.” The operator will address Technical Specification LCO 3.1.4, “Rod Group Alignment Limits.” IAE will determine that manual rod movement is available. Because Xenon is building-in, the operator will need to manually adjust control rod position throughout the remainder of the scenario, to maintain Tavg-Tref within the allowable band.

Subsequently, the 1A CF pump will develop high vibrations on its shaft bearings. The operator will use Enclosure 4.3, “CF Pump(s) Shutdown,” of OP/1/A/6250/001, “Condensate and Feedwater System,” to remove the pump from service.

When the 1A CF Pump is tripped and power is stabilized, 1NV-35, Variable Flow Letdown Orifice Isolation Valve, will fail Closed. The operator will enter AP/1/A/5500/12, “Loss of Letdown, Charging or Seal Injection,” and establish Excess Letdown.

When the plant is stabilized, a second Control Rod will drop into the core. The operator will re-enter AP-14, manually trip the reactor, and go to EP/1/A/5000/E-0, “Reactor Trip or Safety Injection.”

On the reactor trip, the turbine will fail to automatically trip, requiring the operator to manually trip the turbine. Additionally, Pressurizer PORV 1NC-34A will open and stick fully open. When the operator attempts to close the Block Valve, the Block Valve will fail to move.

The operator will perform the Immediate Actions of EP/1/A/5000/E-0, “Reactor Trip or Safety Injection.” Eventually Safety Injection (SI) will actuate, however, NC Cold Leg Injection Valves from NV, 1NI-9/10, will fail to automatically open; and the operator will need to manually open at least one of these valves. Additionally, both the 1A and 1B NI Pumps will fail to automatically start and the operator will need to manually start these pumps. Finally, the 1A ND Pump will trip.

At the E-0 Step 20.a RNO, when the operator aligns nitrogen to Pressurizer PORV 1NC-34A, the valve will re-seat. The operator will continue in E-0 until an SI reduction is initiated. Eventually, the operator will transition to Step 9 of EP/1/A/5000/ES-1.1, "Safety Injection Termination," and complete the SI termination.

The scenario will terminate at Step 14.l of ES-1.1 when the operator determines that Excess Letdown must be established.

Critical Tasks:

Trip the Reactor within 60 Seconds of the second dropped rod.

Safety Significance: Multiple dropped control rods are a significant reactivity transient that can have a serious effect on plant parameters under certain operating conditions, and may result in power distribution limits being exceeded. According to Technical Specification LCO 3.1.4 Bases, if more than one rod is found to be misaligned, the unit conditions fall outside of the accident analysis assumptions. The guidance to trip the reactor is a conservative action to prevent the plant form challenging the Pzr low pressure trip setpoint, etc.; and is consistent with the conservative nature of the industry. PT/0/A/4600/113, Enclosure 13.18 states that it is a management expectation that the operator trip the reactor within 30 seconds of a second dropped rod if the plant is stable and 1 minute if the plant is in a transient. The Transient Limit is applied in this situation since in the past 60-90 minutes the plant has undergone a controlled up-power, and three malfunctions requiring the implementation of an AOP or removal from operation of large components.

Close the failed open PORV before exiting E-0.

Safety Significance: Failure to close a failed Pzr PORV using the nitrogen supply system in the Step 20 of E-0, when able to do so, when coupled with a failure of Safety Injection to automatically actuate, constitutes a degraded fission product barrier that would not have otherwise occurred if the task were performed correctly (Performance of the task will effectively stop the on-going LOCA). The inaction by the operator constitutes a significant reduction of safety margin beyond that irreparably introduced by the scenario.

SIMULATOR OPERATOR INSTRUCTIONS

	Bench Mark	ACTIVITY	DESCRIPTION
☐		**Reset to Temp IC 227** **(Base IC-19)**	**T = 0 Malfunctions:** **Insert LOA-ND003 = 1; (Rackout of the 1B ND Pump Breaker)** **Insert LOA-ND003A = 1; (Rackout of the 1B ND Pump Control Power Breaker)** **Insert MAL-EMF-46A=10 (EMF-46A Fails Low)** **Insert H_X09_001C03_1 = 0 (MCB Annunciator 1AD12/C3)** **Insert:** **insert MAL-DEH003A = True (Failure of Auto Turbine Trip Signal)** **MAL-NI009A = TRUE (1NI-9A Fails to Auto OPEN)** **MAL-NI009B = TRUE (1NI-10B Fails to Auto OPEN)** **cd=H_X01_094_2 = 1 (1A RTB Open indicating lamp ON)** **Insert:** **MAL-NI001A (1A NI Pump fails to Auto Start)** **MAL-NI001B (1B NI Pump fails to Auto Start)** **MAL-ND012A (1A ND Pump trips)** **Insert:** **REM NC-0034A=1 (Pzr PORV 1NC-34A fails OPEN)** **MAL-NC002B=100 (Block Valve fails OPEN)** **cd=H_X01_094_2 = 1 (1A RTB Open indicating lamp ON)**
☐		**RUN** **Reset all SLIMs**	**Place Tagout/O-Stick on:** • **1B ND Pump** • **1EMF-46A, Train A KC Radiation Monitor** • **MCB Annunciator 1AD-12, C-3**
☐		**Update** Status Board, **Setup OAC**	**NOTE:** RMWST DO = <1000 ppb.
☐		**Freeze.**	
☐		**Update Fresh Tech. Spec. Log.**	

	Bench Mark	ACTIVITY	DESCRIPTION
☐		**Fill out the AO's Available section of Shift Turnover Info.**	
☐	Prior to Crew Briefing	**RUN**	
☐	**Crew Briefing** 1. Assign Crew Positions based on evaluation requirements 2. Provide the crew with a marked up copy of Enclosure 4.1 (Through Step 3.36.9), a copy of Enclosure 4.4 of OP/1/A/6150/009 marked up through step 3.7, and a blank copy of OP/1/A/6300/001 A. 3. Direct the crew to Review the Control Boards taking note of present conditions, alarms.		
☐	T-0	Begin Familiarization Period	
☐	At direction of examiner	**Execute Simulator Scenario N18-1-3.**	
☐	At direction of examiner	**Event 1** **NA**	Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low
☐	At direction of examiner	**Event 2** **insert MAL IRE006H8 = STATIONARY _GRPPR**	Dropped Control Rod (H-8)
☐	At direction of examiner	**Event 3** **Insert XMT-LF_TSI4-6 = 7.5 Ramp = 120 seconds** **Insert XMT-LF_TSI4-8 = 2.5 Ramp = 120 seconds** **Insert XMT-LF_TSI4-4 = 2.9 Ramp = 120 seconds**	1A Feedpump Hi Vibrations **NOTE: The Floor Instructor will need to provide the BOP with a copy of Enclosure 4.3 of OP/1/A/6250/001 (Handout 4) when it is desired to print a copy of this procedure.**

	Bench Mark	ACTIVITY	DESCRIPTION
☐	After the 1A CF Pump is tripped and the plant power is stable	**Event 4** **insert REM-NV0035A = 0.0 Ramp = 10 seconds**	Letdown Valve 1NV-35A fails CLOSED
☐	At direction of examiner	**Event 5** **insert MAL IRE006M4 = STATIONARY _GRPPR**	2nd Dropped Control Rod (M-4)
☐	Upon Rx Trip	**Event 6** **Insert:** **REM NC-0034A=1** **MAL-NC002B=100** **cd=H_X01_094_2 = 1 (1A RTB Open indicating lamp ON)**	Pzr PORV 1NC-34A fails OPEN/Block Valve fails OPEN **NOTE: This event will occur on Rx Trip, and is inserted at T=0.**
☐	Post-Rx Trip	**Event 7** **Insert:** **MAL-DEH003A = TRUE**	Turbine fails to Automatically Trip **NOTE: These events will occur on Rx Trip, and are inserted at T=0.**
☐	Post-Rx Trip	**Event 8** **Insert:** **MAL-NI009A = TRUE** **MAL-NI009B = TRUE** **cd=H_X01_094_2 = 1 (1A RTB Open indicating lamp ON)** **Insert:** **MAL-NI001A** **MAL-NI001B** **MAL-ND012A**	SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips **NOTE: These events will occur on Rx Trip, and are inserted at T=0.**
☐	Post-Rx Trip at E-0 Step 20	**Event 9** **REM NC-0034A=0**	Pzr PORV 1NC-34A reseats **NOTE: This event will occur when N2 is aligned to the PORV at Step 20 of E-0.**
☐	**Terminate the scenario upon direction of Lead Examiner**		

Op Test No.:	N18-1	Scenario #	3	Event #	1	Page	9 of 54
Event Description:	**Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low**						

Shortly after taking the watch, the operator will commence a load increase to 100% starting with Step 3.36.10 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation." The operator will dilute the NC System Boron concentration in accordance with Enclosure 4.4, "Alternate Dilute," of OP/1/A/6150/009, "Boron Concentration Control," and raise Turbine load in accordance with OP/1/A/6300/001 A, "Turbine-Generator Load Change." During the power increase, Chemistry will call and report the results of a periodic sample of the Spent Fuel Boron concentration. The operator will address Technical Specification LCO 3.7.14, "Spent Fuel Pool Boron Concentration."	
Booth Operator Instructions:	**NA**
Indications Available:	**NA**

Time	Pos.	Expected Actions/Behavior	Comments
OP/1/A/6100/003, CONTROLLING PROCEDURE FOR UNIT OPERATIONS ENCLOSURE 4.1, POWER INCREASE			
			NOTE: The power increase will be at 2 MWe/minute.
	BOP	(Step 3.36.10) WHEN 70% RTP or as directed by Secondary Chemistry, THEN perform the following:	
		• Begin placing C HDT Pumps in service per OP/1/B/6250/004 (Feedwater Heater Vents, Drains, and Bleed System).	
		• WHEN C HDT Pumps are in service, THEN ensure one Hotwell Pump secured per OP/1/B/6250/004 (Feedwater Heater Vents, Drains, and Bleed System).	
OP/1/A/6150/009, BORON CONCENTRATION CONTROL ENCLOSURE 4.4, ALTERNATE DILUTE			
			NOTE: The BOP may repeat this task as needed during the power increase.

Op Test No.:	N18-1	Scenario #	3	Event #	1	Page	10 of 54
Event Description:	**Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.6) Determine amount of reactor makeup water needed to obtain desired boron concentration using McGuire Data Book, OAC, Reactor Group Guidance, or plant parameters (T-Ave, Steam Pressure, Xenon worth, etc.). (R.M.)	
		• Total Reactor Makeup Water:	**NOTE:** The BOP will add 200 gallons of MU Water.
	BOP	(Step 3.7) Determine current blender contents and evaluate any potential Reactivity effects prior to performing this enclosure:	
		• Rx Makeup Water	
		• Blend	
		• Boron	
	BOP	(Step 3.8) Ensure the following reset to zero: (R.M.)	
		• Total Make Up Flow Counter	
		• Boric Acid Flow Counter	
	BOP	(Step 3.9) Set Total Make Up Flow Counter to value determined in Step 3.6. (R.M.)	
	BOP	(Step 3.10) Select “ALTERNATE DILUTE” on “NC Sys M/U Controller”.	
	BOP	(Step 3.11) IF desired to makeup only through 1NV-175A (U1 Boric Acid Blender To VCT Outlet Control), select “CLOSED” on 1NV-171A (U1 Boric Acid Blender to VCT Inlet Control).	

Op Test No.:	N18-1	Scenario #	3	Event #	1	Page	11 of 54
Event Description:	**Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low**						

Time	Pos.	Expected Actions/Behavior	Comments
NOTE Rapidly changing reactor makeup water flow can cause a Rx Makeup Flow Deviation Annunciator Alarm.			
	BOP	(Step 3.12) IF AT ANY TIME it is desired to adjust reactor makeup water flow, adjust “Rx M/U Water Flow Control” setpoint to achieve desired flowrate.	**NOTE:** Typically, it is NOT desired to adjust reactor makeup water flow.
	BOP	(Step 3.13) IF AT ANY TIME it is desired to manually adjust reactor makeup water flow, perform the following:	
		(Step 3.13.1) Place “Rx M/U Water Flow Control” in manual.	
		(Step 3.13.2) Adjust “Rx M/U Water Flow Control” output to control reactor makeup water flowrate.	
NOTE IF desired to dilute with a constant flow rate as advised by engineering to minimize VCT temperature decrease, it is preferred to allow 1NV-137A (U1 NC Filter Otlt to VCT 3-Way Diversion Cntrl) to auto divert on high level.			
	BOP	(Step 3.14) IF AT ANY TIME it is desired to lower VCT level, perform the following:	
		(Step 3.14.1) Monitor Letdown Pressure.	
NOTE An increase in Letdown Pressure greater than 20 psig during diverts may be indicative of excessive NB Feed Filter DP. {NCR 01597088}			
		(Step 3.14.2) Select “HUT” on 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Contrl).	**NOTE:** The BOP may do this at any time to lower VCT level.
		(Step 3.14.3) IF Letdown Pressure increases greater than 20 psig, notify CRS.	

Op Test No.: N18-1	Scenario # 3	Event # 1	Page 12 of 54
Event Description:	**Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low**		

Time	Pos.	Expected Actions/Behavior	Comments
		(Step 3.14.4) AFTER desired level achieved, select "AUTO" on 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Cntrl).	
NOTE Steps 3.15 - 3.24 may be completed and then checked off as time allows.			
	BOP	(Step 3.15) IF AT ANY TIME plant parameters require termination of dilution, perform the following:	
		(Step 3.15.1) Place "NC System Make Up" to "STOP". (R.M.)	
		(Step 3.15.2) IF 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Cntrl) was placed to HUT, place to "AUTO".	
	BOP	(Step 3.16) Momentarily select "START" on "NC System Make Up". (R.M.)	
	BOP	(Step 3.17) Check "NC System Make Up" red light lit.	
BOOTH INSTRUCTOR:	**AFTER the BOP has started the alternate dilution, as Chemistry, call the Control Room and report that periodic boron sample of the Spent Fuel Pool is 2657 ppm.**		
			NOTE: The CRS will evaluate this condition. **EXAMINER NOTE:** Examiner following the CRS, proceed to **Page 17** for this evaluation.

Op Test No.: N18-1	Scenario # 3	Event # 1	Page 13 of 54
Event Description:	**Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low**		

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS may call WCC to address the low boron concentration. If so, **Booth Instructor** acknowledge as WCC.
	BOP	(Step 3.18) Check 1NV-175A (U1 Boric Acid Blender To VCT Outlet Control) open.	
	BOP	(Step 3.19) Check 1NV-252A (Rx M/U Water Supply To U1 BA Blender Cntrl) open or throttled as required.	
	BOP	(Step 3.20) IF 1NV-171A (U1 Boric Acid Blender To VCT Inlet Control) in “AUTO”, check 1NV-171A (U1 Boric Acid Blender to VCT Inlet Control) open.	**NOTE:** 1NV-171A is NOT in AUTO.
	BOP	(Step 3.21) Check Rx M/U Water Pump starts.	
	BOP	(Step 3.22) Monitor Total Make Up Flow Counter. (R.M.)	
	BOP	(Step 3.23) HOLD until one of the following occurs:	
		• Amount of reactor makeup water recorded per Step 3.6 added	
		OR	
		• Reactor makeup water addition manually terminated	
	BOP	(Step 3.24) Ensure dilution terminated as follows: (R.M.)	
		(Step 3.24.1) IF in “AUTO”, ensure the following off:	

Op Test No.:	N18-1	Scenario #	3	Event #	1	Page	14 of	54
Event Description:	**Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low**							

Time	Pos.	Expected Actions/Behavior	Comments
		• 1A Rx M/U Water Pump	
		• 1B Rx M/U Water Pump	
	BOP	(Step 3.24.2) Ensure the following closed:	
		• 1NV-175A (U1 Boric Acid Blender To VCT Outlet Control)	
		• 1NV-252A (RX M/U Water Supply To U1 BA Blender Cntrl)	
		• 1NV-171A (U1 Boric Acid Blender To VCT Inlet Control)	
	BOP	(Step 3.25) Ensure 1NV-171A (U1 Boric Acid Blender to VCT Inlet Control) in “AUTO”.	
	BOP	(Step 3.26) Ensure “Rx M/U Water Flow Control” in “AUTO”. (R.M.)	

NOTE

- OAC point M1P5614 (Unit 1 Effective Boron Concentration) may be used as the desired boron concentration in the following calculations. Use of Effective Boron Concentration will account for B-10 depletion. {NCR 01641629}
- Results of Boron Concentration makeups have been consistently lower than desired. To compensate it may be necessary to use actual Boron Concentration (instead of Effective Boron Concentration) or adjustment of the "desired" Boron Concentration to obtain a desired resultant Boron Concentration. {NCR 01682204}

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.27) IF “Rx M.U Water Flow Control” adjusted per Step 3.12 or 3.13…	**NOTE:** Typically, the Rx M.U Water Flow Control was NOT adjusted.
	BOP	(Step 3.28) Ensure 1NV-137A (U1 NC Filters Otlt to VCT 3-Way Diversion Cntrl) in “AUTO”.	

NOTE

CRS concurrence required if flush of blender NOT performed.

Op Test No.:	N18-1	Scenario #	3	Event #	1	Page	15 of 54

Event Description: **Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.29) IF desired to flush blender….	**NOTE:** The BOP will likely request that the flush NOT be performed because additional dilutions are expected during the power increase.
	BOP	(Step 3.30) Select “AUTO” for “NC Sys M/U Controller”.	
	BOP	(Step 3.31) Momentarily select “START” on “NC System Make Up”.	
	BOP	(Step 3.32) Check “NC System Make Up” red light lit.	
	BOP	(Step 3.33) Ensure the following reset to zero: (R.M.)	
		• Total Make Up Flow Counter	
		• Boric Acid Flow Counter	
	BOP	(Step 3.34) Record in Auto Log that final blender content is Rx Makeup Water.	
OP/1/A/6300/001A, TURBINE-GENERATOR STARTUP/SHUTDOWN ENCLOSURE 4.1, TURBINE-GENERATOR LOAD CHANGE			
NOTE If reducing power to a level greater than 50%, it is preferable to reduce power at a rate less than 12% per hour in order to minimize sodium peaks. [NCR01574291]			
	RO	(Step 3.4.1) IF Turbine in “OPERATOR AUTO”, perform the following:	
		(Step 3.4.1.1) Ensure desired change within “Calculated Capability Curve”.	

Op Test No.:	N18-1	Scenario #	3	Event #	1	Page	16	of	54

Event Description: **Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low**

Time	Pos.	Expected Actions/Behavior	Comments
		(Step 3.4.1.2) IF turbine load will increase or decrease more than 10 MWs, notify Dispatcher of expected load change.	
		(Step 3.4.1.3) IF desired to change the load rate, THEN perform the following:	
		• Depress "LOAD RATE".	
		• Enter desired load rate in "VARIABLE DISPLAY".	**NOTE:** the RO will select 2-3 MWe/Min loading rate.
		• Depress "ENTER".	
		(Step 3.4.1.4) IF desired to change desired load, THEN perform the following:	
		• Depress "REFERENCE".	
		• Enter desired load in "VARIABLE DISPLAY".	
		• Depress "ENTER".	
		• Depress "GO"	
		(Step 3.4.1.5) IF desired to pause load change, THEN perform the following:	
		• Depress "HOLD".	
		• WHEN desired to resume load change, THEN depress "GO".	
OP/1/A/6100/003, CONTROLLING PROCEDURE FOR UNIT OPERATIONS ENCLOSURE 4.1, POWER INCREASE			
	BOP	(Step 3.36.10) WHEN 70% RTP or as directed by Secondary Chemistry, THEN perform the following:	
		• Begin placing C HDT Pumps in service per OP/1/B/6250/004 (Feedwater Heater Vents, Drains, and Bleed System).	
		• WHEN C HDT Pumps are in service, THEN ensure one Hotwell Pump secured per OP/1/B/6250/004 (Feedwater Heater Vents, Drains, and Bleed System).	

Op Test No.:	N18-1	Scenario #	3	Event #	1	Page	17 of 54
Event Description:	**Power Increase w/Alternate Dilute/ Spent Fuel Pool Boron Concentration Low**						

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will evaluate the SFP Boron Concentration.
TECHNICAL SPECIFICATION 3.7.14, SPENT FUEL POOL BORON CONCENTRATION			
	CRS	LCO 3.7.14 The spent fuel pool boron concentration shall be within the limit specified in the COLR.	**NOTE:** According to Section 2.13.1of the COLR, the minimum SFP boron concentration is 2675 ppm. Since boron concentration has been reported to be 2657 ppm, the SFP boron concentration is too low.
	CRS	APPLICABILITY: When fuel assemblies are stored in the spent fuel pool.	
	CRS	ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Spent fuel pool boron concentration not within limit.	NOTE: LCO 3.0.3 is not applicable. A.1 Suspend movement of fuel assemblies in the spent fuel pool. AND A.2 Initiate action to restore spent fuel pool boron concentration to within limit.	Immediately Immediately

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will determine that Condition A is required and that ACTION A.1 and A.2 must be taken.
At the discretion of the Lead Examiner move to Event #2.			

Op Test No.:	N18-1	Scenario #	3	Event #	2	Page	18 of 54
Event Description:	**Dropped Control Rod (H-8)**						

During the power increase, one Control Bank D Control Rod will drop into the core. The operator will respond in accordance with ARP1AD-2/D-9, "RPI at Bottom Rod Drop" and will implement AP/1/A/5500/14, "Rod Control Malfunction." The operator will address Technical Specification LCO 3.1.4, "Rod Group Alignment Limits." IAE will determine that manual rod movement is available. Because Xenon is building-in, the operator will need to manually adjust control rod position throughout the remainder of the scenario, to maintain Tavg-Tref within the allowable band.

Booth Operator Instructions: **insert MALF = IRE006H8 = STATIONARY_GRPPR**

Indications Available:

- DRPI for Control Rod H-8 indicates Rod on Bottom
- MCB Annunciator 1AD-2/B-10, ROD CONTROL NON URGENT FAILURE
- MCB Annunciator 1AD-2/D-9, RPI AT BOTTOM ROD DROP
- Tref > Tavg

Time	Pos.	Expected Actions/Behavior	Comments
		AP/1/A/5500/14, ROD CONTROL MALFUNCTION	
	RO	(Step 1) IF two or more rods are either dropped OR misaligned by greater than 24 steps,…	**Immediate Action** **NOTE:** Only one Rod Dropped during this event.
	RO	(Step 2) Place control rods in manual.	**Immediate Action** **NOTE:** The RO will place the rods in Manual.
	RO	(Step 3) Check rod movement – STOPPED.	**Immediate Action**
	RO	(Step 4) Check all rods – ALIGNED WITH ASSOCIATED BANK.	
	RO	(Step 4 RNO) Perform the following.	
		NOTE DRPI problems are not addressed by this AP.	

Op Test No.: N18-1	Scenario # 3	Event # 2		Page 19 of 54	
Event Description:	Dropped Control Rod (H-8)				

Time	Pos.	Expected Actions/Behavior	Comments
		• IF misaligned rod(s) due to DRPI indication failure only,…	**NOTE:** The misaligned rod is NOT a DRPI indication failure.
		• IF T-Avg has gone down, THEN lower Turbine load as necessary to restore T-Avg to T-Ref.	**NOTE:** The RO may adjust load on the Turbine to maintain Tavg-Tref = 1ºF.
		• GO TO Enclosure 1 (Response To Dropped or Misaligned Rod)	
			NOTE: The CRS will transition to Enclosure 1.
AP/1/A/5500/14, ROD CONTROL MALFUNCTION ENCLOSURE 1, RESPONSE TO DROPPED OR MISALIGNED ROD			
	CRS	(Step 1) Announce occurrence on paging system.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	CRS	(Step 2) Dispatch rod control system qualified IAE to perform the following:	**NOTE:** The CRS may call WCC/IAE to address. If so, **Booth Instructor** acknowledge as WCC/IAE as appropriate. After **3 Minutes Report as IAE** that **Control Rods can be moved in MANUAL.**
			Examiner NOTE: Because Xenon is building in, the RO will be required to adjust Control Rod position throughout the remainder of the scenario, in order to maintain Tavg/Tref within band.
		• Correct cause of misaligned rod.	
		• Notify Control Room operators when auto or manual rod motion is available for reactivity control.	

Op Test No.:	N18-1	Scenario #	3	Event #	2	Page	20	of	54
Event Description:	**Dropped Control Rod (H-8)**								

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 3) Do not move rods until IAE determines rod movement is available.	
	RO	(Step 4) IF AT ANY TIME a runback occurs while in this procedure, THEN observe the following guidance:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• IF IAE has determined that it is permissible to move rods, THEN respond to the runback PER AP/1/A/5500/03 (Load Rejection).	
		• For all other circumstances, assume rod control is not available and respond to the runback as follows:	
		• Trip Reactor.	
		• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection.	
	RO	(Step 5) Check "ROD CONTROL URGENT FAILURE" alarm (1AD-2, A-10) – DARK.	
	RO	(Step 6) Use OAC point M1P1385 (Reactor Thermal Power, Best Estimate) to determine reactor power in subsequent steps.	
	RO	(Step 7) Check AFD (Tech Spec 3.2.3) – WITHIN TECH SPEC LIMITS.	
NOTE If any control rod is misaligned more than 12 steps, Step 15 will provide guidance for performing any Tech Spec required power reduction.			
	CRS	(Step 8) REFER TO the following Tech Specs while continuing in the enclosure:	
		• Tech Spec 3.1.4 (Rod Group Alignment Limits).	**NOTE:** The CRS may check the TS now and conclude that LCO 3.1.4 must be entered.

Op Test No.:	N18-1	Scenario #	3	Event #	2	Page	21 of 54
Event Description:	**Dropped Control Rod (H-8)**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Tech Spec 3.1.5 (Shutdown Bank Insertion Limits).	The CRS may check the TS now and conclude that LCO 3.1.5 is NOT required to be entered.
		• Tech Spec 3.1.6 (Control Bank Insertion Limits).	**NOTE:** The CRS may check the TS now and conclude that LCO 3.1.6 is NOT required to be entered.
		• Tech Spec 3.2.4 (QPTR)	**NOTE:** The CRS may check the TS now and conclude that LCO 3.2.4 is NOT required to be entered.
		• Ensure shutdown margin calculation is performed within 1 hour.	**NOTE:** The CRS may call WCC or the U2 BOP to perform SDM calculation. If so, **Floor/Booth Instructor** acknowledge as WCC as appropriate.
	CRS	(Step 9) Contact Reactor Engineering for instructions.	**NOTE:** The CRS may call WCC/RE to address. If so, **Booth Instructor** acknowledge as WCC/RE as appropriate.
			NOTE: The CRS will check the Tech Specs.
TECHNICAL SPECIFICATION 3.1.4, ROD GROUP ALIGNMENT LIMITS			
	CRS	LCO 3.1.4 All shutdown and control rods shall be OPERABLE, with all individual indicated rod positions within 12 steps of their group step counter demand position.	
	CRS	APPLICABILITY: MODES 1 and 2.	
		ACTIONS	

Op Test No.:	N18-1	Scenario #	3	Event #	2	Page	22 of 54
Event Description:	**Dropped Control Rod (H-8)**						

Time	Pos.	Expected Actions/Behavior	Comments

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One rod not within alignment limits.	B.1Restore rod to within alignment limits. <u>OR</u> B.2.1.1 Verify SDM is within the limit specified in the COLR. <u>OR</u> B.2.1.2 Initiate boration to restore SDM to within limit. AND B.2.2 Reduce THERMAL POWER to $\leq$ 75% RTP. AND B.2.3 Verify SDM is within the limit specified in the COLR. AND B.2.4 Perform SR 3.2.1.1. AND B.2.5 Perform SR 3.2.2.1. AND B.2.6 Re-evaluate safety analyses and confirm results remain valid for duration of operation under these conditions.	1 hour 1 hour 1 hour 2 hours Once per 12 hours 72 hours 72 hours 5 days

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will determine that Condition B is required and that ACTION B.1 or B.2.1.1 and B.2.1.2 and B.2.2, B.2.3, B.2.4, B.2.5 and B.2.6 must be taken.
			NOTE: The CRS may check TS LCO 3.2.4, however, QPTR is <1.02 on all quadrants.
			Examiner NOTE: Step 15 of AP14 will direct the CRS to lower power to less than 50%. However, subsequent events will limit the crew's ability to perform this downpower.

At the discretion of the Lead Examiner move to Event #3.

Op Test No.:	N18-1	Scenario #	3	Event #	3	Page	23 of 54
Event Description:		**1A Feedpump Hi Vibrations**					

Subsequently, the 1A CF pump will develop high vibrations on its shaft bearings. The operator will use Enclosure 4.3, "CF Pump(s) Shutdown," of OP/1/A/6250/001, "Condensate and Feedwater System," to remove the pump from service.

Booth Operator Instructions: **Insert XMT-LF_TSI4-6 = 7.5 Ramp = 120 sec**
Insert XMT-LF_TSI4-8 = 2.5 Ramp = 120 sec
Insert XMT-LF_TSI4-4 = 2.9 Ramp = 120 sec

Indications Available:

- OAC Alarm M1A1158: 1A CFPT LP BEARING 2 VIBRATION

Time	Pos.	Expected Actions/Behavior	Comments
OAC ALARM M1A1158, 1A CFPT LP BEARING 2 VIBRATION			
	CRS	(Hi-Hi Step 1) Remove affected CF Pump from service using OP/1/A/6250/001 (Condensate and Feedwater)	
			NOTE: The CRS will enter the OP. **Floor Instructor:** When the CRS/BOP seeks to obtain the OP, provide the BOP with a copy of Enclosure 4.3 of OP/1/A/6250/001 (Handout 4).
			NOTE: The CRS may call WCC to address. If so, **Booth Instructor** acknowledge as WCC as appropriate.
			NOTE: The CRS may dispatch an AO to the 1A CF Pump. If so, **Floor/Booth Instructor** acknowledge as **AO**, and after 2 Minutes report that local indications show that there are **elevated vibrations on the 1A CF Pump High Pressure, Low Pressure and Inboard Pump bearings**.

Op Test No.:	N18-1	Scenario #	3	Event #	3	Page	24 of 54
Event Description:	1A Feedpump Hi Vibrations						

Time	Pos.	Expected Actions/Behavior	Comments
OP/1/A/6250/001, CONDENSATE AND FEEDWATER ENCLOSURE 4.3, CF PUMPS(S) SHUTDOWN			
	CRS/ BOP	(Step 3.1) Evaluate all outstanding Clearances that may impact performance of this procedure.	**NOTE:** The CRS/BOP may call WCC to address the R&Rs. If so, **Booth Instructor** acknowledge as WCC, and report none.
	BOP	(Step 3.2) Perform the following sections, as applicable:	
		• Section 3.3, Shutdown 1A CF Pump	
	BOP	(Step 3.3) Shutdown 1A CF Pump	
		• IF this is the last CF Pump to be tripped during plant shutdown,…	**NOTE:** The 1B CF Pump is running.
		• On DCS Workstation Feedpump Overview Graphic, ensure 1CF-76 (1A CF Pump Recirc Control) is in auto.	
	BOP	• Notify OPS Secondary to perform the following:	**NOTE:** The CRS may call WCC/Chemistry to address the CM System operation. If so, **Booth Instructor** acknowledge as WCC/OPS Secondary.
		• Monitor Condensate Polisher flow	
		• Notify Control Room to adjust 1CM-422/423 (Cond Polish Demin Bypass) to provide adequate Condensate Polisher flow	
	BOP	• On DCS Workstation Feedpump Overview Graphic, select “AUTO SET” for 1A CF Pump Turbine.	
		• On “AUTO/SPD SETTER SEL” pop-up (7076), select “SPD SET” for 1A CF Pump Turbine.	

Op Test No.:	N18-1	Scenario #	3	Event #	3	Page	25 of 54
Event Description:	**1A Feedpump Hi Vibrations**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Check "SPEED SET" indicated in window below "AUTO/SPD" select box for button for 1A CF Pump Turbine.	
		• IF 1B CF Pump in service, monitor 1B CF Pump to ensure it maintains expected C flow.	

NOTE

- WHEN both Gov Cntrl's are in auto, the "LP GOV CNTRL" will also lower the "HP GOV CNTRL "if open.
- Decreasing CF Pump speed will cause a decrease in feedwater flow to the steam generators and result in an NC system temperature increase. (R.M.)
- CF Pumps have critical vibration ranges in the 4000 - 4200 rpm range, at 2700 rpm and 1900 - 2100 rpm range. Minimize the time the pumps are operated in these ranges.

CAUTION

IF CF Pump is removed from service too rapidly, feedwater flow oscillations may occur.

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	• Using the "LP GOV CNTRL" decrease pushbutton, slowly lower 1A CF Pump Turbine speed until 1A CF Pump is out of the CF Header (speed should be less than 2000 rpm).	

NOTE

CF Pump should be recirculating 4000 - 8000 gpm.

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	• Check 1A CF Pump NOT adding water to system.	
		• Ensure 1CF-76 (1A CF Pump Recirc Control) manual loader fully open.	

NOTE

CF Pump removed from service should be "tripped" to ensure immediate CA System auto start on loss of operating CF Pump.

Time	Pos.	Expected Actions/Behavior	Comments
		• Depress and hold "RESET" on "A or B CF Pump Recirc Valve Closure Circuit".	
		• Trip "1A CF Pump Turbine".	

Op Test No.:	N18-1	Scenario #	3	Event #	3	Page	26	of	54
Event Description:	**1A Feedpump Hi Vibrations**								

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	• Check the following lit:	
		• “Trip” on 1A CF Pump Turbine	
		• “MIN” on 1SP-15 (1A CFPT Hi Press Stop Valve)	
		• “MIN” on 1HM-157 (1A CFPT Lo Press Stop Valve)	
		• Check “RESET” on “A or B CF Pump Recirc Valve Closure Circuit” lit.	
		• Release “RESET” on “A or B CF Pump Recirc Valve Closure Circuit”.	
		• IF desired to shutdown AC Oil Pumps, perform….	**NOTE:** The CRS will likely leave the AC Oil Pumps running.
		• IF this enclosure was used to secure 1A CF Pump during CF Pump swap, exit this enclosure.	
NOTE Maintaining vacuum and steam supplied to seals while CF Pump is shutdown may result in excessive water accumulation in oil reservoir.			
		• Evaluate placing 1A CF Pump Turbine Oil Reservoir in purification.	
		• WHEN high pressure steam no longer required, close 1SP-1 (Main Steam to 1A CF Pump Turb. Isol.).	
		• IF CF Pump Turbine 1A AND 1B shutdown…	
		• IF removing 1A CF Pump from service for maintenance, go to Enclosure 4.29 (Removing/Returning 1A CF Pump From/To Service For Maintenance).	**NOTE:** The CRS may call WCC and report that the 1A CF Pump has been removed from service. If so, **Booth Instructor** acknowledge as WCC.
When the 1A CF Pump is tripped and the plant power is stable, move to Event #4.			

Op Test No.:	N18-1	Scenario #	3	Event #	4	Page	27 of 54
Event Description:	**Letdown Valve 1NV-35A fails CLOSED**						

When the 1A CF Pump is tripped and power is stabilized, 1NV-35, Variable Flow Letdown Orifice Isolation Valve, will fail Closed. The operator will enter AP/1/A/5500/12, "Loss of Letdown, Charging or Seal Injection," and establish Excess Letdown.

Booth Operator Instructions: **insert REM-NV0035A = 0.0 (Ramp = 10 seconds)**

Indications Available:

- Letdown flow (1NVP5530) indicates 0 gpm.
- 1NV-35A Green status light is LIT.
- Pzr Level trending upward.
- Charging flow (1NVP5630) starts to lower.

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will enter AP-12.
AP/1/A/5500/12, LOSS OF LETDOWN, CHARGING OR SEAL INJECTION			
	BOP	(Step 1) Check if charging is aligned to Regenerative Hx as follows:	
		• Charging flow – GREATER THAN 20 GPM	**NOTE:** The BOP may take MANUAL control of 1NV-238 to control Charging flow.
		• 1NV-241 (U1 Seal Water Inj Flow Control) – THROTTLED OPEN	
		• 1NV-244A (U1 Charging Hdr Cont Outside Isol) - OPEN	
		• 1NV-245B (U1 Charging Hdr Cont Outside Isol) – OPEN.	
	BOP	(Step 2) Check Pzr Level – LESS THAN 96%.	
	CRS	(Step 3) Stop any power or temperature changes in progress.	

Op Test No.:	N18-1	Scenario #	3	Event #	4	Page	28 of 54
Event Description:	**Letdown Valve 1NV-35A fails CLOSED**						

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	(Step 4) Announce occurrence on paging system.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	CRS	(Step 5) IF this AP entered due to loss of letdown only, THEN GO TO Step 37.	
	BOP	(Step 37) Ensure the following valves are CLOSED:	
		• 1NV-458A (U1 75 GPM L.D Orifice Otlt Cont Isol)	
		• 1NV-457A (U1 45 GPM L/D Orifice Otlt Cont Isol)	
		• 1NV-35A (U1 Variable L/D Orifice Otlt Cont Isol).	**NOTE:** 1NV-35 has failed CLOSED.
	BOP	(Step 38) Ensure NC System makeup controller is auto.	
	BOP	(Step 39) Ensure charging flow going down to maintain Pzr at program level.	**NOTE:** The BOP may take MANUAL control of 1NV-238 to control Charging flow.
	BOP	(Step 40) Check “LETDN RELIEF HI TEMP” alarm (1AD-7, I-4) – HAS REMAINED DARK.	
	BOP	(Step 41) Check 1NV-21A (U1 NV Supply to U1 Aux PZR Spray Isol) – CLOSED.	
	BOP	(Step 42) Operate Pzr heaters as follows:	
		• Check A, B, and D Pzr heater group supply breakers on vertical board – CLOSED.	
		• Check normal Pzr spray – AVAILABLE.	

Op Test No.:	N18-1	Scenario #	3	Event #	4	Page	29	of 54
Event Description:	**Letdown Valve 1NV-35A fails CLOSED**							

Time	Pos.	Expected Actions/Behavior	Comments
		Place the following Pzr heater groups in manual and "ON" to maximize spray flow:	
		• A	
		• B	
		• D	
	BOP	(Step 43) Check the following valves – OPEN:	
		• 1NV-1A (U1 NC L/D Isol To Regenerative Hx)	
		• 1NV-2A (U1 NC L/D Isol To Regenerative Hx).	
	CRS	(Step 44) GO TO Step 49.	
	BOP	(Step 49) Establish normal letdown as follows:	**Examiner NOTE:** Although attempts will be made, Normal Letdown will NOT be able to be established. The CRS may recognize that Normal Letdown cannot be established and perform the RNO. If so, go to **Step 52** on **Page 30.**
		• Ensure 1NV-459 (U1 Variable L/D Orifice Outlet Flow Cntrl) is CLOSED.	
		• Place 1NV-124 (U1 Letdown Press Control) in manual with output between 40-45% OPEN.	
		• Check OAC – IN SERVICE.	
		• Check valve position on OAC for 1NV-124 – INDICATING THROTTLED.	
		• Check the following valves – OPEN:	
		• 1NV-1A (U1 NC L/D Isol To Regenerative Hx)	
		• 1NV-2A (U1 NC L/D Isol To Regenerative Hs).	

Op Test No.:	N18-1	Scenario #	3	Event #	4	Page	30 of 54
Event Description:	**Letdown Valve 1NV-35A fails CLOSED**						

Time	Pos.	Expected Actions/Behavior	Comments
CAUTION A Pzr insurge will occur when charging flow is raised in next step. Letdown should be established without delay to limit the amount of insurge.			
		• Establish cooling to Regenerative Hx by performing the following concurrently:	
		• Establish at least 65 GPM charging flow by THROTTLING OPEN 1NV-238 (U1 Charging Hdr Control) or raising PD pump speed.	**NOTE:** The BOP will take MANUAL control of 1NV-238 to control Charging flow.
		• THROTTLE 1NV-241 (U1 Seal Water Inj Flow Control) to establish approximately 8 GPM seal injection flow to each NC pump.	
		• OPEN letdown line isolation valves as follows:	
		• OPEN 1NV-7B (U1 Letdown Cont Outside Isol).	
		• OPEN 1NV-1A (U1 NC L/D Isol To Regenerative Hx).	
		• OPEN 1NV-2A (U1 NC L/D Isol To Regenerative Hx).	
		• OPEN 1NV-35A (U1 Variable L/D Orifice Otlt Cont Isol).	**NOTE:** 1NV-35A cannot be opened.
	CRS	(Step 49g RNO) GO TO Step 52	**NOTE:** Although attempts will be made, Normal Letdown will NOT be able to be established.
	BOP	(Step 52) Establish excess letdown as follows:	
		• Adjust charging to <u>minimum</u> while maintaining the following:	**NOTE:** The BOP will take MANUAL control of 1NV-238 to control Charging flow.
		• NC pump seal injection flow greater that 6 GPM.	

Op Test No.:	N18-1	Scenario #	3	Event #	4	Page	31	of	54
Event Description:	**Letdown Valve 1NV-35A fails CLOSED**								

Time	Pos.	Expected Actions/Behavior	Comments
		• Pzr level at program level.	
	BOP	• IF AT ANY TIME excess letdown cannot be established, THEN observe Note prior to Step 53 and GO TO Step 53 to establish letdown using Rx Vessel Head Vents.	
	BOP	• OPEN the following valves:	
		• 1KC-315B (U1 Excess L/D Hx KC Ret Hdr Cont Otsd Isol).	
		• 1KC-305B (U1 KC To Excess L/D Hx Cont Outside Isol).	
	BOP	• Ensure 1NV-27B (U1 Excess L/D Hx Outlet 3-Way Cntrl) selected to “VCT” position.	
NOTE Opening and then closing 1NV-26B (U1 Excess L/D Hx Outlet Cntrl) in the next steps will reduce the possibility of water hammer by ensuring that the excess letdown line is filled with water.			
	BOP	• OPEN 1NV-26B (U1 Excess L/D Hx Outlet Cntrl	
		• Wait 2 minutes.	
		• CLOSE 1NV-26B (U1 Excess L/D Hx Outlet Cntrl).	
	BOP	• Check the following valves – OPEN:	
		• 1NV-94AC (U1 NC Pumps Seal Water Return Cont Inside Isol)	
		• 1NV-95B (U1 NC Pumps Seal Water Return Cont Outside Isol).	
	BOP	• OPEN 1NV-24B (1C NC Loop To Excess L/D Hx Isol).	
		• OPEN 1NV-25B (1C NC Loop To Excess L/D Hx Isol).	
	BOP	• Check the following:	
		• Reactor - CRITICAL	
		• 1NV-27B – ALIGNED TO VCT.	

Op Test No.: N18-1	Scenario # 3	Event # 4		Page 32 of 54		
Event Description:	**Letdown Valve 1NV-35A fails CLOSED**					

Time	Pos.	Expected Actions/Behavior	Comments
CAUTION The Excess Letdown Hx and associated piping contain approximately 30 gallons of water that is at a different boron concentration than the NC System.			
	RO	• Closely monitor reactor response once excess letdown is in service.	
		• Slowly OPEN 1NV-26B while maintaining excess letdown Hx temperature less than 200°F.	
	CRS	• GO TO Step 52.r.	
		• Notify Primary Chemistry that excess letdown is in service.	**NOTE:** The CRS may call Chemistry. If so, **Booth Instructor** acknowledge as Chemistry.
	BOP	• Adjust charging flow as desired while maintaining the following:	
		• NC pump seal injection flow greater than 6 GPM	
		• Pzr level at program level.	
		• Operate Pzr heaters as desired.	
	BOP	• WHEN time allows, THEN notify engineering to document the following transients:	**NOTE:** The CRS may call Engineering. If so, **Booth Instructor** acknowledge as Engineering.
		• Letdown isolation	
		• Potential charging nozzle transient	
		• IF NV Aux Spray was in service…	
	BOP	• Check 1NV-27B (U1 Excess L/D Hx Outlet 3-Way Cntrl) = ALIGNED TO "VCT".	
NOTE With normal letdown secured, 1NV-137A (U1 NC Filter Otlt To VCT 3-Way Diversion Cntrl) is unavailable to lower VCT level.			

Op Test No.:	N18-1	Scenario #	3	Event #	4	Page	33 of 54
Event Description:	**Letdown Valve 1NV-35A fails CLOSED**						

Time	Pos.	Expected Actions/Behavior	Comments
		• IF AT ANY TIME VCT level needs to be lowered….	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• WHEN normal letdown available…	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• WHEN desired to isolate excess letdown…	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• RETURN TO procedure and step in effect.	
			NOTE: The CRS may call WCC/IAE to address the failed valve. If so, **Booth Instructor** acknowledge as WCC.
			NOTE: The CRS will likely conduct a Focus Brief.
At the discretion of the Lead Examiner move to Event #5.			

Op Test No.:	N18-1	Scenario #	3	Event #	5	Page	34 of 54
Event Description:	2nd Dropped Control Rod (M-4)						

When the plant is stabilized, a second Control Rod will drop into the core. The operator will re-enter AP-14, manually trip the reactor, and go to EP/1/A/5000/E-0, "Reactor Trip or Safety Injection."

Booth Operator Instructions: **insert MALF = IRE006M4 = STATIONARY_GRPPR**

Indications Available:

- MCB Annunciator 1AD-2, B-10, ROD CONTROL NON-URGENT FAILURE, alarms.
- MCB Annunciator 1AD-2, D-9, RPI AT BOTTOM ROD DROP, alarms.
- MCB Annunciator 1AD-2, D-10, RPI URGENT FAILURE, alarms.
- MCB Annunciator 1AD-2, E-9, RPI AT BOTTOM > 1 ROD DROPPED, alarms.
- DRPI indication that Control Rod M4 is on the bottom.

Time	Pos.	Expected Actions/Behavior	Comments
		AP/1/A/5500/14, ROD CONTROL MALFUNCTION	
	RO	(Step 1) IF more than one rod dropped, OR misaligned by greater than 24 steps, THEN perform the following:	**Immediate Action**
		• Trip Reactor.	
		• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	

Op Test No.:	N18-1	Scenario #	3	Event #	5	Page	35 of 54
Event Description:	**2^{nd} Dropped Control Rod (M-4)**						

Time	Pos.	Expected Actions/Behavior	Comments
<u>Critical Task:</u> **Trip the Reactor within 60 Seconds of the second dropped rod.** Safety Significance: Multiple dropped control rods are a significant reactivity transient that can have a serious effect on plant parameters under certain operating conditions, and may result in power distribution limits being exceeded. According to Technical Specification LCO 3.1.4 Bases, if more than one rod is found to be misaligned, the unit conditions fall outside of the accident analysis assumptions. The guidance to trip the reactor is a conservative action to prevent the plant form challenging the Pzr low pressure trip setpoint, etc.; and is consistent with the conservative nature of the industry. PT/0/A/4600/113, Enclosure 13.18 states that it is a management expectation that the operator trip the reactor within 30 seconds of a second dropped rod if the plant is stable and 1 minute if the plant is in a transient. The Transient Limit is applied in this situation since in the past 60-90 minutes the plant has undergone a controlled up-power, and three malfunctions requiring the implementation of an AOP or removal from operation of large components.			
At the discretion of the Lead Examiner move to Events #6-9.			

Op Test No.:	N18-1	Scenario #	3	Event #	6, 7, 8 & 9	Page	36 of 54
Event Description:	**Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**						

On the reactor trip, the turbine will fail to automatically trip, requiring the operator to manually trip the turbine. Additionally, Pressurizer PORV 1NC-34A will open and stick fully open. When the operator attempts to close the Block Valve, the Block Valve will fail to move. The operator will perform the Immediate Actions of EP/1/A/5000/E-0, “Reactor Trip or Safety Injection.” Eventually Safety Injection (SI) will actuate, however, NC Cold Leg Injection Valves from NV, 1NI-9/10, will fail to automatically open; and the operator will need to manually open at least one of these valves. Additionally, both the 1A and 1B NI Pumps will fail to automatically start and the operator will need to manually start these pumps. Finally, the 1A ND Pump will trip. At the E-0 Step 20.a RNO, when the operator aligns nitrogen to Pressurizer PORV 1NC-34A, the valve will re-seat. The operator will continue in E-0 until an SI reduction is initiated. Eventually, the operator will transition to Step 9 of EP/1/A/5000/ES-1.1, “Safety Injection Termination,” and complete the SI termination. The scenario will terminate at Step 14.l of ES-1.1 when the operator determines that Excess Letdown must be established.

Booth Operator Instructions:

Insert REM NC-0034=1 and MAL-NC002B=100;

Insert MAL-DEH003A

cd=H_X01_094_2 = 1 (1A RTB Open indicating lamp ON)

Indications Available:

- 1NC-34A Red Status light is LIT.
- Pzr pressure lowers uncontrollably.

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: Crew will carry out Immediate Actions of E-0, prior to the CRS addressing the EP.
		EP/1/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION	
	RO/ BOP	(Step 1) Monitor Foldout page.	
		NC Pump Trip Criteria	**NOTE:** It is expected that NCP Trip Criteria will apply.

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
		IF all the following conditions are satisfied, THEN trip all NC pumps while maintaining seal injection flow: (1) At least one NV or NI pump on, (2) NC subcooling based on core exit T/Cs less than or equal to 0°F, (3) Reactor power less than 5%.	
		CA Suction Sources (CA storage tank (water tower) goes below 1.5 ft – Not expected)	
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	**NOTE:** The BOP will monitor these conditions.
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	
		Ruptured S/G Aux Feedwater Isolation Criteria (Not expected)	
		Faulted S/G Aux Feedwater Isolation Criteria (Not expected)	
	RO	(Step 2) Check Reactor Trip:	**Immediate Action**
		• All rod bottom lights – LIT	
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 3) Check Turbine Trip:	**Immediate Action**
		• All throttle valves – CLOSED.	**NOTE:** The turbine has failed to trip.
	RO	(Step 3 RNO) Perform the following:	**Immediate Action**
		• Trip turbine.	

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Event Description:	**Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**						

Time	Pos.	Expected Actions/Behavior	Comments
		• IF turbine will not trip, THEN…	
	BOP	(Step 4) Check 1ETA and 1ETB – ENERGIZED.	**Immediate Action**
	RO/ BOP	(Step 5) Check if S/I is actuated:	**Immediate Action**
		• “SAFETY INJECTION ACTUATED” status light (1SI-18) – LIT.	
		• Both LOCA Sequencer Actuated status lights (1SI-14) – LIT.	
	CRS	(Step 6) Announce “Unit 1 Safety Injection”.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement that U1 Safety Injection has been actuated. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 7) Check all Feedwater Isolation status lights (1SI-4) – LIT.	
	BOP	(Step 8) Check Phase A “RESET” lights – DARK.	
	BOP	(Step 9) Check ESF Monitor Light Panel on energized train(s):	
		• Groups 1, 2, 5 – DARK.	
		• Group 3 – LIT.	
		• Group 4 – LIT AS REQUIRED.	**NOTE:** NI-9/10 failed to OPEN, and the 1A/1B NI Pumps failed to start.

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
		(Step 9d RNO) Align or start components as required.	**NOTE:** The BOP will need to manually open NI-9/10, and start the 1A/1B NI Pumps.
		• Group 6 – LIT.	
		• GO TO Step 10.	
	RO/ BOP	(Step 10) Check proper CA pump status:	
		• MD CA pumps – ON	
		• N/R level in at least 3 S/Gs – GREATER THAN 17%.	
	BOP	(Step 11) Check all KC pumps - ON	
	BOP	(Step 12) Check both RN pumps – ON.	
	CRS	(Step 13) Notify Unit 2 to perform the following:	**Floor Instructor:** As U2 RO report “2A RN Pump is running.”
		• Start 2A RN pump.	
		• THROTTTLE Unit 2 RN flow to minimum for existing plant conditions.	**Booth Instructor:** **insert LOA-RN087 (Start 2A RN Pump)** **insert LOA-RN083 8050.000000 delay=0 ramp=10 (Unit 2 Train A Demand Flow)**
	RO	(Step 14) Check all S/G pressures – GREATER THAN 775 PSIG.	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 15) Check Containment Pressure – HAS REMAINED LESS THAN 3 PSIG.	**NOTE:** Containment pressure is ≈0.2 psig, and slowly rising due to the PRT Rupture Disc rupturing.
	BOP	(Step 16) Check S/I flow:	
	BOP	• Check “NV PMPS TO COLD LEG FLOW” gauge – INDICATING FLOW.	**NOTE:** 1NI-9/10 may still be closed. If so, the RNO will be performed.
		(Step 16.a RNO) Start NV pump(s) and align valves.	
		• (Step 16.b) Check NC pressure – LESS THAN 1600 PSIG.	
		• Check NI pumps – INDICATING FLOW.	**NOTE:** Both NI Pumps may still be OFF. If so, the RNO will be performed.
		(Step 16.c RNO) Start NI pumps and align valves.	
	RO	• (Step 16.d) Check NC pressure – LESS THAN 275 PSIG.	
	BOP	(Step 16.d RNO) Perform the following:	
		• Ensure ND pump miniflow valve on running pump(s) OPEN:	
		• 1ND-68A (1A ND Pump & Hx Mini Flow Isol)	
	CRS	• IF valve(s) open on all running ND pumps, THEN GO TO Step 17.	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 17) Notify OSM or other SRO to perform EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 22 (OSM Actions Following an S/I) within 10 minutes.	**NOTE:** The CRS may ask OSM to address. If so, **Floor Instructor** acknowledge as OSM.
	RO/ BOP	(Step 18) Check CA flow:	
		• Total CA flow – GREATER THAN 450 GPM.	
		• Check VI header pressure – GREATER THAN 60 PSIG.	
		• WHEN each S/G N/R level is greater than 11% (32% ACC), THEN control CA flow to maintain that S/G N/R level between 11% (32% ACC) and 50%.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
			NOTE: The use of adverse Containment numbers is required if Containment Pressure is > 3 psig.
	RO	(Step 19) Check NC temperatures:	
		• IF all NC pumps on, THEN check NC T-Avg – STABLE OR TRENDING TO 557ºF.	**NOTE:** The NC Pumps are likely OFF.
		OR	
		• IF all NC pumps off, THEN check NC T-Colds – STABLE OR TRENDING TO 557°F.	**NOTE:** Tavg and/Tcolds may be < 557°F, but also stable. If so, **Examiners** move to **Step 20 of E-0**.
	RO	(Step 19 RNO) Perform the following based on plant conditions:	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
		• IF temperature less than 557°F AND going down, THEN attempt to stop cooldown PER Enclosure 3 (Uncontrolled NC System Cooldown).	**NOTE:** The cooldown may be under control, and Enclosure 3 may NOT be needed. **NOTE:** If needed, the CRS may assign the RO to perform this action. If so, **RO Examiner** follow actions of Enclosure 3. **Other Examiners** follow **E-0** Actions, **Step 20**, on **Page 44**.
E-0, REACTOR TRIP OR SAFETY INJECTION ENCLOSURE 3, UNCONTROLLED NC SYSTEM COOLDOWN			
	RO	(Step 1) Check steam dump valves – CLOSED.	**Examiner NOTE:** Follow the actions associated with Enclosure 3 if RO is assigned by CRS to perform.
	RO	(Step 1 RNO) CLOSE steam dump valves as follows:	
		• Place “STM PRESS CONTROLLER” in manual.	
		• Adjust “STM PRESS CONTROLLER” output to 0%.	
		• Place “STEAM DUMP SELECT” in steam pressure mode.	
		• IF steam dumps still open…	**NOTE:** The Steam Dump Valves will be CLOSED.
	RO	(Step 2) Check all SM PORVs – CLOSED.	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 3) Check MSR "RESET" light – LIT.	
	RO	(Step 4) Check any NC pump – ON.	**NOTE:** It is likely that the NCPs will be OFF.
	RO	(Step 4 RNO) Perform the following:	
		• IF any NC T-Cold is still going down, THEN GO TO Step 6.	
	RO	(Step 6) Control feed flow as follows:	**NOTE:** The use of adverse Containment numbers is required if Containment Pressure is > 3 psig.
		• IF S/G N/R level is less than 11% (32% ACC) in all S/Gs…	
		• WHEN N/R level is greater than 11% (32% ACC) in at least one S/G, THEN THROTTLE feed flow further to:	
		• Minimize cooldown	
		• Maintain at least one S/G N/R level greater than 11% (32% ACC).	
	RO	(Step 7) Check MSIVs – ANY OPEN.	**NOTE:** All MSIVs are CLOSED.
	RO	(Step 8) CLOSE 1SM-15 (U1 SM TO MSR 2nd Stg Tube Bundles Isol).	
	RO	(Step 9) Check any NC pump - ON	**NOTE:** It is likely that the NCPs will be OFF.
	RO	(Step 9 RNO) Perform the following:	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
		• IF any NC T-Cold is still going down,…	**NOTE:** It is expected that NC Tcolds will be stabilized.
		• IF cooldown stopped, THEN exit this enclosure.	
E-0, REACTOR TRIP OR SAFETY INJECTION			
			Examiner NOTE: Examiners following the **CRS/BOP** continue **HERE**.
	BOP	(Step 20) Check Pzr PORV and spray valves:	
		• All Pzr PORVs – CLOSED.	**NOTE:** 1NC-34A is OPEN.
	BOP	(Step 20.a RNO) IF Pzr pressure less than 2315 PSIG, THEN perform the following:	
		• CLOSE Pzr PORV(s)	**NOTE:** All attempts to Close 1NC-34A have failed.
		• IF any Pzr PORV cannot be closed, THEN perform the following:	
		• CLOSE its isolation valve.	**NOTE:** All attempts to Close the 1NC-34A Block Valve have failed.
		• CLOSE the following valve(s):	
		• IF 1NC-34A (U1 Pzr PORV) failed, THEN CLOSE 1NC-270 (PZR PORV Drn Isol For 1NC-34A).	
		• IF PORV isolation valve cannot be closed, THEN perform the following:	
		• Align N2 to all PORVs by OPENING the following valves:	
		• 1NI-430A (Emerg N2 From CLA To 1NC-34A).	
		• CLOSE Pzr PORV.	**NOTE:** When N2 is aligned the PORV will Close.

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
Booth Operator Instructions:			**Modify REM NC-0034A = 0 (1NC-34A will CLOSE)**
		• IF any Pzr PORV cannot be closed or isolated, THEN……	
<u>Critical Task:</u> **Close the failed open PORV before exiting E-0.** Safety Significance: Failure to close a failed Pzr PORV using the nitrogen supply system in the Step 20 of E-0, when able to do so, when coupled with a failure of Safety Injection to automatically actuate, constitutes a degraded fission product barrier that would not have otherwise occurred if the task were performed correctly (Performance of the task will effectively stop the on-going LOCA). The inaction by the operator constitutes a significant reduction of safety margin beyond that irreparably introduced by the scenario.			
	BOP	(Step 20.b) Normal Pzr spray valves - CLOSED	
	BOP	(Step 20.c) At least one Pzr PORV isolation valve – OPEN.	
	RO	(Step 21) Check NC subcooling based on core exit T/Cs – GREATER THAN 0ºF.	**NOTE:** NCS Subcooling is ≈ NEGATIVE 15°F.
	BOP	(Step 21 RNO) IF at least one NV or NI pump on, THEN stop all NC pumps while maintaining seal injection flow.	**NOTE:** The NC Pumps are OFF.
	RO	(Step 22) Check if main steamlines intact:	
		• All S/G pressures – STABLE OR GOING UP	
		• All S/Gs – PRESSURIZED.	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
	RO/ BOP	(Step 23) Check if S/G tubes intact:	
		• The following secondary EMFs – NORMAL:	
		• 1EMF-33 (Condenser Air Ejector Exhaust)	
		• 1EMF-34(L) (S/G Sample (Lo Range))	
		• 1EMF-24 (S/G A)	
		• 1EMF-25 (S/G B)	
		• 1EMF-26 (S/G C)	
		• 1EMF-27 (S/G D)	
		• S/G levels – STABLE OR GOING UP IN A CONTROLLED MANNER.	
	BOP	(Step 24) Check if NC System intact as follows:	
		• 1EMF-38(L) (Containment Particulate (LR)) - NORMAL	
		• 1EMF-39(L) (Containment Gas (Lo Range)) - NORMAL	
		• 1EMF-40 (Containment Iodine) - NORMAL	
		• Check containment pressure – LESS THAN 1 PSIG.	**NOTE:** Containment pressure is likely less than 3 psig.
		• Check containment sump level – NORMAL.	
	RO/ BOP	(Step 25) Check S/I termination criteria:	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
		• NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	
		• Secondary heat sink:	
		• N/R level in at least one S/G - GREATER THAN 11%	
		OR	
		• Total feed flow to S/Gs – GREATER THAN 450 GPM.	
		• NC pressure - STABLE OR GOING UP.	
		• Pzr level - GREATER THAN 11%.	
	BOP	(Step 26) Reset the following:	
		• S/I.	
		• Sequencers.	
	BOP	(Step 27) Stop all but one NV pump.	
	RO/ BOP	(Step 28) Check NC pressure - STABLE OR GOING UP.	
	BOP	(Step 29) Isolate NV S/I flowpath as follows:	
		• Check NV pumps miniflow valves - OPEN:	**NOTE:** The CRS may perform the RNO if these valves are closed. Otherwise, perform Step 29.b.
		• 1NV-150B (U1 NV Pump Recirc Isol)	
		• 1NV-151A (U1 NV Pump Recirc Isol).	
	BOP	(Step 29 RNO) Perform the following:	
		• OPEN valves.	

Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	• IF both valves open, THEN GO TO Step 29.b.	
	BOP	(Step 29.b) CLOSE the following valves:	
		• 1NI-9A (NC Cold Leg Inj From NV)	
		• 1NI-10B (NC Cold Leg Inj From NV).	
	BOP	(Step 30) Establish charging as follows:	
		• Check VI header pressure - GREATER THAN 60 PSIG.	
		• THROTTLE 1NV-238 (U1 Charging Hdr Control) to maintain 6-10 GPM seal injection flow to each NC pump.	
		• CLOSE 1NV-241 (U1 Seal Water Inj Flow Control).	
		• Check one of the following valves - OPEN:	
		• 1NV-13B (U1 NV Supply To 1A NC Loop Isol)	
		OR	
		• 1NV-16A (U1 NV Supply To 1D NC Loop Isol).	
		• Check 1NV-21A (U1 NV Supply to U1 Aux PZR Spray Isol) - CLOSED.	
		• OPEN the following valves:	
		• 1NV-244A (U1 Charging Hdr Cont Outside Isol)	
		• 1NV-245B (U1 Charging Hdr Cont Outside Isol).	
		• WHEN controlling NV flow in subsequent steps, THEN maintain flow within the following limits while THROTTLING charging and seal injection control valves:	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
		• Charging flow - LESS THAN 200 GPM	
		• Seal injection flow to each NC pump - 6-10 GPM.	
	BOP	(Step 31) Control charging flow as follows:	
		• Control charging flow as required to maintain Pzr level stable.	
		• Check Pzr level - STABLE OR GOING UP.	
	BOP	(Step 32) Reset the following:	
		• Phase A Isolation.	
		• Phase B Isolation.	
	BOP	(Step 33) Establish VI to containment as follows:	
		• OPEN the following valves:	
		• 1VI-129B (VI Supply to A Cont Ess VI Hdr Outside Isol).	
		• 1VI-160B (VI Supply to B Cont Ess VI Hdr Outside Isol).	
		• 1VI-150B (Lwr Cont Non-Ess Cont Outside Isol).	
		• Check VI header pressure - GREATER THAN 85 PSIG.	
	RO/ BOP	(Step 34) Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
	RO/ BOP	(Step 35) WHEN EP/1/A/5000/ES-1.1 (Safety Injection Termination) is implemented in next step, THEN monitor its Foldout page.	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
		S/I Reinitiation Criteria (Applies after Step 10 in body of this procedure): (Not Expected)	
		Secondary Integrity Criteria: (Not Expected)	
		Cold Leg Recirc Switchover Criteria: (Not Expected)	
		CA Suction Sources: (Not Expected)	
	CRS	(Step 36) GO TO Step 9 of EP/1/A/5000/ES-1.1 (Safety Injection Termination).	
			NOTE: The CRS will transition to ES-1.1.
EP/1/A/5000/ES-1.1, SAFETY INJECTION TERMINATION			
	RO/ BOP	(Step 9) Check if NI pumps should be stopped:	
		• Check NC pressure –	
		• STABLE OR GOING UP	
		• GREATER THAN 1600 PSIG.	
		• Stop NI pumps.	
	CRS	• GO TO Step 10.	
	BOP	(Step 10) Check if ND pumps should be stopped:	**NOTE:** The 1B ND Pump is OOS and the 1A ND Pump tripped on startup.
		• Check any ND pump - ON.	
	CRS	(Step 10.a RNO) GO TO Step 11.	
	RO/ BOP	(Step 11) Check S/I flow not required:	
		• NC subcooling based on core exit T/Cs - GREATER THAN 0°F.	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
		• Pzr level - GREATER THAN 11% (29% ACC).	
	RO	(Step 12) Check steam dumps:	
		• Check condenser available as follows:	
		• "C-9 COND AVAILABLE FOR STEAM DUMP" status light (1SI-18) - LIT.	
		• MSIVs on intact S/Gs - OPEN.	
		• Perform the following to place steam dumps in steam pressure mode:	
		• Place "STM PRESS CONTROLLER" in manual.	
		• Adjust "STM PRESS CONTROLLER" output to equal "STEAM DUMP DEMAND" signal.	
		• Place "STEAM DUMP SELECT" in steam pressure mode.	
		• Check "P-12 LO-LO TAVG" status light (1SI-18) - DARK.	
	RO	(Step 12.c RNO) Place steam dumps in bypass interlock.	**NOTE:** The CRS may perform the RNO if P-12 is LIT. Otherwise, perform Step 12.d.
	RO	• (Step 12.d) Control steam dumps to maintain NC T-Hots - STABLE.	
		• IF AT ANY TIME "STEAM HEADER PRESSURE" is between 1090-1095 PSIG AND auto control desired, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• Ensure "STM PRESS CONTROLLER" setpoint at 1090-1095 PSIG.	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
		• Place "STM PRESS CONTROLLER" in auto.	
		• Ensure steam dumps control steam header pressure between 1090-1095 PSIG.	
	CRS	• GO TO Step 13.	
	RO	(Step 13) Check NC T-Hots - STABLE.	
	BOP	(Step 14) Check if letdown can be established:	
		• Pzr level - GREATER THAN 25% (50% ACC).	
		• Check ND pumps - OFF.	
		• OPEN the following valves:	
		• 1KC-1A (Trn A Aux Bldg Non Ess Ret Isol)	
		• 1KC-2B (Trn B Aux Bldg Non Ess Ret Isol).	
		• Monitor the following while aligning KC to aux bldg non essential header:	
		• KC surge tank levels	
		• KC System flow.	
		• Place the following in "AUTO" for the operating KC train(s):	
		• 1KC-51A (Train A Recirc Isol)	
		• 1KC-54B (Train B Recirc Isol).	
		• Check 1KC-1A - OPEN.	
		• Perform the following concurrently:	
		• CLOSE 1KC-56A (1A ND Hx KC Inlet Isol)	

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Event Description: **Pzr PORV 1NC-34A fails OPEN/Turbine fails to Automatically Trip/Block Valve fails OPEN/SI Injection Valves NI-9/10 fail to AUTO OPEN/Both NI Pumps fail to AUTO Start/1A ND Pump trips/ Pzr PORV 1NC-34A reseats**

Time	Pos.	Expected Actions/Behavior	Comments
		• As flow goes down, OPEN 1KC-50A (Trn A Aux Bldg Non Ess Sup Isol).	
		• Check 1KC-2B - OPEN.	
		• Perform the following concurrently:	
		• CLOSE 1KC-81B (1B ND Hx KC Inlet Isol)	
		• As flow goes down, OPEN 1KC-53B (Trn B Aux Bldg Non Ess Sup Isol).	
NOTE Resetting modulating valves establishes control of RN to KC Hx control valves.			
		• (Step 14.j) Reset modulating valves using reset buttons on RN control board.	
		• Check the following:	
		• 1EMF-51A (Containment Train A (Hi Range)) - LESS THAN 25 R/HR	
		• 1EMF-51B (Containment Train B (Hi Range)) - LESS THAN 25 R/HR.	
		• Establish letdown PER EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 1 (Establishing Normal Letdown) while continuing in procedure.	
	BOP	(Step 14.l RNO) Perform the following:	
		• Establish excess letdown PER EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 2 (Establishing Excess Letdown).	
At the discretion of the Lead Examiner terminate the exam.			

UNIT 1 STATUS:

Power Level: 55% NCS [B] 1814 ppm Pzr [B]: 1814 ppm Xe: Per OAC

Power History: Reduced from 100% power to support Transformer Maintenance Core Burnup: 25 EFPDs

UNIT 2 STATUS:

Power Level: 100%

CONTROLLING PROCEDURE: OP/1/A/6100/003 Controlling Procedure for Unit Operation

OTHER INFORMATION NEEDED TO ASSUME THE SHIFT:

- The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift.
- It is planned to raise power on this shift to 100%.

The following equipment is Out-Of-Service:

- The 1B ND Pump is OOS due to an oil leak. ACTION has been taken in accordance with Technical Specification LCO 3.5.2 ACTION A.1.
- 1EMF46A, Train A KC Radiation Monitor, failed last shift (IAE is investigating).
- MCB Annunciator 1AD-12, C-3, “A RN PUMP SUCTION LO PRESS,” will not ILLUMINATE (IAE is investigating).

Crew Directions:

- The crew will raise power to 100% on this shift, starting with Step 3.36.10 of Enclosure 4.1 of OP/1/A/6100/003 Controlling Procedure for Unit Operation.
- The loading rate will be 2-3 MWe/minute.
- The RE recommends 100% Control Rod position of 215 steps on Control Bank D.
- RE has recommended a 200-gallon initial dilution using Enclosure 4.4 (Alternate Dilute) of OP/1/A/6150/009 (Boron Concentration Control).
- RMWST Dissolved O_2 is less than 1000 ppb.
- Blender content is Reactor Makeup Water.

Work Control SRO/Offsite Communicator **Jim**

Plant SRO **Joe (FB)**

AO's AVAILABLE

Unit 1	**Unit 2**
Aux Bldg. John	**Aux Bldg. Chris**
Turb Bldg. Bob (FB)	**Turb Bldg. Mike (FB)**
5th Rounds. Carol	

Extra(s) Bill (FB) Ed (FB) Wayne (FB) Tanya Gus (RW)

Facility:	**McGuire**	Scenario No.: **4**	Op Test No.: **N18-1**
Examiners:	______________	Operators:	______________ (SRO)
	______________		______________ (RO)
	______________		______________ (BOP)

Initial Conditions:	The plant is at 4x10^{-3} RTP (BOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.
Turnover:	The following equipment is Out-Of-Service: The 1B OAPT Fan is OOS due to a Motor failure. ACTION has been taken in accordance with Technical Specification LCO 3.7.9 ACTION A.1. 1KFT-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-1, B-9, "TURBINE OVER SPEED (111%) TURB TRIP," has failed ILLUMINATED (IAE is investigating). An Ice Condenser Intermediate Door Inspection is on-going. It is planned to raise power on this shift to 3.5-4%.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	R-RO N-BOP N(TS)-SRO	Raise Power to 3.5-4%/Ice Condenser Door Failure
2	MAL ENB009A	I-BOP I(TS)-SRO	N31/N35 High Voltage failure
3	MAL EMF-34L LOA BB019	I-RO I-SRO	1EMF-34 fails HIGH/Failure of SG Blowdown Flow Control Valve to Auto CLOSE
4	MAL SM001A	C-BOP C-SRO	1A SG PORV fails OPEN (No Manual Control)
5	MAL NCP012D NCP013G/H NCP014G/H NCP015G/H NCP016G/H	C-RO C-BOP C-SRO	High Vibration on 1D NCP
6	MAL SG001C	M-RO M-BOP M-SRO	1C Steam Generator Tube Rupture
7	REM NC0027C NC0029C	C-BOP C-SRO	Pzr Spray Valves fail to CLOSE (After Manual Opening)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2018 NRC Scenario #4

The plant is at $4x10^{-3}$ RTP (BOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.

The following equipment is Out-Of-Service: The 1B OAPT Fan is OOS due to a Motor failure. ACTION has been taken in accordance with Technical Specification LCO 3.7.9 ACTION A.1. 1KFT-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-1, B-9, “TURBINE OVER SPEED (111%) TURB TRIP,” has failed ILLUMINATED (IAE is investigating). An Ice Condenser Intermediate Door Inspection is on-going. It is planned to raise power on this shift to 3.5-4%.

Shortly after taking the watch, the operator will raise power to 3.5-4% in accordance with Step 3.16 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, “Controlling Procedure for Unit Operation.” While raising power the operator will start a Steam Generator Blowdown Pump in accordance with OP/1/A/6250/008, “Steam Generator Blowdown.” During the power change, operators in Containment will report that three Ice Condenser Intermediate Doors are blocked closed and inoperable. The operator will address Technical Specification LCO 3.6.13, “Ice Condenser Doors.”

Following this, the Channel N31/N35 high voltage will fail. The operator will enter AP/1/A/5500/16, “Malfunction of Nuclear Instrumentation,” and perform Case II, “Intermediate Range Malfunction,” and then Case I, “Source Range Malfunction.” The operator will address Technical Specification LCO 3.3.1, “Reactor Trip Instrumentation.”

Subsequently, 1EMF-34, S/G Sample Radiation Monitor, will fail HIGH, however, one of the SG Blowdown Control Valves will NOT automatically close. The operator will respond in accordance with OP/1/A/6100/010 Q, “Annunciator Response for 1RAD-1,” C3, 1EMF 34 S/G SAMPLE HI RAD, and manually close the valve. The operator may enter Case I of AP/1/A/5500/10, “NC System Leakage Within the Capacity of Both NV Pumps.” The crew will determine that the alarm is due to a failure, and NOT an actual high radioactivity condition.

Afterwards, the 1A Steam Generator PORV will fail OPEN. The operator will respond in accordance with AP/1/A/5500/01, “Steam Leak,” to isolate the PORV and maintain reactor power stable.

After this, a high vibration condition will develop on the 1D NCP. The operator will respond in accordance with OAC Alarm M1D3041, 1D NC PUMP VIBRATION (HALM), and enter AP/1/A/5500/08, “Malfunction of NC Pump.” Ultimately, the vibration condition will rise above the Hi-Hi threshold requiring tripping of the reactor and stopping the NCP. The operator will manually trip the reactor and enter EP/1/A/5000/E-0, “Reactor Trip or Safety Injection.”

Upon the reactor trip, a 350 gpm Steam Generator Tube Rupture will occur on the 1C SG and the operator will actuate Safety Injection. Upon completion of E-0, the operator will transition to EP/1/A/5000/E-3, “Steam Generator Tube Rupture,” to isolate the flow into and out of the 1C Steam Generator and then conduct a cooldown and depressurization of the NC System.

While performing an NCS depressurization using normal spray, both Pzr Spray Valves will stick OPEN on completion of the depressurization; and the operator will be required to stop both the 1A and 1B NCPs.

The scenario will terminate at Step 22.c of E-3, after the crew has closed the Cold Leg Isolation Valves from the NV System.

<u>Critical Tasks:</u>

Isolate feedwater flow into and steam flow from the ruptured SG so that minimum ΔP between ruptured Steam Generator and intact Steam Generators is not less than 250 psid once target temperature is reached (Entry into ECA-3.1).

Safety Significance: Failure to isolate the ruptured SG causes a loss of ΔP between the ruptured SG and the intact SGs. Upon a loss of ΔP, the crew must transition to a contingency procedure that constitutes an incorrect performance that "necessitates the crew taking compensating action which complicates the event mitigation strategy." If the crew fails to isolate steam from the SG, or feed flow into the SG the ruptured SG pressure will tend to decrease to the same pressures as the intact SGs, requiring a transition to a contingency procedure, and delaying the stopping of RCS leakage into the SG.

Establish/maintain an NCS temperature so that transition from E-3 does not occur because the RCS temperature is either too high to maintain minimum required subcooling of 20°F or too low creating an Orange Path condition on the NCS Integrity Critical Safety Function.

Safety Significance: Failure to establish and maintain the correct NCS temperature during a SGTR leads to a transition from E-3 to a contingency ERG. This failure constitutes an incorrect performance that "necessitates the crew taking compensating action that would complicate the event mitigation strategy."

Depressurize the NCS to meet SI termination criteria before the Quality of the steam exiting the SG exceeds 80% (≤0.8 on Void Fraction SGINFO.cts).

Safety Significance: Failure to stop the reactor coolant leakage into a ruptured SG by depressurizing the RCS (when it is possible to do so) needlessly complicates the mitigation of the event. It also constitutes a "significant reduction of Safety Margin beyond that irreparably introduced by the scenario. If NCS depressurization does NOT occur, the inventory in the secondary side of the ruptured SG will rise to the level of the Main Steam Lines leading to water release through the SG PORV or Safety Valve, which could cause and unisolable fault in the ruptured SG.

PROGRAM: McGuire Operations Training

MODULE: Initial License Operator Training Class ILT 18-1

TOPIC: NRC Simulator Exam

Scenario N18-1-4

REFERENCES:

1. Technical Specification LCO 3.7.9, "Control Room Area Ventilation System (CRAVS)" (Amendment 282/261)
2. PT/1/A/4200/014 A, "Ice Condenser Intermediate Deck Door and Monitoring System Inspection" (Rev 19)
3. OP/1/A/6100/003, "Controlling Procedure for Unit Operation" (Rev 201)
4. OP/1/A/6250/008, "Steam Generator Blowdown" (Rev 90)
5. Technical Specification LCO 3.6.13, "Ice Condenser Doors" (Amendment 292/271)
6. AP/1/A/5500/16, "Malfunction of Nuclear Instrumentation" (Rev 15)
7. Technical Specification LCO 3.3.1, "Reactor Trip Instrumentation" (Amendment 184/166)
8. AP/1/A/5500/10, "NC System Leakage Within the Capacity of Both NV Pumps" (Rev 23)
9. OP/1/A/6100/010 Q, "Annunciator Response for 1RAD-1" (Rev 67)
10. AP/1/A/5500/01, "Steam Leak" (Rev 18)
11. AP/1/A/5500/08, "Malfunction of NC Pump" (Rev 17)
12. EP/1/A/5000/E-0, "Reactor Trip or Safety Injection" (Rev 36)
13. EP/1/A/5000/E-3, "Steam Generator Tube Rupture" (Rev 26)

Validation Time: 131 minutes

Author: David Lazarony, Essential Training & Consulting, LLC

Facility Review: ________________________

Rev. 010818

McGuire 2018 NRC Scenario #4 Objectives:

Given the simulator at an initial condition of $4x10^{-3}$ % RTP power with a power increase to 3.5-4% planned, evaluate:

1. the SRO's ability to supervise the control room team during the normal, abnormal, and emergency situations that arise, including compliance with all facility procedures, Technical Specifications, and other commitments.

2. each crew member's ability to effectively communicate as part of a control room team during the normal, abnormal, and emergency situations that arise.

3. the RO and BOP's ability to effectively raise power in accordance with Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation."

4. each crew member's ability to effectively diagnose an Intermediate/Source Range Nuclear Instrumentation Channel, and the BOP's ability to respond to such an event in accordance with AP/1/A/5500/16, "Malfunction of Nuclear Instrumentation."

5. each crew member's ability to effectively diagnose a high failure of Radiation Monitor 1EMF-34 and an accompanying failure of its automatic functions to occur; and the RO's ability to respond to such an event in accordance with Annunciator Response Procedures.

6. each crew member's ability to effectively diagnose a Stuck OPEN SG PORV with no manual control; and the RO's ability to respond to such an event in accordance with AP/1/A/5500/01, "Steam Leak."

7. each crew member's ability to effectively diagnose a high vibration condition occurring on an NC Pump requiring a pump trip; and the RO's and BOP's ability to respond to such an event in accordance with AP/1/A/5500/08, "Malfunction of NC Pump."

8. each crew member's ability to effectively diagnose a Steam Generator Tube Rupture, and the RO and BOP's ability to respond to such an event in accordance with EP/1/A/5000/E-0, "Reactor Trip or Safety Injection," and EP/1/A/5000/E-3, "Steam Generator Tube Rupture."

9. each crew member's ability to effectively diagnose a failure of the Pressurizer Spray Valves to close after the NCS depressurization during a SGTR, and the BOP's ability to respond to such an event in accordance with EP/1/A/5000/E-3, "Steam Generator Tube Rupture."

Facility:	McGuire	Scenario No.:	4	Op Test No.:	N18-1
Examiners:		Operators:			(SRO)
					(RO)
					(BOP)

Initial Conditions:	The plant is at 4×10^{-3} RTP (BOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.
Turnover:	The following equipment is Out-Of-Service: The 1B OAPT Fan is OOS due to a Motor failure. ACTION has been taken in accordance with Technical Specification LCO 3.7.9 ACTION A.1. 1KFT-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-1, B-9, "TURBINE OVER SPEED (111%) TURB TRIP," has failed ILLUMINATED (IAE is investigating). An Ice Condenser Intermediate Door Inspection is on-going. It is planned to raise power on this shift to 3.5-4%.
Critical Tasks:	See Below

Event No.	Malf. No.	Event Type*	Event Description
1	NA	R-RO N-BOP N(TS)-SRO	Raise Power to 3.5-4%/Ice Condenser Door Failure
2	MAL ENB009A	I-BOP I(TS)-SRO	N31/N35 High Voltage failure
3	MAL EMF-34L LOA BB019	I-RO I-SRO	1EMF-34 fails HIGH/Failure of SG Blowdown Flow Control Valve to Auto CLOSE
4	MAL SM001A	C-BOP C-SRO	1A SG PORV fails OPEN (No Manual Control)
5	MAL NCP012D NCP013G/H NCP014G/H NCP015G/H NCP016G/H	C-RO C-BOP C-SRO	High Vibration on 1D NCP
6	MAL SG001C	M-RO M-BOP M-SRO	1C Steam Generator Tube Rupture
7	REM NC0027C NC0029C	C-BOP C-SRO	Pzr Spray Valves fail to CLOSE (After Manual Opening)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

McGuire 2018 NRC Scenario #4

The plant is at $4x10^{-3}$ RTP (BOL). The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift. Unit 2 is at 100% power.

The following equipment is Out-Of-Service: The 1B OAPT Fan is OOS due to a Motor failure. ACTION has been taken in accordance with Technical Specification LCO 3.7.9 ACTION A.1. 1KFT-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating) and MCB Annunciator 1AD-1, B-9, “TURBINE OVER SPEED (111%) TURB TRIP,” has failed ILLUMINATED (IAE is investigating). An Ice Condenser Intermediate Door Inspection is on-going. It is planned to raise power on this shift to 3.5-4%.

Shortly after taking the watch, the operator will raise power to 3.5-4% in accordance with Step 3.16 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, “Controlling Procedure for Unit Operation.” While raising power the operator will start a Steam Generator Blowdown Pump in accordance with OP/1/A/6250/008, “Steam Generator Blowdown.” During the power change, operators in Containment will report that three Ice Condenser Intermediate Doors are blocked closed and inoperable. The operator will address Technical Specification LCO 3.6.13, “Ice Condenser Doors.”

Following this, the Channel N31/N35 high voltage will fail. The operator will enter AP/1/A/5500/16, “Malfunction of Nuclear Instrumentation,” and perform Case II, “Intermediate Range Malfunction,” and then Case I, “Source Range Malfunction.” The operator will address Technical Specification LCO 3.3.1, “Reactor Trip Instrumentation.”

Subsequently, 1EMF-34, S/G Sample Radiation Monitor, will fail HIGH, however, one of the SG Blowdown Control Valves will NOT automatically close. The operator will respond in accordance with OP/1/A/6100/010 Q, “Annunciator Response for 1RAD-1,” C3, 1EMF 34 S/G SAMPLE HI RAD, and manually close the valve. The operator may enter Case I of AP/1/A/5500/10, “NC System Leakage Within the Capacity of Both NV Pumps.” The crew will determine that the alarm is due to a failure, and NOT an actual high radioactivity condition.

Afterwards, the 1A Steam Generator PORV will fail OPEN. The operator will respond in accordance with AP/1/A/5500/01, “Steam Leak,” to isolate the PORV and maintain reactor power stable.

After this, a high vibration condition will develop on the 1D NCP. The operator will respond in accordance with OAC Alarm M1D3041, 1D NC PUMP VIBRATION (HALM), and enter AP/1/A/5500/08, “Malfunction of NC Pump.” Ultimately, the vibration condition will rise above the Hi-Hi threshold requiring tripping of the reactor and stopping the NCP. The operator will manually trip the reactor and enter EP/1/A/5000/E-0, “Reactor Trip or Safety Injection.”

Upon the reactor trip, a 350 gpm Steam Generator Tube Rupture will occur on the 1C SG and the operator will actuate Safety Injection. Upon completion of E-0, the operator will transition to EP/1/A/5000/E-3, “Steam Generator Tube Rupture,” to isolate the flow into and out of the 1C Steam Generator and then conduct a cooldown and depressurization of the NC System.

While performing an NCS depressurization using normal spray, both Pzr Spray Valves will stick OPEN on completion of the depressurization; and the operator will be required to stop both the 1A and 1B NCPs.

The scenario will terminate at Step 22.c of E-3, after the crew has closed the Cold Leg Isolation Valves from the NV System.

Critical Tasks:

Isolate feedwater flow into and steam flow from the ruptured SG so that minimum ΔP between ruptured Steam Generator and intact Steam Generators is not less than 250 psid once target temperature is reached (Entry into ECA-3.1).

Safety Significance: Failure to isolate the ruptured SG causes a loss of ΔP between the ruptured SG and the intact SGs. Upon a loss of ΔP, the crew must transition to a contingency procedure that constitutes an incorrect performance that "necessitates the crew taking compensating action which complicates the event mitigation strategy." If the crew fails to isolate steam from the SG, or feed flow into the SG the ruptured SG pressure will tend to decrease to the same pressures as the intact SGs, requiring a transition to a contingency procedure, and delaying the stopping of RCS leakage into the SG.

Establish/maintain an NCS temperature so that transition from E-3 does not occur because the RCS temperature is either too high to maintain minimum required subcooling of 20°F or too low creating an Orange Path condition on the NCS Integrity Critical Safety Function.

Safety Significance: Failure to establish and maintain the correct NCS temperature during a SGTR leads to a transition from E-3 to a contingency ERG. This failure constitutes an incorrect performance that "necessitates the crew taking compensating action that would complicate the event mitigation strategy."

Depressurize the NCS to meet SI termination criteria before the Quality of the steam exiting the SG exceeds 80% (≤0.8 on Void Fraction SGINFO.cts).

Safety Significance: Failure to stop the reactor coolant leakage into a ruptured SG by depressurizing the RCS (when it is possible to do so) needlessly complicates the mitigation of the event. It also constitutes a "significant reduction of Safety Margin beyond that irreparably introduced by the scenario. If NCS depressurization does NOT occur, the inventory in the secondary side of the ruptured SG will rise to the level of the Main Steam Lines leading to water release through the SG PORV or Safety Valve, which could cause and unisolable fault in the ruptured SG.

SIMULATOR OPERATOR INSTRUCTIONS

	Bench Mark	ACTIVITY	DESCRIPTION
☐		**Reset to Temp IC 228** **(Base IC-13)**	**Load Simulator File SGINFO.cts (This file will be used to assess the performance of Ruptured SG Overfill Critical Task)** **T = 0 Malfunctions:** **Insert XHV_086_1 = 0 (Override 1B OAPT Fan Breaker Status lights OFF)** **Insert XMT-KF_1KFTT5130 =0 (1KFT-5130, Spent Fuel Pool Temperature)** **Insert OVR-1AD1_B09 = ON (MCB Annunciator 1AD1/B9)** **Insert MAL-SG001C=350** **cd=H_X01_094_2 = 1 (1A RTB Open indicating lamp ON)**
☐		**RUN** **Reset all SLIMs**	**Place Tagout/O-Stick on:** • **1B OAPT Fan** • **1KFTT5130, SFP Temperature Monitor** • **MCB Annunciator 1AD-1, B-9**
☐		**Update** Status Board, **Setup OAC**	**NOTE:** RMWST DO = <1000 ppb.
☐		**Freeze.**	
☐		**Update Fresh Tech. Spec. Log.**	
☐		**Fill out the AO's Available section of Shift Turnover Info.**	
☐	Prior to Crew Briefing	**RUN**	

	Bench Mark	ACTIVITY	DESCRIPTION
☐	**Crew Briefing** 1. Assign Crew Positions based on evaluation requirements 2. Review the Shift Turnover Information with the crew. 3. Provide the crew with a marked up copy (Through Step 3.15) of Enclosure 4.1 (Handout 1) and a blank copy of Enclosure 4.14 of OP/1/A/6100/003 (Handout 2). 4. Provide the crew with a marked up copy (Through Step 3.4.5) of Enclosure 4.1 (Handout 3) of OP/1/A/6250/008. 5. Direct the crew to Review the Control Boards taking note of present conditions, alarms.		
☐	T-0	Begin Familiarization Period	
☐	At direction of examiner	**Execute Simulator Scenario N18-1-4.**	
☐	At direction of examiner	**Event 1** **NA**	Raise Power to 3.5-4%/Ice Condenser Door Failure
☐	At direction of examiner	**Event 2** **insert MALF-ENB009A = LOSS**	N31/N35 High Voltage failure
☐	At direction of examiner	**Event 3** **insert MAL-EMF-34L = 10^7** **insert LOA-BB019 = TRUE** **insert:** **REM-BB0123=0 delay = 2 seconds** **REM-BB0124=0 delay = 2 seconds** **REM-BB0125=0 delay = 2 seconds**	1EMF-34 fails HIGH/Failure of SG Blowdown Flow Control Valve to Auto CLOSE

	Bench Mark	ACTIVITY	DESCRIPTION
☐	At direction of examiner	**Event 4** **Insert MAL-SM001A = 100**	1A SG PORV fails OPEN (No Manual Control)
☐	At direction of examiner	**Event 5** **Insert MAL:** **NCP014G=4.6** **NCP014H=4.6** **(320 Second Ramp to 5.0)** **Insert MAL:** **NCP012D=13** **NCP013G=13** **NCP013H=13** **NCP015G=14.5** **NCP015H=14.5** **NCP016G=12** **NCP016H=12**	High Vibration on 1D NCP **NOTE: All Malfunctions must be deleted when the 1D NCP is stopped.**
☐	At direction of examiner	**Event 6** **Insert MAL-SG001C=350 (No Delay or Ramp)** **cd=H_X01_094_2 = 1 (1A RTB Open indicating lamp ON)**	1C Steam Generator Tube Rupture **NOTE: This event will occur on Rx Trip.**
☐	Post-Rx Trip during NCS depress.	**Event 7** **Insert:** **REM-NC0027C = 1** **REM-NC0029C = 1**	Pzr Spray Valves fail to CLOSE (After Manual Opening) **NOTE: This event will occur when valves are fully opened during NCS depressurization in E-3.**
☐	**Terminate the scenario upon direction of Lead Examiner**		

Op Test No.: N18-1	Scenario # 4	Event # 1	Page 9 of 57
Event Description:	**Raise Power to 3.5-4%/Ice Condenser Door Failure**		

Shortly after taking the watch, the operator will raise power to 3.5-4% in accordance with Step 3.16 of Enclosure 4.1, Power Increase, of OP/1/A/6100/003, "Controlling Procedure for Unit Operation." While raising power the operator will start a Steam Generator Blowdown Pump in accordance with OP/1/A/6250/008, "Steam Generator Blowdown." During the power change, operators in Containment will report that three Ice Condenser Intermediate Doors are blocked closed and inoperable. The operator will address Technical Specification LCO 3.6.13, "Ice Condenser Doors."

Booth Operator Instructions: **NA**

Indications Available: **NA**

Time	Pos.	Expected Actions/Behavior	Comments
OP/1/A/6100/003, CONTROLLING PROCEDURE FOR UNIT OPERATION ENCLOSURE 4.1, POWER INCREASE			
	BOP	(Step 3.16) Perform the following to control NC System temperature until Turbine Generator is paralleled to the grid:	
NOTE Steps 3.16.1 - 3.16.2 should be performed concurrently.			
		• Maintain the following by adjusting setpoint on "STM PRESS CONTROLLER":	
		• Tcold 557 - 559°F	
		• SM Pressure 1060 - 1110 psig	
NOTE • While maintaining Tcold at 557 - 559°F using Steam Dumps, Table 4.14-1 should be used to approximate Tavg for a given Reactor Power level. • Increasing Reactor Power while Turbine Power remains constant will result in Tavg exceeding Program Tref (557°F). (Turbine Inlet Pressure Channels will **NOT** increase until Turbine Generator is paralleled to the grid.)			

Op Test No.:	N18-1	Scenario #	4	Event #	1	Page	10 of 57
Event Description:	**Raise Power to 3.5-4%/Ice Condenser Door Failure**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Refer to Enclosure 4.14 (Reactor Power/Expected Tavg), Table 4.14-1 (Reactor Power/Expected Tavg) for expected Tavg for a given Reactor Power level.	
	BOP	(Step 3.17) IF feedwater flow aligned to CA nozzles, THEN …..	**NOTE:** Feedwater flow is NOT aligned to CA nozzles.
	BOP	(Step 3.18) Ensure in service CF Pump Turbine "LP GOV CNTRL" and "HP GOV CNTRL" in auto.	
NOTE Due to inherent design of BWI S/Gs, S/G WR level will decrease as Reactor Power is increased through 3% RTP.			
	BOP	(Step 3.19) IF AT ANY TIME S/G N/R Level decreases to 28% OR exceeds 52%, THEN perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• IF individual S/G level control problem, THEN perform the following:	
	BOP	• Place affected S/G CF Control Bypass and/or CF Control Valve in manual.	
		• Adjust affected S/G CF Control Bypass or CF Control Valve as required to return affected S/G N/R level to setpoint.	
		• Place affected S/G CF Control Bypass and/or CF Control Valve in auto.	
		• IF all S/G's indicate level control problems, THEN perform either Step 3.19.2.1 or Step 3.19.2.2:	
		• To operate the in service CF Pump Turbine in manual, perform the following:	

Op Test No.:	N18-1	Scenario #	4	Event #	1	Page	11 of 57

Event Description: **Raise Power to 3.5-4%/Ice Condenser Door Failure**

Time	Pos.	Expected Actions/Behavior	Comments
		• Place operating CF Pump Turbine "LP GOV CNTRL" and "HP GOV CNTRL" in manual.	
		• Use CF Pump Turbine "LP GOV CNTRL" increase/decrease pushbuttons to restore associated S/G NR levels to setpoint.	
		• WHEN S/G NR levels normal, THEN place operating CF Pump Turbine "HP GOV CNTRL" in auto.	
		• WHEN in service CF Pump Turbine speed within 50 - 100 rpm of "AUTO SPT" on DCS Feedpump Overview graphic, THEN place "LP GOV CNTRL" in auto.	
		• To operate the in service CF Pump Turbine in "Speed Set" mode, perform the following:	
		• On DCS Feedpump Overview graphic, select "AUTO/SPD" for the in service CF Pump Turbine.	
	BOP	• Select "SPD/SET" in the "AUTO/SPD SETTER SEL" box.	
		• On the in service CF Pump Turbine, adjust "LP GOV CNTRL" auto increase/decrease pushbuttons as required to restore S/G NR levels to setpoint.	
		• WHEN S/G NR levels normal, on DCS Feedpump Overview graphic, THEN select "AUTO/SPD" on the in service CF Pump Turbine.	
		• Select "AUTO" in the "AUTO/SPD SETTER SEL" box to return the in service CF Pump Turbine to auto.	

Op Test No.: N18-1	Scenario # 4	Event # 1	Page 12 of 57
Event Description:	**Raise Power to 3.5-4%/Ice Condenser Door Failure**		

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 3.20) Increase Reactor Power to 2% RTP (2.0 - 2.5%).	**NOTE:** The RO will manually withdrawal Control Rods to raise power.
	CRS	(Step 3.21) WHEN at 2% RTP (2.0 - 2.5%), THEN perform the following:	
		• Evaluate if plant conditions are stable to continue in procedure.	
		• IF plant conditions determined NOT stable, THEN HOLD for a minimum of 10 minutes.	**NOTE:** Plant conditions are expected to be stable.
	RO	(Step 3.22) Ensure BB Pump in service per OP/1/A/6250/008 (Steam Generator Blowdown).	**NOTE:** The BOP will perform Section 3.4 of Enclosure 4.1 of OP/1/A/6250/008 to place the 1A BB Pump in service.
OP/1/A/6250/008, STEAM GENERATOR BLOWDOWN ENCLOSURE 4.1, ESTABLISHING BLOWDOWN			
NOTE BB System conditions at Rx Power less than 1% may prevent proper BB Pump operation.			
	BOP	(Step 3.4.6) IF Reactor Power less than 1%,….	**NOTE:** Rx power is stable at 2.0-2.5%
	BOP	(Step 3.4.7) Check the following:	
		• 1AD-4, A5 (BB Blowoff Tank Lo Level) dark	
		• BB flow indicated on OAC (evidence no Hi Level in BB Tank exists)	
NOTE 1MBBSS5160 (BB Flow Selector Station) is located on BB Demin Panel (near KG Panel). Controller operates 1BB-88 (CM Polish Demin) or 1BB-238 (S/G BB Demineralizers) as determined by path select switch on Main Control Board.			

Op Test No.:	N18-1	Scenario #	4	Event #	1	Page	13 of 57
Event Description:	**Raise Power to 3.5-4%/Ice Condenser Door Failure**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.4.8) Perform the following at 1MBBSS5160 (BB Flow Selector Station):	**NOTE:** The BOP will contact AO John. **Booth Instructor** acknowledge and report that Step 3.4.8 is complete.
		• Place Controller in "M" (Manual).	
		• Adjust output demand to 30% using "VALVE" knob.	
NOTE BB pumps will trip on the following: • BB Tank level less than 8 inches • BB Pump ΔP greater than 311 psid			
	BOP	(Step 3.4.9) Perform the following to slowly fill piping to prevent BB pump from tripping on BB Tank low level:	**NOTE:** The BOP will contact AO John. **Booth Instructor** acknowledge and report that Step 3.4.9 is complete.
		• Close 1BB-199 (U1 BB Regen Hx Inlet Isol) (Located TB1, 760 + 20, 1H25)	
		• Open 1BB-199 (U1 BB Regen Hx Inlet Isol) 1 1/2 turn.	
		• WHEN BB Pump is started in next step, throttle as necessary in 1/2 turn increments 1BB-199 (U1 BB Regen Hx Inlet Isol) to maintain the following:	
		• BB tank level 50% - 65% Tank level as indicated on 1BBP5160 (U1 BB Tank Level) (Elev. 760, 1G-26)	
		• BB Pump DP less than 300 psid as indicated on 1BBPS5820 (1A BB Pump D/P) or 1BBPS5830 (1B BB Pump D/P) (located at base of pump)	
CAUTION Minimum Blowdown flow rate of 8000 - 12000 lbs/hr per loop required to prevent tripping BB Pump on BB Tank lo level {PIP M97-3291}			

Op Test No.:	N18-1	Scenario #	4	Event #	1	Page	14	of	57
Event Description:	**Raise Power to 3.5-4%/Ice Condenser Door Failure**								

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.4.10) IF 1A BB Pump is to be started, perform the following:	**NOTE:** The BOP will contact AO John. **Booth Instructor** acknowledge and report that Step 3.4.10.a is complete.
		• Throttle 1BB-322 (1A BB Blowoff Tank Pump Seal Flow Manual Control Valve) to obtain one of the following:	
		• 2 - 3 gpm on 1BBFG5750 (1A BB Pump Mech Seal Cooler BB Outlet Flow)	
		OR	
		• 100 - 200 psig on 1BBPG5770 (1A BB Pump Mech Seal Cooler BB Outlet Press) Start 1A BB Pump.	
		• Start 1A BB Pump.	**NOTE:** The BOP will start the 1A BB Pump.
CAUTION Minimum Blowdown flow rate of 8000 - 12000 lbs/hr per loop required to prevent tripping BB Pump on BB Tank lo level {PIP M97-3291}			
	BOP	(Step 3.4.11) IF 1B BB Pump is to be started,…..	**NOTE:** The 1B BB Pump is NOT intended to be started.
	BOP	(Step 3.4.12) Ensure 1BB-199 (U1 BB Regen Hx Inlet Isol) full open.	**NOTE:** The BOP will contact AO John. **Booth Instructor** acknowledge and report that Step 3.4.12 is complete.
NOTE • 1MBBSS5160 (BB Flow Selector Station) is located on BB Demin Panel (near KG Panel). Controller operates 1BB-88 (CM Polish Demin) or 1BB-238 (S/G BB Demineralizers) as determined by path select switch on Main Control Board. • Valve 1BB-238 opens at 25% on manual loader. Until 1BB-238 opens, flow is still on 1BB-44 (Unit 1 BB Blowoff Tank Recirc Control) and BB Pump pressure is close to high DP trip setpoint. {PIP-98-2656}			

Op Test No.: N18-1	Scenario # 4	Event # 1	Page 15 of 57
Event Description:	**Raise Power to 3.5-4%/Ice Condenser Door Failure**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3.4.13) Perform the following at 1MBBSS5160 (BB Flow Selector Station):	**NOTE:** The BOP will contact AO John. **Booth Instructor** acknowledge and report that Step 3.4.13 is complete.
		• Adjust BB tank level to 50 - 65% by slowly adjusting "VALVE" knob.	
		• Place Controller in "A" (Auto).	
		• Adjust BB Tank setpoint to control level at 50 - 65% using "SET".	
		• Check auto control maintaining desired tank level.	
	BOP	(Step 3.4.14) IF desired to adjust BB flow,…..	**NOTE:** The BOP will contact AO John. **Booth Instructor** acknowledge and report that Step 3.4.14 is NOT needed.
OP/1/A/6100/003, CONTROLLING PROCEDURE FOR UNIT OPERATION ENCLOSURE 4.1, POWER INCREASE			
	RO	(Step 3.23) Increase Rx Power to 4% RTP (3.5 - 4.0%) as follows:	**NOTE:** The RO will manually withdrawal Control Rods to raise power.
		• Begin power increase to 4% RTP (3.5 - 4.0%).	
BOOTH INSTRUCTOR:		**AFTER the RO has begun rod withdrawal, as an operator in Containment, call the Control Room and report that the Bay 7 Ice Condenser Intermediate Deck Doors 2, 4 and 6 have failed to open freely with reasonable pull force, and per step 12.3.3 of PT/1/A/4200/014 A must be declared inoperable.**	
			NOTE: The CRS will evaluate this condition. **EXAMINER NOTE:** Examiner following the CRS, proceed to **Page 17** for this evaluation.

Op Test No.:	N18-1	Scenario #	4	Event #	1	Page	16 of 57
Event Description:	**Raise Power to 3.5-4%/Ice Condenser Door Failure**						

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS may call WCC to address the door inoperability. If so, **Booth Instructor** acknowledge as WCC.
	BOP	• WHEN greater than 3% RTP, THEN perform the following:	
		• Open:	
		• 1SM-83 (A SM Line Drain)	
		• 1SM-89 (B SM Line Drain)	
		• 1SM-95 (C SM Line Drain)	
		• 1SM-101 (D SM Line Drain)	
NOTE IF the Turbine is placed in manual in the following step, 1AD-1, F4 (Turbine in Manual) will alarm. This is an expected alarm.			
	BOP	• Ensure Turbine in "MANUAL".	
		• Close Governor Valves using "GV Lower".	
NOTE Mode 1 is entered at 5% RTP.			
	CRS	(Step 3.24) WHEN at 4% RTP, THEN perform the following:	
		• Evaluate if plant conditions are stable to continue in procedure.	
		• IF plant conditions determined NOT stable, THEN HOLD for a minimum of 10 minutes.	**NOTE:** Plant conditions are expected to be stable.
	BOP	• Using "Plant Mode Change & Alarm Look Ahead", change the OAC to "Mode 1".	
	BOP	• On the DCS Work Station, change the DCS Modal Alarming to Mode 1 as follows:	

Op Test No.:	N18-1	Scenario #	4	Event #	1	Page	17 of 57
Event Description:	**Raise Power to 3.5-4%/Ice Condenser Door Failure**						

Time	Pos.	Expected Actions/Behavior	Comments
		• Access DCS "PLANT MODE SELECTION" Screen (6012).	
		• Select "MODE 1".	
		• Select "ACCEPT MODE".	
		• Check "MODE" 1 is displayed in "CURRENT PLANT MODE".	
			NOTE: The CRS will evaluate the Ice Condenser Door inoperability.
TECHNICAL SPECIFICATION 3.6.13, ICE CONDENSER DOORS			
	CRS	LCO 3.6.13 The ice condenser lower inlet doors, intermediate deck doors, and top deck doors shall be OPERABLE and closed.	
	CRS	APPLICABILITY: MODES 1, 2, 3, and 4.	
	CRS	NOTE:	
		• Separate Condition entry is allowed for each ice condenser door.	
		• Entry into Condition B is not required due to personnel standing on or opening an intermediate deck or top deck door for short durations to perform required surveillances, minor maintenance such as ice removal or routine tasks such as system walkdowns.	
	CRS	ACTIONS	

Op Test No.:	N18-1	Scenario #	4	Event #	1	Page	18 of 57
Event Description:	**Raise Power to 3.5-4%/Ice Condenser Door Failure**						

Time	Pos.	Expected Actions/Behavior	Comments
CONDITION		REQUIRED ACTION	COMPLETION TIME
B. One or more ice condenser doors inoperable for reasons other than Condition A or not closed.		B.1 Verify maximum ice bed temperature is ≤ 27°F. AND NOTE: Required Action B.2.1 applies only when one or more ice condenser lower inlet doors are inoperable due to having an invalid open alarm. B.2.1 Verify affected lower inlet door is closed. OR B.2.2 Restore ice condenser door to OPERABLE status and closed positions.	Once per 4 hours Once per 14 days 14 days
			NOTE: The CRS will determine that Condition B is required and that ACTION B.1 AND B.2.2 must be taken.
At the discretion of the Lead Examiner move to Event #2.			

Op Test No.:	N18-1	Scenario #	4	Event #	2	Page	19 of 57
Event Description:	**N31/N35 High Voltage failure**						

Following this, the Channel N31/N35 high voltage will fail. The operator will enter AP/1/A/5500/16, "Malfunction of Nuclear Instrumentation," and perform Case II, "Intermediate Range Malfunction," and then Case I, "Source Range Malfunction." The operator will address Technical Specification LCO 3.3.1, "Reactor Trip Instrumentation."

Booth Operator Instructions: **insert MAL-ENB009A = LOSS**

Indications Available:

- MCB Annunciator, 1AD2 C2, IR/SR AMPLIFIER NON-OPERATE
- N31 off scale LOW
- N35 off scale LOW

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS will enter to AP-16 Case II.
		AP/1/A/5500/16, MALFUNCTION OF NUCLEAR INSTRUMENTATION CASE II, INTERMEDIATE RANGE MALFUNCTION	
		CAUTION If either I/R drawer shows evidence of damage due to overheating (i.e. visible smoke or flame), the following enclosure will quickly deenergize the channel. A reactor trip will occur unless the signal has been blocked in SSPS ("I/R TRAIN (A/B) TRIP BLOCKED" status lights on 1SI-18 lit).	
	CRS	(Step 1) IF AT ANY TIME I/R drawer shows evidence of damage (i.e. visible smoke or flame), THEN evaluate deenergizing affected drawer PER Enclosure 2 (Removal of Damaged I/R Channel from Service).	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		NOTE S/R and I/R channels share common detectors and electronics. If symptoms apply for both Case I and Case II, the two cases may be performed concurrently or in any order.	
	RO	(Step 2) Check one I/R channel – OPERABLE.	**NOTE:** N-36 is OPERABLE.
	CRS	(Step 3) Announce occurrence on paging system.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.

Op Test No.:	N18-1	Scenario #	4	Event #	2	Page	20	of 57
Event Description:	**N31/N35 High Voltage failure**							

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 4) Place failed or channel "LEVEL TRIP" switch on I/R Drawer to "BYPASS".	
	BOP	(Step 5) Check the following – LIT:	
		• "LEVEL TRIP BYPASS" indicating light on failed I/R drawer.	
		• "S/R OR I/R TRIP BYPASS" alarm (1AD-2, E-2).	
		• The failed channel's status light on 1SI-19:	
		• "1/N-35A I/R CHANNEL I TRIP BYPASS"	
		OR	
		• "1/N-36A I/R CHANNEL II TRIP BYPASS".	

CAUTION

- Opening I/R control power breaker or a loss of power to the I/R channel will result in a reactor trip unless the affected channel is blocked in SSPS ("I/R TRAIN (A/B) TRIP BLOCKED" status light on 1SI-18 is lit).
- Opening I/R instrument power breaker will result in a reactor trip unless:
  - Affected channel "LEVEL TRIP" switch is in "BYPASS"

  OR
  - Affected channel is blocked in SSPS ("I/R TRAIN (A/B) TRIP BLOCKED" status light on 1SI-18 is lit).
- Closing either I/R control power breaker or instrument power breaker with any P/R channel inoperable or in tripped condition may result in a reactor trip on P/R rate trip due to voltage spikes.

Time	Pos.	Expected Actions/Behavior	Comments
	CRS/ RO/ BOP	(Step 6) IF AT ANY TIME I/R control power breaker is opened above P-10, THEN breaker should be closed prior to lowering power below P-10 (to prevent a reactor trip).	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	RO	(Step 7) Check I/R channel – FAILED LOW.	

Op Test No.:	N18-1	Scenario #	4	Event #	2	Page	21 of	57
Event Description:	**N31/N35 High Voltage failure**							

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 8) Evaluate performing Case I (Source Range Malfunction) based on symptoms while continuing in this case.	**NOTE:** CASE I should also be performed.
	RO	(Step 9) WHEN malfunctioning I/R channel repaired, THEN….	**NOTE:** The channel will remain OOS.
			NOTE: The CRS may call WCC/IAE to address the malfunction. If so, **Booth Instructor** acknowledge as WCC.
			NOTE: The CRS will likely conduct a Focus Brief.
AP/1/A/5500/16, MALFUNCTION OF NUCLEAR INSTRUMENTATION CASE I, SOURCE RANGE MALFUNCTION			
CAUTION If either S/R drawer shows evidence of damage due to overheating (i.e. visible smoke or flame), the following enclosure will quickly deenergize the channel. A reactor trip will occur unless the signal has been blocked in SSPS ("S/R TRAIN (A/B) TRIP BLOCKED" status lights on 1SI-18 lit).			
	CRS	(Step 1) IF AT ANY TIME S/R drawer shows evidence of damage (i.e. visible smoke or flame), THEN evaluate deenergizing affected drawer PER Enclosure 1 (Removal of Damaged S/R Channel from Service).	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
NOTE S/R and I/R channels share common detectors and electronics. If symptoms apply for both Case I and Case II, the two cases may be performed concurrently or in any order.			
	RO	(Step 2) Check at least one of the following S/R Channels - OPERABLE.	
		• N-31	
		OR	
		• N-32	

Op Test No.:	N18-1	Scenario #	4	Event #	2	Page	22 of 57
Event Description:		**N31/N35 High Voltage failure**					

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 3) Announce occurrence on paging system.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	CRS/ RO	(Step 4) Check unit status - IN MODE 6.	
	CRS	(Step 4 RNO) GO TO Step 7.	
	CRS/ RO	(Step 7) Check "S/R HI FLUX AT SHUTDOWN" alarm (1AD-2, D-3) - DARK.	
	CRS/ RO	(Step 8) Monitor available I/R Channels and W/R Neutron Flux Monitors.	
	RO/ BOP	(Step 9) Check if failure has occurred on any of the following S/R Channels:	
		• N-31	
		OR	
		• N-32	
	RO	(Step 10) Check at least one of the following S/R Channels - OPERABLE:	**NOTE:** N-32 is OPERABLE.
		• N-31	
		OR	
		• N-32	
	CRS/ RO	(Step 11) Check unit status - IN MODE 3, 4, 5, 6, OR NO MODE.	
	CRS	(Step 11 RNO) IF in Mode 2 below P-6, THEN…..	**NOTE:** The plant is in Mode 2, but above P-6.

Op Test No.: N18-1	Scenario # 4	Event # 2	Page 23 of 57
Event Description:	**N31/N35 High Voltage failure**		

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 12) Perform the following actions on the failed S/R drawer:	
		• Place the "LEVEL TRIP" switch to "BYPASS".	
		• Check "LEVEL TRIP BYPASS" light - LIT.	
		• Place the "HIGH FLUX AT SHUTDOWN" switch to "BLOCK".	
	RO/ BOP	(Step 13) Check the following S/R indications:	
		• Check "S/R OR I/R TRIP BYPASS" alarm (1AD-2, E-2) - LIT.	
		• Check the failed channel's status light on 1SI-19:	
		• "1/N-31B S/R CHANNEL I TRIP BYPASS" - LIT	
		• OR	
		• "1/N-32B S/R CHANNEL II TRIP BYPASS" - LIT.	
	CRS/ RO	Check unit status - IN MODE 3, 4, 5, 6, OR NO MODE.	
	CRS	(Step 13.c RNO) Perform the following:	
		• IF unit status in Mode 2 below P-6, THEN……	**NOTE:** The plant is in Mode 2, but above P-6.
		• Observe Cautions prior to Step 14 and GO TO Step 14.	

Op Test No.: N18-1 Scenario # 4 Event # 2 Page 24 of 57

Event Description: **N31/N35 High Voltage failure**

Time	Pos.	Expected Actions/Behavior	Comments
CAUTION • Opening S/R control power breaker will result in a reactor trip unless the affected channel is blocked in SSPS ("S/R TRAIN (A/B) TRIP BLOCKED" status light on 1SI-18 is lit). • Opening S/R instrument power breaker will result in a reactor trip unless: • Affected channel "LEVEL TRIP" switch is in "BYPASS" OR • Affected channel is blocked in SSPS ("S/R TRAIN (A/B) TRIP BLOCKED" status light on 1SI-18 is lit).			
	CRS	(Step 14) IF AT ANY TIME S/R control power breaker is opened above P-6, THEN breaker should be closed prior to lowering power below P-6 (to prevent a reactor trip).	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 15) Evaluate performing Case II (Intermediate Range Malfunction) based on symptoms while continuing in this case.	**NOTE:** It is likely that Case II has already been performed.
	CRS	(Step 16) WHEN malfunctioning S/R channel repaired, THEN…….	**NOTE:** The CRS may call WCC/IAE to address the malfunction. If so, **Booth Instructor** acknowledge as WCC.
			NOTE: The CRS will likely conduct a Focus Brief.
TECHNICAL SPECIFICATION 3.3.1, REACTOR TRIP SYSTEM INSTRUMENTATION			
	CRS	LCO 3.3.1 The RTS instrumentation for each Function in Table 3.3.1-1 shall be OPERABLE (Functions 4 and 16.a).	
	CRS	APPLICABILITY: According to Table 3.3.1-1	
	CRS	ACTIONS	

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one or more required channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.1-1 for the channel(s).	IMMEDIATELY

Op Test No.: N18-1 Scenario # 4 Event # 2	Page 25 of 57
Event Description:	**N31/N35 High Voltage failure**

Time	Pos.	Expected Actions/Behavior	Comments
F. THERMAL POWER >P-6 and <P-10, one IR Neutron Flux channel inoperable		F.1 Reduce THERMAL POWER to <P-6. OR F.2 Increase THERMAL POWER to >P-10.	24 hours 24 hours
			NOTE: The CRS will determine that Condition A is required and that ACTION A.1 must be taken. The CRS will determine that Function 4 is affected by the failure. The CRS will determine that Condition F is required and that ACTION F.1 or F.2 must be taken.
At the discretion of the Lead Examiner move to Event #3.			

Op Test No.:	N18-1	Scenario #	4	Event #	3	Page	26 of 57

Event Description: **1EMF-34 fails HIGH/Failure of SG Blowdown Flow Control Valve to Auto CLOSE**

Subsequently, 1EMF-34, S/G Sample Radiation Monitor, will fail HIGH, however, one of the SG Blowdown Control Valves will NOT automatically close. The operator will respond in accordance with OP/1/A/6100/010 Q, "Annunciator Response for 1RAD-1," C3, 1EMF 34 S/G SAMPLE HI RAD, and manually close the valve. The operator may enter Case I of AP/1/A/5500/10, "NC System Leakage Within the Capacity of Both NV Pumps." The crew will determine that the alarm is due to a failure, and NOT an actual high radioactivity condition.

Booth Operator Instructions:

insert MAL-EMF-34L = 10^7
insert LOA-BB019 = TRUE
insert:

- **REM-BB0123=0 delay = 2 seconds**
- **REM-BB0124=0 delay = 2 seconds**
- **REM-BB0125=0 delay = 2 seconds**

Indications Available:

- MCB Annunciator 1RAD1/C-3, 1EMF SG SAMPLE HI RAD, alarms
- MCB Annunciator 1RAD1/F-2, 1EMF34 LOSS OF S/G SAMPLE FLOW, alarms
- 1EMF 34 Amber TRIP 1 light is LIT
- 1EMF 34 Red TRIP 2 light is LIT
- 1EMF 34 indication off-scale high

Time	Pos.	Expected Actions/Behavior	Comments
		OP/1/A/6100/010 Q, ANNUNCIATOR RESPONSE FOR 1RAD-1 C-3, 1EMF 34 S/G SAMPLE HI RAD	
	RO	(IA Step 1) Ensure blowdown flow secured.	**NOTE:** The 1D S/G Blowdown Throttle Valve has remained OPEN.
	RO	(IA Step 2) Close the following manual loaders:	
		• 1BB-123 (1A S/G BB Flow Control)	
		• 1BB-124 (1B S/G BB Flow Control)	
		• 1BB-125 (1C S/G BB Flow Control)	
		• 1BB-126 (1D S/G BB Flow Control)	**NOTE:** The RO will close the Manual Loader to stop Blowdown flow.

Op Test No.: N18-1	Scenario # 4	Event # 3	Page 27 of 57

Event Description: **1EMF-34 fails HIGH/Failure of SG Blowdown Flow Control Valve to Auto CLOSE**

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(IA Step 3) Notify the following of possible S/G Tube Leakage. Inform them of EMF in alarm and to implement their Response Procedure.	
		• RP Shift	**NOTE:** The CRS may call RP to address the Rad Monitor failure. If so, **Booth Instructor** acknowledge as RP. After **ten minutes** report back that **there is no abnormal radiation and that it is believed that 1EMF-34 has failed high.**
		• Primary Chemistry	**NOTE:** The CRS may call Primary Chemistry to address the Rad Monitor failure. If so, **Booth Instructor** acknowledge as Primary Chemistry.
		• Secondary Chemistry	**NOTE:** The CRS may call Secondary Chemistry to address the Rad Monitor failure. If so, **Booth Instructor** acknowledge as Secondary Chemistry. After **5 minutes** report back that **there is no abnormal radiation and that it is believed that 1EMF-34 has failed high.**
	CRS	(IA Step 4) Contact Secondary Chemistry to secure blowdown to HR Tank by closing 1BB-194 (1BB Flow to Heater Tank).	**NOTE:** The CRS may call Secondary Chemistry to secure blowdown. If so, **Booth Instructor** acknowledge as Secondary Chemistry.
			NOTE: The CRS may enter AP-10 believing that a SGTL exists.

Op Test No.:	N18-1	Scenario #	4	Event #	3	Page	28 of 57
Event Description:	**1EMF-34 fails HIGH/Failure of SG Blowdown Flow Control Valve to Auto CLOSE**						

Time	Pos.	Expected Actions/Behavior	Comments
AP/1/A/5500/10, NC SYSTEM LEAKAGE WITHIN THE CAPACITY OF BOTH NV PUMPS, CASE I			
	BOP	(Step 1) Check Pzr level - STABLE OR GOING UP.	**NOTE:** Pzr level will be stable.
	CRS/ BOP	(Step 2) IF AT ANY TIME Pzr level goes down in an uncontrolled manner OR cannot be maintained greater than 4%, THEN perform Step 1.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
NOTE In subsequent steps "affected S/G" is considered the S/G with primary to secondary leakage requiring unit shutdown.			
	RO/ BOP	(Step 3) Identify affected S/G as follows:	
		• Any S/G N/R level - GOING UP IN AN UNCONTROLLED MANNER.	**NOTE:** No SG level will be rising uncontrollably.
		OR	
		• Check any of the following EMFs- ABOVE NORMAL:	**NOTE:** No increase in radiation level will be indicated on any of these radiation monitors.
		• 1EMF-24 (S/G A Steamline Hi Rad)	
		• 1EMF-25 (S/G B Steamline Hi Rad)	
		• 1EMF-26 (S/G C Steamline Hi Rad)	
		• 1EMF-27 (S/G D Steamline Hi Rad)	
		• 1EMF 71 (S/G A Leakage Hi Rad)	
		• 1EMF 72 (S/G B Leakage Hi Rad)	
		• 1EMF 73 (S/G C Leakage Hi Rad)	
		• 1EMF 74 (S/G D Leakage Hi Rad)	
		OR	
		• Check CF Flow - LOWER IN ANY S/G COMPARED TO ALL.	**NOTE:** No SGTL will be indicated.

Op Test No.:	N18-1	Scenario #	4	Event #	3	Page	29 of 57
Event Description:	**1EMF-34 fails HIGH/Failure of SG Blowdown Flow Control Valve to Auto CLOSE**						

Time	Pos.	Expected Actions/Behavior	Comments
		OR	
		• Secondary Chemistry or RP has determined affected S/G by sampling or evaluation of available EMF data.	**NOTE:** The CRS may call Secondary Chemistry/RP to evaluate data. If so, **Booth Instructor** acknowledge as Secondary Chemistry and RP.
		OR	
		• Notify RP to frisk all Unit 1 S/G cation columns (CT Lab) to determine if activity level is significantly higher for any S/G.	**NOTE:** The CRS may call RP to evaluate data. If so, **Booth Instructor** acknowledge as RP. After 2 minutes report that there is no higher radioactivity on any cation column.
	CRS	(Step 4) Announce occurrence on page.	**NOTE:** CRS may ask U2 RO to make Plant Announcement. If so, **Floor Instructor** acknowledge as U2 RO.
	CRS	(Step 5) REFER TO the following:	
		• RP/0/A/5700/000 (Classification of Emergency)	
		• RP/0/A/5700/010 (NRC Immediate Notification Requirements).	
	CRS	(Step 6) IF AT ANY TIME NC leakage exceeds Tech Spec limits, THEN perform the following:	**NOTE:** The CRS may ask OSM to address. If so, **Floor Instructor** acknowledge as OSM.
		• Ensure Outside Air Pressure Filter Train in service PER OP/0/A/6450/011 (Control Area Ventilation/Chilled Water System), Enclosure 4.4 (Control Room Atmosphere Pressurization During Abnormal Conditions).	

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Event Description: **1EMF-34 fails HIGH/Failure of SG Blowdown Flow Control Valve to Auto CLOSE**

Time	Pos.	Expected Actions/Behavior	Comments
		• Have another SRO evaluate if leakage exceeds SLC 16.9.7 condition C limits and immediately notify Security if SSF is inoperable.	
	CRS	(Step 7) Check if unit shutdown or reactor trip required as follows:	
		• Check VCT makeup - IN PROGRESS.	
	CRS	(Step 7.a RNO) GO TO Step 7.c.	
	BOP	(Step 7.c) Check S/G tube leak size - LESS THAN 90 GPM.	
		• Leakage in one S/G - GREATER THAN 125 GPD (GALLON PER DAY).	
	CRS	(Step 7.d RNO) Perform the following:	
		• IF unit shutdown required per PT/1/A/4150/001C (Primary to Secondary Leakage Monitoring), THEN……	
		• IF station management desires to exit procedure, THEN exit procedure at this time.	**NOTE:** The CRS may call WCCS/SM to evaluate the plant data. If so, **Booth Instructor** acknowledge as WCCS/SM, and report that AP10 should be exited.

At the discretion of the Lead Examiner, move to Event #4.

Op Test No.: N18-1	Scenario # 4	Event # 4	Page 31 of 57
Event Description:	**1A SG PORV fails OPEN (No Manual Control)**		

Afterwards, the 1A Steam Generator PORV will fail OPEN. The operator will respond in accordance with AP/1/A/5500/01, "Steam Leak," to isolate the PORV and maintain reactor power stable.

Booth Operator Instructions: **Insert MALF-SM001A=100**

Indications Available:

- OAC Alarm: 1SV19 1A SM PORV OPEN
- 1SV-19 Red status light is LIT

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: It is likely that the operator will take actions to isolate the 1A SG PORV prior to being directed by the CRS. (Step 13)
		AP/1/A/5500/01, STEAM LEAK	
	CRS	(Step 1) Monitor Foldout page.	
		Manual Reactor Trip Criteria: (IF any of the following occur: (1) Steam leak is jeopardizing personnel safety or plant equipment, (2) T-Avg is less than 551°F AND going down, or (3) UST level is less than 1 ft – NOT Expected).	**NOTE:** Manual Reactor Trip Criteria is NOT expected to be utilized.
	RO	(Step 2) Reduce turbine load to maintain the following:	**NOTE:** The Turbine is NOT latched. The RO will be expected to manual adjust control rods so that Rx power remains between 3.5-4%.
		• Excore NI's – LESS THAN OR EQUAL TO 100%.	
		• NC Loop D/T's – LESS THAN 60°F D/T	
		• T-Avg – AT T-REF.	
	CRS	(Step 3) Check containment entry – IN PROGRESS.	**NOTE:** A Containment Entry is NOT in progress.

Op Test No.:	N18-1	Scenario #	4	Event #	4	Page	32 of 57
Event Description:	**1A SG PORV fails OPEN (No Manual Control)**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 3 RNO) GO TO Step 5.	
	BOP	(Step 5) Check Pzr pressure prior to event – GREATER THAN P-11 (1955 PSIG).	
	BOP	(Step 6) Check Pzr level – STABLE OR GOING UP.	
	BOP	(Step 7) IF AT ANY TIME while in this procedure Pzr level cannot be maintained stable, THEN RETURN TO Step 6.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 8) GO TO Step 12.	
	CRS	(Step 12) Announce occurrence on paging system.	**NOTE:** CRS may ask U2 RO to make Plant Announcement that AP-1 has been entered. If so, **Floor Instructor** acknowledge as U2 RO.
	RO	(Step 13) Identify and isolate leak on Unit 1 as follows:	
		• (Step 13a) Check SM PORVs – CLOSED.	**NOTE:** The 1A SG PORV is Open.
	RO	(Step 13a RNO) IF S/G pressure is less than 1092 PSIG, THEN perform the following:	
		• Close affected S/G SM PORV manual loader.	**NOTE:** Closing the Manual Loader will have no effect.
		• IF SM PORV is still open, THEN perform the following:	**NOTE:** The 1A SG PORV Isolation Valve will need to be closed.
		• Close SM PORV isolation valve.	

Op Test No.:	N18-1	Scenario #	4	Event #	4	Page	33 of 57
Event Description:	**1A SG PORV fails OPEN (No Manual Control)**						

Time	Pos.	Expected Actions/Behavior	Comments
		• IF SM PORV isolation valve still open……	**NOTE:** The PORV Isolation valve is closed.
	BOP	• (Step 13.b) Check condenser dump valves – CLOSED.	**NOTE:** The Steam Dumps are expected to be OPEN.
	BOP	• (Step 13.b RNO) IF steam dumps required to be closed, THEN…..	**NOTE:** The Steam Dumps are required to be OPEN.
	BOP	• (Step 13.c) Check containment conditions – NORMAL:	
		• Containment temperature	
		• Containment pressure	
		• Containment humidity	
		• Containment floor and equipment sump level.	
	RO / BOP	• (Step 13.d) Check TD CA pump – OFF.	
	BOP	• (Step 13.e) Check valves on “STEAM LINE DRAIN VALVES” board (1MC-9) – CLOSED.	**NOTE:** One or more of these valves may be cycling. The RNO will direct closing the valves.
	CRS	• (Step 13.f) Check opposite Unit (Unit 2) “STEAM HEADER PRESSURE” – GREATER THAN 200 PSIG.	**NOTE:** CRS may ask U2 RO for AS Header pressure. If so, **Floor Instructor** report as **U2 RO that U2 Steam Header pressure** is ≈**1000 psig**.
	CRS	• (Step 13.g) Dispatch operator to check for leaks.	**NOTE:** The CRS may dispatch an AO to look for leaks. If so, **Floor Instructor:** acknowledge. **Booth Instructor:** Report back in 3-5 minutes that there are no leaks.

Op Test No.: N18-1	Scenario # 4	Event # 4	Page 34 of 57
Event Description:	**1A SG PORV fails OPEN (No Manual Control)**		

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The CRS may NOT dispatch AOs to look for leaks because it is understood that the SM PORV opening was the reason that AP-1 was entered.
	BOP	(Step 14) Check UST level – STABLE OR GOING UP.	**NOTE:** If the UST level is lowering, the BOP may perform the RNO and initiate makeup to the UST.
	CRS	(Step 15) Evaluate unit shutdown as follows:	
		• Check unit status – IN MODE 1 OR 2.	
		• Determine if unit shutdown or load reduction is warranted based on the following criteria:	**NOTE:** CRS may call WCC/Management to address the failure. If so, **Booth Instructor** acknowledge as WCC.
		• Size of leak	
		• Location of leak	
		• Rate of depletion of secondary inventory	
		• IF steam is leaking from a secondary heater relief OR MSR relief valve…	
		• IF turbine trip will isolate steam leak (such as feedwater heater leak or MSR leak…	
		• Check unit shutdown or load reduction – REQUIRED.	**NOTE:** Shutdown/Load Reduction will NOT be required.
	CRS	(Step 15.c RNO) Perform the following:	
		• Maintain present plant conditions until leak can be isolated or repaired.	
		• Exit this procedure.	
			NOTE: The CRS will likely conduct a Focus Brief.

At the discretion of the Lead Examiner, move to Event #5.

Op Test No.:	N18-1	Scenario #	4	Event #	5	Page	35	of 57
Event Description:		High Vibration on 1D NCP						

After this, a high vibration condition will develop on the 1D NCP. The operator will respond in accordance with OAC Alarm M1D3041, 1D NC PUMP VIBRATION (HALM), and enter AP/1/A/5500/08, "Malfunction of NC Pump." Ultimately, the vibration condition will rise above the Hi-Hi threshold requiring tripping of the reactor and stopping the NCP. The operator will manually trip the reactor and enter EP/1/A/5000/E-0, "Reactor Trip or Safety Injection."

Booth Operator Instructions:	**Insert MAL: NCP014G=4.6 and NCP014H=4.6** **(320 Second Ramp to 5.0)** **Insert MAL: NCP012D=13, NCP013G=13, NCP013H=13, NCP015G=14.5, NCP015H=14.5, NCP016G=12, NCP016H=12**

NOTE: All Malfunctions must be deleted when the 1D NCP is stopped.

Indications Available:

- OAC Alarm: 1D NC Pump Vibration
- MCB Annunciator 1AD-6/E-11 NC Pump Hi Vibration
- 1D NC Pump hi vibration on NC Pump Vibration Monitor

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: The performance of Step 5 of AP8 will be dependent upon the timing of addressing the procedure (i.e. Step 5 may be performed when Hi-Hi Vibration exceeds setpoint).
AP/1/A/5500/08, MALFUNCTION OF NC PUMP **CASE III, EXCESSIVE VIBRATION**			
NOTE Step 1 RNO should be used to validate the vibration problem unless it has been previously validated or is clearly known to be valid.			
	BOP	(Step 1) Check NC Pump vibration problem – KNOWN TO BE VALID.	**NOTE:** The BOP will use the Step 1 RNO to determine that the Vibration Alarm is valid.

Op Test No.:	N18-1	Scenario #	4	Event #	5	Page	36 of 57
Event Description:	**High Vibration on 1D NCP**						

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 1 RNO) Perform the following:	
		• REFER TO appropriate annunciator response:	
		• "NC PUMP HI VIBRATION" (1AD-6, E-11)	**NOTE:** The BOP will use 1AD-6/E-11 ARP to determine if alarm is valid (Place GAP switch left or right to determine if vibration probe reliable. IF gap indicates less than 4 OR greater than 19 volts/mils, vibration output is unreliable.).
		• "NC PUMP HI-HI VIBRATION" (1AD-6, F-11).	
	CRS	• IF vibration alarm valid, THEN GO TO Step 2.	
	BOP	(Step 2) Check affected NC pump vibration indication within operating limits:	
		• Motor frame vibration – LESS THAN 5 MILS • All of the following - LESS THAN 20 MILS • Motor shaft vibration • Pump shaft vibration • Motor axial vibration • Motor flywheel vibration	**NOTE:** The Motor Frame Vibration will be rising.
	CRS	(Step 3) IF AT ANY TIME vibration exceeds operating limits, THEN GO TO Step 5	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	CRS	(Step 4) GO TO Step 6	
	CRS	(Step 6) Announce occurrence on the paging system.	**NOTE:** The CRS may ask U2 RO to make Plant Announcement that AP-8 has been entered. If so, **Floor Instructor** acknowledge as U2 RO.

Op Test No.:	N18-1	Scenario #	4	Event #	5	Page	37 of 57
Event Description:	**High Vibration on 1D NCP**						

Time	Pos.	Expected Actions/Behavior	Comments
	CRS	(Step 7) Check NC pumps - ANY RUNNING	**NOTE:** All 4 NCPs are currently running. The CRS will direct the crew to continue monitoring NCP vibrations until the Hi-Hi Vibration alarm actuates. When alarm occurs, the crew will go to Step 5.
	BOP	(Step 5) Stop affected NC pump as follows:	
		• IF A or B NC pump is the affected pump, Then CLOSE associated spray valve:	
	BOP	• 1NC-27C (1A NC Loop PZR Spray Control).	**NOTE:** The 1A RCP is NOT affected.
		• 1NC-29C (1B NC Loop PZR Spray Control).	**NOTE:** The 1B RCP is NOT affected.
		• Check unit status – IN MODE 1 OR 2.	
	RO	• Trip reactor	
	BOP	• WHEN reactor power less than 5%, THEN stop affected NC pump.	
Booth Operator Instructions:		**Delete All Vibration Malfunctions when the 1D NCP is stopped.**	
	CRS	• GO TO EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).	
When the crew trips the reactor move to Events #6-7.			

Op Test No.: N18-1	Scenario # 4	Event # 6 & 7			Page 38 of 57		

Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Upon the reactor trip, a 350 gpm Steam Generator Tube Rupture will occur on the 1C SG and the operator will actuate Safety Injection. Upon completion of E-0, the operator will transition to EP/1/A/5000/E-3, "Steam Generator Tube Rupture," to isolate the flow into and out of the 1C Steam Generator and then conduct a cooldown and depressurization of the NC System. While performing an NCS depressurization using normal spray, both Pzr Spray Valves will stick OPEN on completion of the depressurization; and the operator will be required to stop both the 1A and 1B NCPs. The scenario will terminate at Step 22.c of E-3, after the crew has closed the Cold Leg Isolation Valves from the NV System.

Booth Operator Instructions: **insert MAL-SG001C 350 delay=0 ramp=0 (Occurs on Rx Trip)**

Indications Available:

- Pzr level lowers uncontrollably
- Pzr pressure lowers consistently with Pzr level
- Narrow Range Level in the 1C SG starts to rise

Time	Pos.	Expected Actions/Behavior	Comments
		EP/1/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION	
			NOTE: Crew will carry out Immediate Actions of E-0, prior to the CRS addressing the EP.
	RO/ BOP	(Step 1) Monitor Foldout page.	
		NC Pump Trip Criteria (Not expected)	
		CA Suction Sources (CA storage tank (water tower) goes below 1.5 ft – Not expected)	
		Position Criteria for 1NV-150B and 1NV-151A (U1 NV Pump Recird Isol)	**NOTE:** The BOP will monitor these conditions.
		• IF NV S/I flowpath aligned AND NC pressure is less than 1500 PSIG, THEN CLOSE 1NV-150B and 1NV-151A.	
		• IF NC pressure is greater than 2000 PSIG, THEN OPEN 1NV-150B and 1NV-151A.	

Op Test No.: N18-1	Scenario # 4	Event # 6 & 7	Page 39 of 57

Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
		Ruptured S/G Aux Feedwater Isolation Criteria (Expected)	**NOTE:** The BOP will monitor these conditions, and isolate CA flow to the 1C SG when met.
		• IF both of the following conditions met, THEN stop CA flow to affected S/G:	
		• Level going up in an uncontrolled manner or radiation level in that S/G is abnormal	
		• N/R level - GREATER THAN 11% (32% ACC).	
		Faulted S/G Aux Feedwater Isolation Criteria (Not expected)	
	RO	(Step 2) Check Reactor Trip:	**Immediate Action**
		• All rod bottom lights – LIT	
		• Reactor trip and bypass breakers – OPEN	
		• I/R power – GOING DOWN.	
	RO	(Step 3) Check Turbine Trip:	**Immediate Action**
		• All throttle valves – CLOSED.	
	BOP	(Step 4) Check 1ETA and 1ETB – ENERGIZED.	**Immediate Action**
	RO/ BOP	(Step 5) Check if S/I is actuated:	**Immediate Action**
		• "SAFETY INJECTION ACTUATED" status light (1SI-18) – LIT.	
	RO/ BOP	(Step 5.a RNO) Perform the following:	
		• Check if S/I is required:	
		• Pzr pressure less than 1845 PSIG	

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Event Description:	**1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**						

Time	Pos.	Expected Actions/Behavior	Comments
		OR	
		• Containment pressure greater than 1 PSIG.	
		• IF S/I is required, THEN initiate S/I.	
		• IF S/I is not required, THEN perform the following:	**Examiner NOTE:** The CRS may make the transition to ES-0.1 and/or concurrently perform AP-10 (Not Scripted). If so, wait HERE until the crew actuates Safety Injection, and returns to E-0.
		• Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
		• GO TO EP/1/A/5000/ES-0.1 (Reactor Trip Response).	
	RO	• (Step 5.b) Both LOCA Sequencer Actuated status lights (1SI-14) – LIT.	
	CRS	(Step 6) Announce "Unit 1 Safety Injection".	**NOTE:** The CRS may ask U2 RO to make Plant Announcement that a U1 Safety Injection has occurred. If so, **Floor Instructor** acknowledge as U2 RO.
	BOP	(Step 7) Check all Feed water Isolation status lights (1SI-4) – LIT.	
	BOP	(Step 8) Check Phase A "RESET" lights – DARK.	
	BOP	(Step 9) Check ESF Monitor Light Panel on Energized train(s):	
		• Groups 1, 2, 5 – DARK.	

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Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
		• Group 3 – LIT.	
		• Group 4 – LIT AS REQUIRED.	
		• Group 6 – LIT.	
	CRS	• GO TO Step 10.	
	RO	(Step 10) Check proper CA pump status:	
		• MD CA pumps – ON.	
		• N/R level in at least 3 S/Gs – GREATER THAN 17%.	
	BOP	(Step 11) Check all KC pumps – ON.	
	BOP	(Step 12) Check both RN pumps – ON.	
	CRS	(Step 13) Notify Unit 2 to perform the following:	**Floor Instructor:** As U2 RO report "2A RN Pump is running."
		• Start 2A RN pump.	
		• THROTTLE Unit 2 RN flow to minimum for existing plant condition.	**Booth Instructor:** **insert LOA-RN087 (Start 2A RN Pump)** **insert LOA-RN083 8050.000000 delay=0 ramp=10 (Unit 2 Train A Demand Flow)**
	RO	(Step 14) Check all S/G pressures – GREATER THAN 775 PSIG.	
	BOP	(Step 15) Check Containment Pressure – HAS REMAINED LESS THAN 3 PSIG.	**NOTE:** Containment Pressure is normal.
	BOP	(Step 16) Check S/I flow:	

Op Test No.:	N18-1	Scenario #	4	Event #	6 & 7	Page	42	of	57
Event Description:	**1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**								

Time	Pos.	Expected Actions/Behavior	Comments
		• Check "NV PMPS TO COLD LEG FLOW" gauge – INDICATING FLOW.	
		• Check NC pressure – LESS THAN 1600 PSIG.	
	BOP	(Step 16b RNO) Perform the following:	
		• Ensure ND pump miniflow valve on running pump(s) OPEN:	
		• 1ND-68A (1A ND Pump & Hx Mini Flow Isol)	
		• 1ND-67B (1B ND Pump & Hx Mini Flow Isol).	
	CRS	• IF valve(s) open on all running ND pumps, THEN GO TO Step 17.	
	CRS	(Step 17) Notify OSM or other SRO to perform EP/1/A/5000/G-1 (Generic Enclosures), Enclosure 22 (OSM Actions Following an S/I) within 10 minutes.	**NOTE:** The CRS may ask OSM to address. If so, **Floor Instructor** acknowledge as OSM.
	RO/ BOP	(Step 18) Check CA flow:	
		• Total CA flow – GREATER THAN 450 GPM.	**NOTE:** The crew may have throttled CA flow to < 450 gpm because NR S/G levels are > 11%. If so, the RNO will be performed.
	BOP	• Check VI header pressure – GREATER THAN 60 PSIG.	
	RO/ BOP	• WHEN each S/G N/R level is greater than 11% (32% ACC), THEN control CA flow to maintain that S/G N/R level between 11% (32% ACC) and 50%.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
	RO	(Step 19) Check NC temperatures:	

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Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
		• IF any NC pumps on, THEN check NC T-Avg – STABLE OR TRENDING TO 557°F.	**NOTE:** The 1A, 1B and 1C NCPs will be running.
			NOTE: It is most likely that the cooldown will be under control. If NOT, the CRS will assign the RO (BOP) to perform Enclosure 3 (Not Scripted), and continue the performance of E-0 with the BOP (RO).
	BOP (RO)	(Step 20) Check Pzr PORV and spray valves:	
		• All Pzr PORVs – CLOSED.	
		• Normal Pzr spray valves – CLOSED.	**NOTE:** The Pzr Spray Valves may be OPEN. If so, the RNO will be performed.
		• At least one Pzr PORV isolation valve-OPEN.	
	BOP (RO)	(Step 21) Check NC subcooling based on core exit T/Cs – GREATER THAN 0°F.	
	BOP (RO)	(Step 22) Check if main steamlines intact:	
		• All S/G pressures – STABLE OR GOING UP	
		• All S/Gs – PRESSURIZED.	
	BOP (RO)	(Step 23) Check if S/G tubes intact:	
		• The following secondary EMFs – NORMAL:	
		• 1EMF-33 (Condenser Air Ejector Exhaust)	
		• 1EMF-34(L) (S/G Sample (Lo Range))	**NOTE:** 1EMF-34 is in TRIP 2.

Op Test No.: N18-1	Scenario # 4	Event # 6 & 7	Page 44 of 57
Event Description:	**1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**		

Time	Pos.	Expected Actions/Behavior	Comments
		• 1EMF-24 (S/G A)	
		• 1EMF-25 (S/G B)	
		• 1EMF-26 (S/G C)	
		• 1EMF-27 (S/G D).	
		• S/G levels – STABLE OR GOING UP IN A CONTROLLED MANNER.	**NOTE:** The 1C SG Level is increasing in an uncontrolled manner.
	CRS	(Step 23 RNO) IF S/G levels going up in an uncontrolled manner OR any EMF abnormal, THEN perform the following:	
		• Implement EP/1/A/5000/F-0 (Critical Safety Function Status Trees).	
		• GO TO EP/1/A/5000/E-3 (Steam Generator Tube Rupture).	
			NOTE: The CRS will transition to E-3.
EP/1/A/5000/E-3, STEAM GENERATOR TUBE RUPTURE			
	RO/ BOP	(Step 1) Monitor Foldout page.	
		NC Pump Trip Criteria (Not expected)	
		S/I Reinitiation Criteria (SI On – Not expected)	
		Secondary Integrity Criteria (Not expected)	
		Cold Leg Switchover Criteria (< 95 INCHES in FWST – Not expected)	
		CA Suction Sources (<1.5 feet – Not expected)	
		Multiple Tube Rupture Criteria (Not expected)	
	BOP	(Step 2) Identify ruptured S/G(s):	
		• Any S/G N/R level – GOING UP IN AN UNCONTROLLED MANNER	**NOTE:** The 1C SG Level is increasing in an uncontrolled manner.

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Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
		OR	
		• Primary Chemistry or RP has determined ruptured S/G.	**NOTE:** The CRS may contact Chemistry for sampling. **Booth Instructor:** Acknowledge as appropriate.
		OR	
		• Any of the following EMFs – ABOVE NORMAL:	
		• 1EMF-24 (S/G A)	
		• 1EMF-25 (S/G B)	
		• 1EMF-26 (S/G C)	
		• 1EMF-27 (S/G D)	
	RO	(Step 3) Check at least one S/G – AVAILABLE FOR NC SYSTEM COOLDOWN.	
	RO	(Step 4) Isolate flow from ruptured S/G(s) as follows:	
		• Check ruptured S/G(s) PORV – CLOSED.	
		• Check S/Gs 1B and 1C – INTACT.	**NOTE:** The 1C SG is NOT Intact.
	CRS	(Step 4b RNO) Isolate TD CA pump steam supply from ruptured S/G as follows:	
		• IF TD CA pump is the only source of feedwater….	**NOTE:** The TD CA Pump is NOT the ONLY CA Source.
		• Ensure operators dispatched in next step immediately notify Control Room Supervisor when valves are closed.	**NOTE:** It is likely that these actions have already been performed.

Op Test No.: N18-1	Scenario # 4	Event # 6 & 7	Page 46	of 57
Event Description:	**1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**			

Time	Pos.	Expected Actions/Behavior	Comments
		• Immediately dispatch two operators to concurrently verify (CV), unlock and CLOSE valves on ruptured S/G(s):	**NOTE:** It is likely that these actions have already been performed. If NOT, the CRS will dispatch two AOs. **Floor Instructor:** Acknowledge as AOs.
		• For 1C S/G:	
		• 1SA-77 (1C S/G SM Supply to Unit 1 TD CA Pump Turb Loop Seal Isol) (Unit 1 interior doghouse, 767+10, FF-53).	**Booth Instructor**: **Insert REMSA0001 = 0** **Insert REMSA0077 = 0** Within **3 minutes,** as **AO** report that **steam has been isolated to the TD CA Pump from the 1C SG.**
		• 1SA-1 (1C S/G SM Supply to Unit 1 TD CA Pump Turb Maint Isol) (Unit 1 interior doghouse, 767+10, FF-53, above ladder).	
	CRS	• IF AT ANY TIME local closure of SA valves takes over 8 minutes, THEN isolate TD CA pump steam supply PER Enclosure 2 (Tripping TD CA Pump Stop Valve or Alternate Steam Isolation).	**NOTE:** Eight minutes will NOT elapse before the valves are closed.
	RO	• Check blowdown isolation valves on ruptured S/G/(s) – CLOSED.	
		• For 1C S/G:	
		• 1BB-3B (1C S/G Blowdown Cont Outside Isol Control)	
		• 1BB-7A (C S/G BB Cont Inside Isol).	
	BOP	• CLOSE steam drain on ruptured S/G(s)	
		• 1SM-95 (C SM Line Drain Isol)	
	RO	• CLOSE the following valves on ruptured S/G(s):	
		• MSIV	
		• MSIV bypass valve.	

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Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 5) Control ruptured S/G(s) level as follows:	
		• Check ruptured S/G(s) N/R level – GREATER THAN 11% (32% ACC).	
	BOP	• Isolate feed flow to ruptured S/G(s):	
		• For 1C S/G:	
		• CLOSE 1CA-50B (U1 TD CA Pump Disch TO 1C S/G Isol).	
		• CLOSE 1CA-46B (1B CA Pump Disch To 1C S/G Isol).	
	RO	(Step 6) Check ruptured S/G(s) pressure – GREATER THAN 350 PSIG.	

Critical Task:

Isolate feedwater flow into and steam flow from the ruptured SG so that minimum ΔP between ruptured Steam Generator and intact Steam Generators is not less than 250 psid once target temperature is reached (Entry into ECA-3.1).

Safety Significance: Failure to isolate the ruptured SG causes a loss of ΔP between the ruptured SG and the intact SGs. Upon a loss of ΔP, the crew must transition to a contingency procedure that constitutes an incorrect performance that "necessitates the crew taking compensating action which complicates the event mitigation strategy." If the crew fails to isolate steam from the SG, or feed flow into the SG the ruptured SG pressure will tend to decrease to the same pressures as the intact SGs, requiring a transition to a contingency procedure, and delaying the stopping of RCS leakage into the SG.

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 7) Check any NC pump – RUNNING.	**NOTE:** The 1A, 1B and 1C NCPs will be running.
	BOP	(Step 8) Check Pzr pressure – GREATER THAN 1955 PSIG.	

Op Test No.: N18-1	Scenario # 4	Event # 6 & 7	Page 48 of 57

Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
	RO	(Step 9) Initiate NC System cooldown as follows:	
	CRS	• Determine required core exit temperature based on lowest ruptured S/G pressure:	
		>1099 psig - 515°F/485-505°F	**NOTE:** The CRS will determine the target temperature to be 515°F, and the desired control band to be 485-505°F.
	RO	• Check the following valves on ruptured S/G(s) – CLOSED:	
		• MSIV	
		• MSIV bypass valve.	
	RO	• Check ruptured S/G(s) SM PORV – CLOSED.	
	RO	• Check S/G(s) 1B and 1C – INTACT.	**NOTE:** The 1C SG is ruptured.
	RO	(Step 9.d RNO) IF 1B OR 1C S/G is ruptured, THEN perform the following:	
		• Ensure steam to TDCA pump is isolated from ruptured S/G per one of the following:	**NOTE:** It is likely that these actions have already been performed.
		• Local isolation of SA line (per Step 4.b)	
		• OR	
		• Tripping TD CA pump stop valve (per Step 4.b).	

Op Test No.:	N18-1	Scenario #	4	Event #	6 & 7	Page	49	of	57

Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
			NOTE: If NOT already done, the CRS will direct two AOs to CLOSE 1SA-1 and 77. **Booth Instructor**: **insertREMSA0001 = 0** **insertREMSA0077 = 0** Within **3 minutes,** as **AO** report that **steam has been isolated to the TD CA Pump from the 1C SG.**
		• Do not continue until affected TDCA pump steam supply is either:	
		• Isolated	
		OR	
		• Determined to be unisolable.	
NOTE • NC pump trip criteria based on subcooling does not apply after starting a controlled cooldown. • After the Low Pressure Steamline Isolation signal is blocked, maintaining steam pressure negative rate less than 2 PSIG per second will prevent a Main Steam Isolation.			
	RO	• (Step 9e) Check condenser available as follows:	**NOTE:** Because of a C-9 failure the Condenser is NOT available.
	RO	• “C-9 COND AVAILABLE FOR STEAM DUMP” status light (1SI-18) – LIT	
		• MSIV on intact S/G(s) - OPEN.	
		• (Step 9.f) Place steam dumps in steam pressure mode as follows:	
		• Place "STM PRESS CONTROLLER" in manual.	
		• Adjust "STM PRESS CONTROLLER" output to equal "STEAM DUMP DEMAND" signal.	

Op Test No.:	N18-1	Scenario #	4	Event #	6 & 7	Page	50	of	57
Event Description:	**1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**								

Time	Pos.	Expected Actions/Behavior	Comments
		• Place "STEAM DUMP SELECT" in steam pressure mode.	
	RO	• (Step 9.g) WHEN "P-12 LO-LO TAVG" status light (1SI-18) lit, THEN place steam dumps in bypass interlock.	
CAUTION After initiating cooldown in next step, continue with subsequent steps without delay.			
	RO	• (Step 9.h) Dump steam from intact S/G(s) to condenser at maximum rate while attempting to avoid a Main Steam Isolation.	**Examiner NOTE:** If an MSI occurs (Not Expected), the CRS will need to return to this step in progress and initiate a cooldown using SG PORVs B and D (A SG PORV has previously failed). This is NOT scripted. **When cooldown is started, continue with on Step 10 on Page 51.**
		• (Step 9.i) Check Low Pressure Steamline Isolation - BLOCKED.	**NOTE:** If the Low Pressure Steamline Isolation signal is NOT blocked, the Step 9.i RNO will be performed. Otherwise, continue to Step 9.j.
	RO	(Step 9.i RNO) Depressurize Pzr to less than 1955 PSIG using one of the following:	
		• Maximum available Pzr spray	
		OR	
		• IF normal Pzr spray is not available, THEN use Pzr PORV.	
		• Do not continue until Pzr pressure is less than 1955 PSIG.	
		• Depress "BLOCK" on Low Pressure Steamline Isolation block switches.	
		• CLOSE Pzr spray valve(s) and Pzr PORVs.	

Op Test No.:	N18-1	Scenario #	4	Event #	6 & 7	Page	51	of	57

Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
		• (Step 9.j) Check core exit T/Cs - LESS THAN REQUIRED TEMPERATURE.	**NOTE:** It is likely that when the CRS arrives at this step, that the target temperature will NOT be reached.
	RO	(Step 9.j RNO) Perform the following:	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware.
		• WHEN core exit T/Cs are less than required temperature, THEN stabilize core exit T/Cs in desired control band, 10°F to 30°F less than required temperature.	**NOTE:** The CRS will determine use the desired control band to be 485-505°F.
	CRS	• GO TO Step 10.	
	RO	(Step 10) Control intact S/G levels:	
		• Check N/R level in any intact S/G – GREATER THAN 11% (32% ACC).	
		• Throttle feed flow to maintain all intact S/G N/R levels between 22% (32% ACC) and 50%.	
	BOP	(Step 11) Check Pzr PORVs and isolation valves:	
		• Power to all Pzr PORV isolation valves – AVAILABLE.	
		• All Pzr PORVs – CLOSED.	
		• At least one Pzr PORV isolation valve – OPEN.	
	BOP	(Step 12) Reset the following:	
		• S/I	
		• Sequencers	
		• Phase A Isolation	

Op Test No.:	N18-1	Scenario #	4	Event #	6 & 7	Page	52	of	57
Event Description:	**1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**								

Time	Pos.	Expected Actions/Behavior	Comments
		• Phase B Isolation	
	BOP	(Step 13) Establish VI to containment as follows:	
		• Open the following valves:	
		• 1VI-129B (VI Supply to A Cont Ess VI Hdr Outside Isol))	
		• 1VI-160B (VI Supply to B Cont Ess VI Hdr Outside Isol))	
		• 1VI-150B (Lwr Cont Non Ess Cont Outside Isol).	
		• Check VI header pressure – GREATER THAN 85 PSIG.	
	RO	(Step 14) Check if NC System cooldown should be stopped as follows:	
		Check cooldown – INITIATED PER STEP 9.	
		• Check Core exit T/Cs – LESS THAN REQUIRED TEMPERATURE.	**NOTE:** It is likely that when the CRS arrives at this step, that the target temperature will NOT be reached.
	CRS	(Step 14b RNO) Perform the following:	
NOTE The following step only applies during performance of this RNO. It may be performed more than once if ruptured S/G pressure continues to rise.			
		• IF ruptured S/G pressure goes up by over 50 PSIG since required temperature was selected, AND ruptured S/G pressure is greater than 400 PSIG, THEN select a new required temperature from table in Step 9.a.	**NOTE:** This is a Continuous Action. The CRS will make one or more board operators aware, and HOLD.
		• Do not continue until core exit T/Cs are less than target temperature.	

Op Test No.:	N18-1	Scenario #	4	Event #	6 & 7	Page	53	of	57

Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
	RO	• (Step 14c) Stabilize core exit T/Cs in desired control band, 10°F to 30°F less than required temperature.	
	RO	(Step 15) Check ruptured S/G(s) pressure – STABLE OR GOING UP.	
	RO	(Step 16) Check NC subcooling based on core exit T/Cs – GREATER THAN 20°F.	

Critical Tasks:

Establish/maintain an NCS temperature so that transition from E-3 does not occur because the RCS temperature is either too high to maintain minimum required subcooling of 20°F or too low creating an Orange Path condition on the NCS Integrity Critical Safety Function.

Safety Significance: Failure to establish and maintain the correct NCS temperature during a SGTR leads to a transition from E-3 to a contingency ERG. This failure constitutes an incorrect performance that "necessitates the crew taking compensating action that would complicate the event mitigation strategy."

Time	Pos.	Expected Actions/Behavior	Comments
	BOP	(Step 17) Depressurize NC System using Pzr spray as follows:	
		• Check normal Pzr spray flow – AVAILABLE.	**NOTE:** Normal Pzr Spray will be available with the 1A, 1B and 1C NCPs will be running.
		• Initiate NC depressurization using maximum available spray.	**NOTE:** The BOP will manually open both Pzr Spray Valves.

BOOTH OPERATOR INSTRUCTIONS: **After both Pzr Spray Valves have been FULLY OPENED, Insert:**
REM-NC0027C = 1
REM-NC0029C = 1

Op Test No.:	N18-1	Scenario #	4	Event #	6 & 7	Page	54	of	57

Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
		• IF AT ANY TIME during this step, spray valves are not effective in reducing NC pressure, OR ruptured S/G(s) NR level goes above 83% (73% ACC), THEN GO TO Step 18.	**NOTE:** It will likely be determined that the NC Spray Valves are NOT effective in reducing NC pressure, and the CRS will proceed to Step 18.
	BOP	(Step 18) Depressurize NC System using Pzr PORV as follows:	
		• Check at least one Pzr PORV - AVAILABLE.	
		• OPEN one Pzr PORV.	
		• Do not continue until any of the following conditions satisfied:	
		• NC subcooling based on core exit T/Cs - LESS THAN 0°F	
		OR	
		• Pzr level - GREATER THAN 76% (58% ACC)	
		OR	
		• Both of the following:	
		• NC pressure - LESS THAN RUPTURED S/G(s) PRESSURE.	
		• Pzr level - GREATER THAN 11% (29% ACC).	
		• CLOSE Pzr PORV.	
		• CLOSE Pzr spray valves.	**NOTE:** The Pzr Spray Valves will fail in the Full OPEN position.
	BOP	(Step 18.e RNO) IF spray valve(s) cannot be closed, THEN perform the following:	**NOTE:** The BOP will stop both the 1A and 1B NCP, and leave the 1C NCP running..
		• Stop 1A and 1B NC pumps.	

Op Test No.:	N18-1	Scenario #	4	Event #	6 & 7	Page	55	of	57

Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
		• IF both 1C AND 1D NC pumps on, THEN…..	
	RO	(Step 19) Check NC pressure - GOING UP.	
CAUTION S/I must be terminated when termination criteria are satisfied to prevent overfilling the ruptured S/G(s).			
	RO/ BOP	(Step 20) Check S/I termination criteria:	
		• NC subcooling based on core exit T/Cs – GREATER THAN 0°F.	
		• Secondary heat sink:	
		• N/R level in at least one intact S/G – GREATER THAN 11% (32% ACC)	
		• OR	
		• Total feed flow available to S/G(s) - GREATER THAN 450 GPM.	
		• NC pressure – STABLE OR GOING UP.	
		• Pzr level – GREATER THAN 11% (29% ACC)	
	BOP	(Step 21) Stop S/I pumps as follows:	
		• NI pumps.	
		• All but one NV pump.	
	BOP	(Step 22) Isolate NV S/I flowpath as follows:	
		• Check the following valves - OPEN	
		• 1NV-221A (U1 NV Pumps Suct From FWST Isol)	
		• 1NV-222B (U1 NV Pumps Suct From FWST Isol).	

Op Test No.: N18-1	Scenario # 4	Event # 6 & 7			Page 56	of 57	

Event Description: **1C Steam Generator Tube Rupture/ Pzr Spray Valves fail to CLOSE (After Manual Opening)**

Time	Pos.	Expected Actions/Behavior	Comments
		• Check the following valves - OPEN	
		• 1NV-150B (U1 NV Pump Recirc Isol).	
		• 1NV-151A (U1 NV Pump Recirc Isol).	
	BOP	• Close the following valves:	
		• 1NI-9A (NC Cold Leg Inj From NV)	
		• 1NI-10B (NC Cold Leg Inj From NV).	

<u>Critical Task:</u>

Depressurize the NCS to meet SI termination criteria before the Quality of the steam exiting the SG exceeds 80% (≤0.8 on Void Fraction SGINFO.cts).

Safety Significance: Failure to stop the reactor coolant leakage into a ruptured SG by depressurizing the RCS (when it is possible to do so) needlessly complicates the mitigation of the event. It also constitutes a “significant reduction of Safety Margin beyond that irreparably introduced by the scenario. If NCS depressurization does NOT occur, the inventory in the secondary side of the ruptured SG will rise to the level of the Main Steam Lines leading to water release through the SG PORV or Safety Valve, which could cause and unisolable fault in the ruptured SG.

At the discretion of the Lead Examiner terminate the exam.

UNIT 1 STATUS:

Power Level: 0% NCS [B] 1966 ppm Pzr [B]: 1966 ppm Xe: Per OAC

Power History: At this power level for 1 hour Core Burnup: 25.1 EFPDs

UNIT 2 STATUS:

Power Level: 100%

CONTROLLING PROCEDURE: OP/1/A/6100/003 Controlling Procedure for Unit Operation
OP/1/A/6250/008 Steam Generator Blowdown

OTHER INFORMATION NEEDED TO ASSUME THE SHIFT:

- The area has experienced steady light rain for the past 6 hours, with light wind from the South at 5-10 mph, and this is expected to continue throughout the shift.
- Three operators are in Containment completing the weekly surveillance on the Ice Condenser Intermediate Deck Doors (PT/1/A/4200/14A).

The following equipment is Out-Of-Service:

- The 1B OAPT Fan is OOS due to a Motor failure. ACTION has been taken in accordance with Technical Specification LCO 3.7.9 ACTION A.1.
- 1KFT-5130, Spent Fuel Pool Temperature, failed last shift (IAE is investigating).
- MCB Annunciator 1AD-1, B-9, “TURBINE OVER SPEED (111%) TURB TRIP,” has failed ILLUMINATED (IAE is investigating).

Crew Directions:

- It is planned to raise power on this shift to 3.5-4%, and stabilize power.
- When directed, start the 1A BB Pump per Section 3.4 of Enclosure 4.1 of OP/1/A/6250/008 (AO John is standing by at the Local BB Panel)

Work Control SRO/Offsite Communicator **Jim**

Plant SRO **Joe (FB)**

AO's AVAILABLE

Unit 1	**Unit 2**
Aux Bldg. John	**Aux Bldg. Chris**
Turb Bldg. Bob (FB)	**Turb Bldg. Mike (FB)**
5th Rounds. Carol	

Extra(s) Bill (FB) Ed (FB) Wayne (FB) Tanya Gus (RW)

SIM JPM A

Facility:	McGuire	Task No.:	
Task Title:	Respond to High VCT Temperature	JPM No.:	2018 Systems - Control Room JPM A (Alternate Path)
K/A Reference:	APE 026 AA1.02 (3.2/3.3)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Ensure Handout 1 is placed on CRS Desk.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 2.

Initial Conditions:

- Unit 1 was at 100% power when a leak developed in the KC System.
- The crew entered AP/1/A/5500/21 (Loss of KC or KC System Leakage).
- The crew has completed actions through Step 12.
- MCB Annunciator 1AD-7, D1, VCT HI TEMP, has just alarmed, and Foldout Page item #5 now applies.
- The leak is suspected to be on the aux building non-essential header, and this header is NOT likely to be restored within 15 minutes.

Initiating Cue: The CRS has directed you to perform the actions of Enclosure 6 of AP/1/A/5500/21 (Loss of KC or KC System Leakage), while the crew continues with AP-21.

Task Standard: The operator will isolate Letdown, and attempt to start the PD Pump. When the PD Pump fails to start, the operator will align the suction of the NV Pumps to the FWST.

Required Materials: None

General References: AP/1/A/5500/21 (Loss of KC or KC System Leakage), Rev 10
OP/1/A/6100/010 H (Annunciator Response For Panel 1AD-7), Rev 66
OMP 4-3 (Use of Emergency And Abnormal Procedure and FLEX Support Guidelines), Rev 46

Handouts: Handout 1: AP/1/A/5500/21 (Loss of KC or KC System Leakage) marked up for place-keeping through Step 12.
Handout 2: Enclosure 6 (VCT High Temperature Actions) of AP/1/A/5500/21 (Loss of KC or KC System Leakage).

Time Critical Task: NO

Validation Time: 12 minutes

Critical Step Justification	
Step 1	This step is critical because rotating the 1NV-35A Control Switch to the CLOSE position is necessary to isolate Letdown and stop VCT heat-up due to the loss of KC flow to the LDHX.
Step 17	This step is critical because the response to this event is normally to start the PD Pump because it does not recirc to the VCT, and remove the NV Pumps from service (The operator does not know that this pump will fail to operate).
Alternate Path Critical Step Justification	
Step 21	This step is critical because opening one of two available suction paths from the FWST to the Charging Pump suction is necessary under the current plant conditions (i.e. PD Pump has failed) to maintain charging flow.
Step 22	This step is critical because closing one of two valves needed to isolate the suction path from the VCT to the Charging Pump suction is necessary under the current plant conditions (i.e. PD Pump has failed) to maintain charging flow.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-39 (100%).
2. Place in RUN
3. Insert MALF-NV006C = TRUE (PD Pump fails to start manually).
4. Insert REM-KC139 = 15% (Reduce Seal Water HX Cooling)
5. Insert REM-KC130 = 0.01 until VCT hi temp alarm occurs. This is done to simulate a leak in the Letdown Heat Exchanger KC flow which robs flow from LDHX and causes Letdown temperature to rise.
6. Ensure MCB Annunciator 1AD-7 D1, HI VCT TEMP, has alarmed.
7. Perform actions of AP/1/A/5500/21 through Step 12. Ensure AP/1/A/5500/21 marked up for place-keeping through Step 12 is available at the CRS Desk.
8. Acknowledge the alarms.
9. Freeze the Simulator

OR

1. Reset to IC-232 (October, 2017)
2. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.
3. Leave Simulator in FREEZE until operator is ready to begin.

NOTE: Simulator Instructor will need to remain available to respond to alarms that are not related to the task.

(Denote Critical Steps with an asterisk*)

Ensure Handout 1 is placed on CRS Desk.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 2.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
Examiner NOTE: The Critical nature of Step 1 is to close 1NV-35A. IF this valve is NOT closed, the Critical nature of the Step can be satisfied by closing either 1NV-1A or 1NV-2A in Step 2.				
1 *	(Step 1) Isolate letdown as follows: (Step 1.a) CLOSE the following valves: • 1NV-458A (U1 75 GPM L/D Orifice Otlt Cont Isol) • 1NV-457A (U1 45 GPM L/D Orifice Otlt Cont Isol) • 1NV-35A (U1 Variable L/D Orifice Otlt Cont Isol).	The operator observes the 1NV-458A Green status light LIT, Red status light OFF. The operator observes the 1NV-457A Green status light LIT, Red status light OFF. The operator rotates the 1NV-35A Control Switch to the CLOSE position, allowing it to return to AUTO, and observes the Green status light LIT, Red status light OFF. **NOTE:** **MCB Annunciators 1AD-7, G2 (**CHARGING LINE ABNORMAL FLOW**), F2 (**CHARGING LINE DEMAND LO FLOW**) and J1 (**NC PUMP SEAL INJ LO FLOW**) may alarm.** The operator will adjust the 1NV-241 Controller knob to address annunciators.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
2	(Step 1.b) CLOSE the following valves: • 1NV-1A (U1 NC L/D Isol To Regenerative Hx) • 1NV-2A (U1 NC L/D Isol To Regenerative Hx).	The operator rotates the 1NV-1A Control Switch to the CLOSE position, allowing it to return to AUTO, and observes the Green status light LIT, Red status light OFF. The operator rotates the 1NV-2A Control Switch to the CLOSE position, allowing it to return to AUTO, and observes the Green status light LIT, Red status light OFF.		
3	(Step 1.c) Check ND - IN SERVICE PRIOR TO EVENT.	The operator observes the plant operating at power, recognizes that ND is NOT in operation, and proceeds to the Step 1.c RNO.		
4	(Step 1.c RNO) GO TO Step 2.	The operator proceeds to Step 2.		
5	(Step 2) Check NV pumps suction - ALIGNED TO VCT.	The operator observes the 1NV-141A Red status light LIT, Green status light OFF. The operator observes the 1NV-142B Red status light LIT, Green status light OFF. (Or Equivalent)		
6	(Caution prior to Step 3) VCT high temperature will degrade NC pump seal cooling and NV pump operation.	The operator reads the Caution and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
7	(Note prior to Step 3) A loss of KC cooling to KC Aux Building Non-essential Header causes VCT temperature to rise, primarily due to NV pump recirc flow.	The operator reads the Note and proceeds.		
8	(Step 3) IF restoration of KC cooling to Aux Building Non-essential Header is expected within next 15 minutes, THEN exit this enclosure.	The operator requests this information from the CRS. **Cue:** **IF required, as the CRS, report that the leak is suspected to be on the aux building non-essential header, and this header is NOT likely to be restored within 15 minutes.**		
9	(Step 4) Check excess letdown - ISOLATED.	The operator observes the 1NV-24B Green status light LIT, Red status light OFF. The operator observes the 1NV-25B Green status light LIT, Red status light OFF. The operator determines that Excess letdown is isolated.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
		Examiner NOTE: **About 4-5 minutes from the start of the JPM, it is expected that 1AD-6, C-7 will alarm, and an AUTO Makeup will occur.**		
10	(Step 5) IF AT ANY TIME excess letdown must be established, AND KC cooling still lost to KC aux building non-essential header, THEN excess letdown must be aligned to NCDT instead of VCT.	The operator reads the conditional step and proceeds.		
11	(Notes prior to Step 6) PD pump will not heat up VCT since it does not recirc water to VCT. Running PD pump instead of swapping NV to FWST will prevent thermal transient on NC pumps, and allow continued operation of unit. 1A and 1B NV pumps will be stopped to prevent VCT overheating.	The operator reads the Notes and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
12	(Step 6) Check the following: PD pump - AVAILABLE TO RUN 1ETA - ENERGIZED 1RN-42A (AB Non Ess Supply Isol) - OPEN.	The operator observes the PD Pump breaker Green status light is LIT. The operator observes the voltage on 1ETA to be ≈ 4171 volts. The operator observes 1RN-42A red status light LIT, Green status light OFF, and recognizes that the PD Pump is available.		
13	(Step 7) Start PD Pump as follows: (Step 7.a) Open the following valves: • 1RN-63B (AB Non Ess Return Isol). • 1RN-64A (AB Non Ess Return Isol).	The operator observes the 1RN-63B Red status light LIT, Green status light OFF. The operator presses the 1RN-64A OPEN pushbutton, and observes the Red status light LIT, Green status light OFF.		
14	(Step 7.b) Ensure Charging flow - LESS THAN 90 GPM.	The operator observes 1NVP5630, and determines that Charging flow is <90 gpm, and lowering.		
15	(Step 7.c) Adjust PD Pump speed controller output to 0%.	The operator observes the PD Pump Speed Control SLIMs MAN light LIT, and the controller output and setpoint indicate 0.		
16	(Step 7.d) OPEN 1NV-1047A (U1 PD Pump Recirc Isol).	The operator presses the 1NV-1047A OPEN pushbutton, and observes the Red status light is LIT, Green status light OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*17	(Step 7.e) Start the PD pump.	The operator presses the PD Pump START pushbutton, and observes the Green status light LIT, Red status light OFF; and recognizes that the PD Pump has failed to start **(Alternate Path)**. The operator proceeds to the Step 7 RNO.		
18	(Step 7 RNO) GO TO Step 15.	The operator proceeds to Step 15.		
19	(Step 15) Check Reactor - TRIPPED.	The operator observes the plant operating at power, recognizes that the plant is NOT tripped, and proceeds to the Step 15 RNO.		
20	(Step 15 RNO) Perform the following: (Step 15 RNO a) Reduce turbine load as required to maintain T-Ave at T-Ref in subsequent steps. (Step 15 RNO b) REFER TO AP/1/A/5500/04 (Rapid Downpower) as required.	The operator reads the step to reduce Turbine Load. **Cue:** **As the CRS, indicate that the OATC will maintain Tavg-Tref.** The operator reads the step to refer to AP-4. **Cue:** **As the CRS, indicate that the crew will address AP-4.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*21	(Step 16) Swap NV suction to FWST as follows: (Step 16.a) OPEN the following valves: • 1NV-221A (U1 NV Pump Suct From FWST Isol). • 1NV-222B (U1 NV Pump Suct From FWST Isol).	The operator presses the 1NV-221A OPEN pushbutton, and observes the Red status light LIT, Green status light OFF. OR The operator presses the 1NV-222B OPEN pushbutton, and observes the Red status light LIT, Green status light OFF. The operator will acknowledge an expected alarm on Group 3 of the ESF Monitor Panel (Not Critical).		
*22	(Step 16.b) CLOSE the following valves: • 1NV-141A (U1 VCT Outlet Isol) • 1NV-142B (U1 VCT Outlet Isol).	The operator presses the 1NV-141A CLOSE pushbutton, and observes the Green status light LIT, Red status light OFF. OR The operator presses the 1NV-142B CLOSE pushbutton, and observes the Green status light LIT, Red status light OFF. The operator will acknowledge an expected alarm on Group 4 of the ESF Monitor Panel (Not Critical).		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
23	(Step 17) WHEN KC cooling is restored to KC aux building non-essential header, THEN NV suction may be realigned to VCT as follows: OPEN the following valves: • 1NV-141A (U1 VCT Outlet Isol) • 1NV-142B (U1 VCT Outlet Isol). CLOSE the following valves • 1NV-221A (U1 NV Pump Suct From FWST Isol) • 1NV-222B (U1 NV Pump Suct From FWST Isol).	The operator reads the conditional Step and proceeds.		
24	(Step 18) RETURN TO step in effect in body of this procedure.	The operator informs the CRS that Enclosure 6 is complete.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Systems - Control Room JPM A

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- Unit 1 was at 100% power when a leak developed in the KC System.
- The crew entered AP/1/A/5500/21 (Loss of KC or KC System Leakage).
- The crew has completed actions through Step 12.
- MCB Annunciator 1AD-7, D1, VCT HI TEMP, has just alarmed, and Foldout Page item #5 now applies.
- The leak is suspected to be on the aux building non-essential header, and this header is NOT likely to be restored within 15 minutes.

INITIATING CUE:

The CRS has directed you to perform the actions of Enclosure 6 of AP/1/A/5500/21 (Loss of KC or KC System Leakage), while the crew continues with AP-21.

SIM JPM B

Facility:	McGuire	Task No.:	
Task Title:	Align the Containment Spray System to Cold Leg Recirculation	JPM No.:	2018 Systems - Control Room JPM B (Alternate Path)
K/A Reference:	026 A4.01 (4.5/4.3)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- A High Energy Line Break has occurred inside Containment.
- EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirc) has been implemented and completed through step 6.
- FWST Level is approximately 80 inches and lowering.

Initiating Cue: The CRS has directed you to perform Steps 7 and 8 of EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirc).

Task Standard: The operator will attempt to align the 1A NS Pump for operation until it is observed that 1NS-18A has failed to open. The operator will then align the 1B NS Train for operation, and secure the 1A NS Train operation.

Required Materials: None

General References: EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Rev 36
EP/1/A/5000/E-2 (Faulted Steam Generator Isolation), Rev 10
EP/1/A/5000/E-1 (Loss of Reactor or Secondary Coolant), Rev 18

	EP/1/A/5000/ES-1.3 (Transfer to Cold Leg Recirc), Rev 28 EP/1/A/5000/F-0 (Critical Safety Function Status Trees (Containment), Rev 6 OMP 4-3 (Use of Emergency And Abnormal Procedure and FLEX Support Guidelines), Rev 46
Handouts:	Handout 1: ES-1.3 (Transfer to Cold Leg Recirc) marked up for this JPM.
Time Critical Task:	NO
Validation Time:	12 minutes

Critical Step Justification	
Step 2	This step is critical because pressing the 1NS-20A CLOSE pushbutton and the 1NS-3B CLOSE pushbutton is necessary to attempt to align the 1A NS Pump for operation until it is observed that 1NS-18A has failed to open.
Step 9	This step is critical because pressing the 1NS-32A OPEN pushbutton is necessary to attempt to align the 1A NS Pump for operation until it is observed that 1NS-18A has failed to open.
Step 10	This step is critical because pressing the 1NS-29A OPEN pushbutton is necessary to attempt to align the 1A NS Pump for operation until it is observed that 1NS-18A has failed to open.
Step 12	This step is critical because pressing the 1NS-18A OPEN pushbutton is necessary to attempt to align the 1A NS Pump for operation until it is observed that 1NS-18A has failed to open.
Alternate Path Critical Step Justification	
Step 13	This step is critical because correctly implementing Step 8.e.7 of the procedure is necessary to align the 1B NS Train for operation, and secure the 1A NS Train operation.
Step 17	This step is critical because pressing the 1NS-12B OPEN pushbutton is necessary to align the 1B NS Train for operation.
Step 18	This step is critical because pressing the 1NS-15B OPEN pushbutton is necessary to align the 1B NS Train for operation.
Step 20	This step is critical because pressing the 1NS-1B OPEN pushbutton is necessary to align the 1B NS Train for operation.
Step 22	This step is critical because pressing the 1B NS Pump START pushbutton is necessary to align the 1B NS Train for operation.
Step 23	This step is critical because pressing the 1RN-235 OPEN pushbutton is necessary to align the 1B NS Train for operation.
Step 24	This step is critical because pressing the 1RN-238 OPEN pushbutton as necessary is necessary to align the 1B NS Train for operation, and secure the 1A NS Train operation.
Step 30	This step is critical because pressing the 1NS-32A CLOSE pushbutton, and the 1NS-29A CLOSE pushbutton is necessary to secure the 1A NS Train operation.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset Simulator to IC-39 (100% power)
2. Insert LOA-NS009 (1NS-18A Racked Out), Insert H_X11_394_3=1 (Override Green status light ON)
3. Insert MALF NC008D = 1 (Loop D Cold Leg LOCA) and MALF SM007A-D = 4125000 (Steam Line D Break in Containment) (OR as many as are needed to raise Containment Pressure to greater than 3 psig at start of JPM, and keep it above 3 psig by the time the operator starts the 1B NS Pump at Step 22 of the JPM).
4. Carry out E-0, E-2 and E-1.
5. Allow FWST Level to lower to 95 inches and perform ES-1.3 up to Step 7.
6. Check FWST Level at approximately 80 inches.
7. Ensure Containment pressure is greater than 3.
8. Check CONT SUMP LEVEL GREATER THAN 3 FT alarm LIT on either 1AD-14 or 1AD-15 and Freeze Simulator.

OR

1. Reset Simulator to Temporary Snap IC-233 (October, 2017).

Simulator Instructor NOTE:
- **Remain available to silence alarms NOT related to the Task.**
- **Leave Simulator in FREEZE until the operator is ready to start (Containment Pressure must be greater than 3 psig at Step 3 of the JPM).**

(Denote Critical Steps with an asterisk)*

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin OR Containment Pressure may drop to less than 3 psig.				
1	(Step 7) Check both NS pumps - OFF.	The operator observes the 1A NS Pump Green status light is LIT, and the Red status light is OFF. The operator observes the 1B NS Pump Green status light is LIT, and the Red status light is OFF.		
*2	(Step 8) Align NS for recirc as follows: (Step 8.a) CLOSE the following valves: 1NS-20A (1A NS Pump Suction From FWST Isol) 1NS-3B (1B NS Pump Suction From FWST Isol).	The operator presses the 1NS-20A CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF. The operator presses the 1NS-3B CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF.		
3	(Step 8.b) Check containment pressure - GREATER THAN 3 PSIG.	The operator observes Containment pressure to be greater than 3 psig, and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
4	(Step 8.c) Check at least one of the following alarms - LIT: "CONT SUMP LEVEL GREATER THAN 3 FT" on 1AD-14 – LIT OR "CONT SUMP LEVEL GREATER THAN 3 FT" on 1AD-15 – LIT	The operator observes that both "CONT SUMP LEVEL GREATER THAN 3 FT" alarms on 1AD-14 and 1AD-15 are LIT.		
5	(Step 8.d) Check 1A NS pump - AVAILABLE TO RUN.	The operator observes the 1A NS Pump Green status light is LIT, and the Red status light is OFF, and determines that it is available to run.		
6	(Step 8.e) Align A Train NS to containment sump as follows: (Step 8.e.1) Check 1NI-185A (1A ND Pump Suction From Cont Sump Isol) - OPEN.	The operator observes the 1NI-185A Red status light is LIT, and the Green status light is OFF.		
7	(Step 8.e.2) Check 1B NS pump - OFF.	The operator observes the 1B NS Pump Green status light is LIT, and the Red status light is OFF.		
8	(Step 8.e.3) Check 1A RN pump - ON.	The operator observes the 1A RN Pump Red status light is LIT, and the Green status light is OFF.		
*9	(Step 8.e.4) OPEN 1NS-32A (1A NS Hx Outlet Cont Outside Isol).	The operator presses the 1NS-32A OPEN pushbutton, and observes the Red status light LIT, and the Green status light is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*10	(Step 8.e.5) OPEN 1NS-29A (1A NS Hx Outlet Cont Outside Isol).	The operator presses the 1NS-29A OPEN pushbutton, and observes the Red status light LIT, and the Green status light is OFF.		
11	(Step 8.e.6) Check 1NS-20A (1A NS Pump Suction From FWST Isol) - CLOSED.	The operator observes the 1NS-20A Green status light is LIT, and the Red status light is OFF.		
*12	(Step 8.e.7) OPEN 1NS-18A (1A NS Pump Suction From Cont Sump Isol).	The operator presses the 1NS-18A OPEN pushbutton and observes the Green status light is LIT, and the Red status light is OFF. **(Alternate Path)**		
*13	(Step 8.e.7 RNO) GO TO Step 8.f.	The operator proceeds to Step 8.f.		
14	(Step 8.f) Align B Train NS to containment sump as follows: (Step 8.f.1) Check 1NI-184B (1B ND Pump Suction From Cont Sump Isol) - OPEN.	The operator observes the 1NI-184B Red status light is LIT, and the Green status light is OFF.		
15	(Step 8.f.2) Check 1A NS pump - OFF.	The operator observes the 1A NS Pump Green status light is LIT, and the Red status light is OFF.		
16	(Step 8.f.3) Check 1B RN pump - ON.	The operator observes the 1B RN Pump Red status light is LIT, and the Green status light is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*17	(Step 8.f.4) OPEN 1NS-12B (1B NS Hx Outlet Cont Outside Isol).	The operator presses the 1NS-12B OPEN pushbutton, and observes the Red status light LIT, and the Green status light is OFF.		
*18	(Step 8.f.5) OPEN 1NS-15B (1B NS Hx Outlet Cont Outside Isol).	The operator presses the 1NS-15B OPEN pushbutton, and observes the Red status light LIT, and the Green status light is OFF.		
19	(Step 8.f.6) Check 1NS-3B (1B NS Pump Suction From FWST Isol) - CLOSED.	The operator observes the 1NS-3B Green status light is LIT, and the Red status light is OFF.		
*20	(Step 8.f.7) OPEN 1NS-1B (1B NS Pump Suction From Cont Sump Isol).	The operator presses the 1NS-1B OPEN pushbutton, and observes the Red status light LIT, and the Green status light is OFF.		
21	(Step 8.f.8) Wait up to 30 seconds for the following valves to open: 1NS-12B 1NS-15B 1NS-1B	The operator observes the 1NS-12B OPEN Red status light LIT, and the Green status light is OFF. The operator observes the 1NS-15B OPEN Red status light LIT, and the Green status light is OFF. The operator observes the 1NS-1B OPEN Red status light LIT, and the Green status light is OFF.		
*22	(Step 8.f.9) Start 1B NS pump.	The operator presses the 1B NS Pump START pushbutton and observes Red status light is LIT, Green status light is OFF; and running amps are approximately 42 amps.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*23	(Step 8.f.10) OPEN 1RN-235B (B NS HX Inlet Isol).	The operator presses the 1RN-235B OPEN pushbutton, and observes the Red status light LIT, and the Green status light is OFF.		
*24	(Step 8.f.11) WHEN 1RN-235B begins to open, THEN THROTTLE OPEN 1RN-238B (B NS Hx Outlet Isol) to establish 3600 GPM to 1B NS Hx.	The operator observes the 1RN-235B position, and presses the 1RN-238 OPEN pushbutton as necessary to establish 3600 gpm (1RNP-5880).		
25	(Step 8.g) Check NS alignment as follows: (Step 8.g.1) Check 1NS-18A (1A NS Pump Suction From Cont Sump Isol) - OPEN.	The operator observes the 1NS-18A Green status light is LIT, and the Red status light is OFF, and proceeds to the RNO.		
26	(Step 8.g.1 RNO) Perform the following: (Step 8.g.1 RNO a) IF 1NI-185A is open, AND 1NS-20A is closed, THEN OPEN 1NS-18A.	The operator presses the 1NS-18A OPEN pushbutton and observes the Green status light is LIT, and the Red status light is OFF.		
27	(Step 8.g.1 RNO b) IF 1NS-18A is closed, THEN place INFO sticker on 1A NS pump switch stating "Do not start until aligned to sump".	The operator observes the 1NS-18A Green status light is LIT, and the Red status light is OFF, and seeks to place an INFO Tag on the valve. **Cue:** **Another operator will hang this Sticker.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
28	(Step 8.g.2) Check 1NS-1B (1B NS Pump Suction From Cont Sump Isol) - OPEN.	The operator observes the 1NS-1B OPEN Red status light LIT, and the Green status light is OFF.		
29	(Step 8.g.3) Check 1A NS pump - ON.	The operator observes the 1A NS Pump Green status light is LIT, and the Red status light is OFF.		
*30	(Step 8.g.3 RNO) CLOSE the following valves: 1NS-32A (1A NS Hx Outlet Cont Outside Isol) 1NS-29A (1A NS Hx Outlet Cont Outside Isol).	The operator presses the 1NS-32A CLOSE pushbutton, and observes the Green status light LIT, and the Red status light is OFF. The operator presses the 1NS-29A CLOSE pushbutton, and observes the Green status light LIT, and the Red status light is OFF.		
31	(Step 8.g.4) Check 1B NS pump - ON.	The operator observes the 1B NS Pump Red status light is LIT, Green status light is OFF; and running amps are approximately 42 amps.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Systems - Control Room JPM B

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- A High Energy Line Break has occurred inside Containment.
- EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirc) has been implemented and completed through step 6.
- FWST Level is approximately 80 inches and lowering.

INITIATING CUE:

The CRS has directed you to perform Steps 7 and 8 of EP/1/A/5000/ES-1.3 (Transfer To Cold Leg Recirc).

SIM JPM C

Facility:	McGuire	Task No.:	
Task Title:	Emergency Borate in Mode 6	JPM No.:	2018 Systems - Control Room JPM C (Alternate Path)
K/A Reference:	APE 024 AA1.17 (3.9/3.9)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: ___X___

Classroom ______ Simulator ___X___ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM) and Handout 1.

Initial Conditions:

- The plant is in Mode 6 with Core Alterations in progress.
- Chemistry has just reported that a boron sample taken 30 minutes ago indicates that the RCS boron concentration is less than that required for Mode 6 indicating an NCS boron dilution may be occurring.
- MCB Annunciator 1AD-2/D3, S/R HI FLUX AT SHUTDOWN, has just alarmed.

Initiating Cue:

- The CRS has directed you to perform AP/1/A/5500/38, (Emergency Boration and Response to Inadvertent Dilution).
- The 1B BA Transfer Pump is available, however, due to elevated vibration levels, the 1A BA Transfer Pump is preferred.

Task Standard: The operator will perform steps 1-12 of AP/1/A5500/38, initiate emergency boration using the 1A BA Transfer Pump, and reinitiate emergency boration using the 1B BA Transfer Pump when 1ELXA de-energizes.

Required Materials: None

General References: OP/1/A/6100/010 C (Annunciator Response For Panel 1AD-2), Rev 69

AP/1/A/5500/38 (Emergency Boration and Response to Inadvertent Dilution), Rev 11

OMP 4-3 (Use of Emergency And Abnormal Procedure and FLEX Support Guidelines), Rev 46

Handouts: Handout 1: Blank copy of AP/1/A/5500/38.

Time Critical Task: NO

Validation Time: 8 minutes

Critical Step Justification	
Step 4	This step is critical because ensuring both RMUW Pumps are OFF is necessary to isolate dilution sources per AP/1/A/5500/38.
Step 5	This step is critical because closing 1NV-171A, 175A and 252A is necessary to isolate dilution sources per AP/1/A/5500/38.
Step 8	This step is critical because ensuring that 1NV-127A is aligned to the VCT is necessary to avoid an unsaturated Demineralizer from diluting the NCS boron concentration.
Step 11	This step is critical because ensuring that 1NV-250 is CLOSED is necessary to avoid diluting the NCS boron concentration.
Step 19	This step is critical because opening 1NV-265B is necessary to initiate emergency boration per AP/1/A/5500/38.
Step 20	This step is critical because ensuring that the 1A BA Transfer Pump is running is necessary to initiate emergency boration per AP/1/A/5500/38.
Alternate Path Critical Step Justification	
Step 22	This step is critical because ensuring that the 1B BA Transfer Pump is running is necessary to re-initiate emergency boration per AP/1/A/5500/38 after the failure of the 1A BA Transfer Pump.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-1 (Mode 6).

2. Place in RUN

3. Ensure the following:

   - ND Letdown is in service A Train ND
   - The A Train of ND is in service with the 1A RHR running
   - RCS temperature is stable < 140°F
   - One NV Pump is in operation
   - The A RMUW Pump is running
   - Information Sticker on 1B BA Transfer Pump indicating that pump is available but 1A BA Transfer Pump is preferred

4. Insert the following malfunctions:

   - PLP-086 [Variable RCS Boron Concentration] = 1350 ppm (Inadvertent NCS Dilution causing MCB Annunciator 1AD-2/D3, S/R HI FLUX AT SHUTDOWN)

5. Insert LOA-EP045 = OPEN_BOTH, delay = 2 Seconds, cd = X10_239_3 = 1 (after the operator starts the 1A BA Transfer Pump) 1ELXA De-energizes causing a loss of the 1A BA Transfer Pump [Via 1EMXA])

6. Acknowledge all alarms.

7. Freeze the Simulator

<u>**OR**</u>

1. Reset to IC-234 (October, 2017)

2. Verify that LOA-EP045 is PENDING.

3. Information Sticker on 1B BA Transfer Pump indicating that pump is available but 1A BA Transfer Pump is preferred

4. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.

5. Leave Simulator in FREEZE until operator is ready to begin.

NOTE: The Booth instructor will need to verify that when the operator starts the 1A BA Transfer Pump LOA-EP045 is ACTIVE at Step 20.

(Denote Critical Steps with an asterisk)*

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM) and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(AP/1/A/5500/38, Step 1) Check if boron dilution - SUSPECTED.	The operator recognizes that with the RCS boron concentration less than the Refueling concentration, a dilution event is suspected.		
2	(Step 2) Maintain reactor power less than or equal to 100%.	The operator recognizes the plant is in Mode 6 and continues.		
3	(Step 3) Announce occurrence on paging system.	The operator makes an announcement that AP/1/A/5500/38 has been entered.		
*4	(Step 4/4.a) Isolate reactor makeup water to VCT as follows: • Ensure both reactor makeup water pumps are off.	The operator rotates the 1A RMUW Pump Control Switch to the STOP position and observes the Green status light is LIT, and the Red status light is OFF. The operator rotates the 1B RMUW Pump Control Switch to the STOP position and observes the Green status light is LIT, and the Red status light is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(Step 4.b) Select "CLOSE" on the following valve switches: • 1NV-171A (U1 Boric Acid Blender To VCT Inlet Control) • 1NV-175A (U1 Boric Acid Blender to VCT Outlet Control) • 1NV-252A (Rx M/U Water Supply To U1 BA Blender Cntrl).	The operator places the 1NV-171A control switch to CLOSED, and observes the Green status light is LIT, and the Red status light is OFF. The operator places the 1NV-175A control switch to CLOSED, and observes the Green status light is LIT, and the Red status light is OFF. The operator places the 1NV-252A control switch to CLOSED, and observes the Green status light is LIT, and the Red status light is OFF.		
6	(Step 5) Check reactor status at time of dilution - CRITICAL.	The operator recognizes the plant is in Mode 6 and continues.		
7	(Step 5 RNO) IF any control rod withdrawn, THEN……	The operator recognizes the plant is in Mode 6 and continues.		
*8	(Step 6) Place 1NV-127A (U1 L/D Hx 3-Way Temp Control) in the "VCT" position.	The operator places the 1NV-127A control switch to the VCT position and observes the White status light is LIT, and the Red status light is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
9	(Step 7) Notify OSM or another SRO to perform the following while continuing with this procedure: Evaluate ongoing or recent plant evolutions for potential dilution sources. • IF source of dilution cannot readily be determined or isolated, THEN perform the following: • Evaluate dispatching an operator to CLOSE 1NB-256 (Unit 1 RMWST Outlet Isol) (East Side of RMWST, 760+2). • IF 1NB-256 is closed, THEN notify Radwaste that the Reactor Makeup Water flush header is isolated.	The operator requests the CRS to perform Step 7. **Cue:** **As the CRS, state that you will perform Step 7 of AP/1/A/5500/38.**		
10	(Step 8) Check unit status - IN MODE 1 OR 2.	The operator recognizes the plant is in Mode 6 and continues.		
*11	(Step 8 RNO a) Perform the following: IF in Mode 6, THEN dispatch operator to ensure 1NV-250 (Rx Makeup Water Supply to Unit 1 NV Isol) (aux bldg, 733, JJ-54, 25 ft north of KC pumps) is CLOSED.	The operator dispatches an AO to perform Step 8 RNO a. **Cue:** **As the AO, acknowledge.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
12	(Step 8 RNO b) IF fuel handling activities in progress, THEN stop fuel handling PER Enclosure 2 (Actions To Stop Fuel Handling).	The operator addresses Enclosure 2. **Cue:** **State that the Refueling SRO is performing Enclosure 2 of AP/1/A/5500/38.**		
13	(Step 8 RNO c) Evaluate need to evacuate Containment PER RP/0/A/5700/011 (Conducting a Site Assembly, Site Evacuation, or Containment Evacuation).	The operator addresses RP/0/A/5700/011. **Cue:** **State that the SM will conduct the evacuation.**		
14	(Step 8 RNO d) Evaluate stopping any heatup or cooldown in progress to minimize reactivity changes.	The operator observes NC temperature to be stable at ≈130°F, and continues.		
15	(8 RNO e) GO TO Step 12.	The operator proceeds to Step 12.		
16	(Step 12/12.a) Initiate emergency boration as follows: • Check 1A or 1B NV pump - AVAILABLE.	The operator observes that the 1A NV Pump Red status light is LIT, and the Green status light is OFF.		
17	(Step 12.b) Check any NV pump - ON.	The operator observes that the 1A NV Pump Red status light is LIT, and the Green status light is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
18	(Step 12.c) Check the following boric acid system components - AVAILABLE. • Boric Acid Storage Tank • Boric Acid Transfer pump.	The operator observes 1NVP-5740 and determines that 1 BAT level is 61%. (Or equivalent, i.e. observes the OAC) The operator observes 1NVP-6070 and determines that 2 BAT level is 60%. (Or equivalent, i.e. observes the OAC) The operator observes Green status light LIT, Red status light OFF for the 1A BA Transfer Pump. The operator observes Green status light LIT, Red status light OFF for the 1B BA Transfer Pump. The operator observes the Information Sticker on the 1B BA Transfer Pump Control Switch indicating that the pump is available but the 1A BA Transfer Pump is preferred pump.		
*19	(Step 12.d) OPEN 1NV-265B (U1 NV Pump Boric Acid Sup Isol).	The operator presses the 1NV-265B OPEN pushbutton and observes the Red status light is LIT, and the Green status light is OFF.		
*20	(Step 12.e) Ensure a boric acid transfer pump is running.	The operator rotates the Control Switch to START for the 1A BA Transfer Pump, and observes Red status light LIT, Green status light OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor: **ENSURE LOA is ACTIVE** **Insert LOA-EP045 = OPEN_BOTH, delay = 2 Seconds, cd = X10_239_3 = 1 (after the operator starts the 1A BA Transfer Pump) 1ELXA De-energizes causing a loss of the 1A BA Transfer Pump [Via 1EMXA]) (ALTERNATE PATH)** **NOTE: 1AD-11, A2 and A3 will alarm on the loss of 1ELXA.**				
		Cue: **If the operator announces these alarms to the CRS, as the CRS, state that another operator will address the ARPs.**		
21	(Step 12.f) Check boration flow using one of the following methods: • IF 1NV-265B is open, THEN check "EMERGENCY BORATION FLOW" - ESTABLISHED. OR • IF 1NV-269 is open, THEN check "BORIC ACID FLOW" on chart recorder 1MNVCR5450 - ESTABLISHED.	The operator observes 1NVP-5440 (Or equivalent, i.e. OAC) indicating 0 gpm, and determines that Emergency Boration Flow is NOT established, and proceeds to RNO. **Examiner Note:** **The operator may start the 1B BA Transfer Pump in Step 12.e (ENSURE BA Transfer Pump is RUNNING). If so, after verifying flow is greater than 0 gpm (≈70 gpm), terminate the JPM.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*22	(Step 12.f RNO) Perform the following: • Start second boric acid transfer pump • IF boration flow cannot be established, THEN……..	The operator rotates the Control Switch to START for the 1B BA Transfer Pump, and observes Red status light LIT, Green status light OFF. The operator observes 1NVP-5440 (Or equivalent, i.e. OAC) 70 gpm, and determines that Emergency Boration Flow is established.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Systems - Control Room JPM C

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ________________________ Date: ______________

INITIAL CONDITIONS:

- The plant is in Mode 6 with Core Alterations in progress.
- Chemistry has just reported that a boron sample taken 30 minutes ago indicates that the RCS boron concentration is less than that required for Mode 6 indicating an NCS boron dilution may be occurring.
- MCB Annunciator 1AD-2/D3, S/R HI FLUX AT SHUTDOWN, has just alarmed.

INITIATING CUE:

- The CRS has directed you to perform AP/1/A/5500/38, (Emergency Boration and Response to Inadvertent Dilution).
- The 1B BA Transfer Pump is available, however, due to elevated vibration levels, the 1A BA Transfer Pump is preferred.

SIM JPM D

Facility:	McGuire	Task No.:	
Task Title:	Remove Pressurizer Heaters from Service	JPM No.:	2018 Systems - Control Room JPM D (Alternate Path)
K/A Reference:	010 A4.02 (3.6/3.4)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: __X__

Classroom ______ Simulator __X__ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:	• Unit 1 has just increased reactor power to 100% per OP/1/A/6100/003 (Controlling Procedure for Unit Operation). • Chemistry has confirmed that the Boron Concentration difference between the Pzr and the NC System is 4 ppm.

Initiating Cue:	• The CRS has directed you to remove Pzr Heater Groups A, B and D from service per Enclosure 4.6 (Operation of Pzr Heaters) of OP/1/A/6100/003, and ensure that NC System pressure is being controlled normally at 2235 psig. • All outstanding Clearances that may impact performance of Enclosure 4.6 have been evaluated.

Task Standard:	The operator will remove the A, B and D Pzr Heater Groups from service in accordance with Step 3.4.4 of Enclosure 4.6, and then after responding to the failure of the C Pzr Heater Group, manually control pressure by re-energizing at least one heater group. The operator will place at least one Pzr Heater Group in service in accordance with Step 3.3.1 (or equivalent) of Enclosure 4.6, before MCB Annunciator 1AD-6, C6 alarms.

Required Materials:	None
General References:	OP/1/A/6100/003 (Controlling Procedure for Unit Operation), Rev 201 OP/1/A/6100/010G (Annunciator Response for Panel 1AD-6), Rev 73 AD-HU-ALL-004 (Procedure And Work Instruction Use and Adherence), Rev 9 OMP 4-3 (Use of Emergency And Abnormal Procedure and FLEX Support Guidelines), Rev 46
Handouts:	Handout 1: Blank Copy of Enclosure 4.6 (Operation of Pzr Heaters) of OP/1/A/6100/003 (Controlling Procedure for Unit Operation)
Time Critical Task:	NO
Validation Time:	13 minutes

Critical Step Justification	
Step 7	This step is critical because rotating either the A, B or D Pzr Htr Mode Select Switch counter - clockwise to AUTO is necessary to remove the A, B and D Pzr Heater Groups from service.
Step 10	This step is critical because rotating either the A, B or D Pzr Htr Mode Select Switch counter - clockwise to AUTO is necessary to remove the A, B and D Pzr Heater Groups from service.
Step 16	This step is critical because rotating either the A, B or D Pzr Htr Mode Select Switch counter - clockwise to AUTO is necessary to remove the A, B and D Pzr Heater Groups from service.
Step 18	This step is critical because selecting Pzr Pressure Master and selects "M" (Turns RED) is necessary to remove the A, B and D Pzr Heater Groups from service (Establishes Cycling Heaters in AUTO).
Step 19	This step is critical because adjusting the Pzr Press Master output is necessary to remove the A, B and D Pzr Heater Groups from service (Establishes Cycling Heaters in AUTO).
Step 20	This step is critical because selects Pzr Pressure Master and selects "A" is necessary to remove the A, B and D Pzr Heater Groups from service (Establishes Cycling Heaters in AUTO).
Alternate Path Critical Step Justification	
Step 21	This step is critical because determining that Pzr Pressure is lowering with only the cycling heaters on is necessary to manually control pressure by re-energizing at least one heater group.
Step 23	This step is critical because re-energizing at least one group of Pressurizer Heaters is necessary to manually control pressure.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-39 (100%)

2. Ensure Simulator reflects having been completed through Step 3.37.10.4 of OP/1/A/6100/003, Enclosure 4.1 (Power Increase).

3. Ensure that Pzr Heaters groups A, B, and D are energized.

4. Acknowledge Alarms and Freeze Simulator

5. Create Scenario Manager File NRC JPM D (Failure of Pzr Variable Heaters).
(ANN) 1AD6-D06 = ON
Insert X10_190_1 = False (0) (C heaters energize/de-energize Red Status light – OFF)
Insert X10_186_2 (PZR HTR C Supply Breaker Open)

OR

1. Reset Simulator to Temporary Snap IC-235 (October, 2017).
2. Load Scenario Manager File NRC JPM D (Failure of Pzr Variable Heaters).
3. Momentarily place Simulator in Run to acknowledge alarms.
4. Leave Simulator in FREEZE until operator is ready to begin.

NOTE: During the performance of this JPM, the simulator operator will need to execute failure at Step 20 of the JPM.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(Enclosure 4.6, Step 3.1) Evaluate all outstanding Clearances that may impact performance of this procedure.	The operator recognizes that this step has already been performed (Initial Conditions), and proceeds.		
2	(Note prior to Step 3.2) During steady state conditions, Pzr Htr Groups are normally OFF and in AUTO.	The operator reads the Note and proceeds.		
3	(Step 3.2) Perform the following sections as applicable: • Section 3.3, Placing A, B, D Pzr Heater Groups in Service. • Section 3.4, Removing A, B, D Pzr Heater Groups from Service. • Section 3.5, Placing C Pzr Heater Group in Service. • Section 3.6, Removing C Pzr Heater Group from Service. • Section 3.7, Manual Operation of A, B, D Pzr Heater Groups	The operator recognizes that Section 3.4 is the applicable section and proceeds to Section 3.4.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
4	(Step 3.4) Removing A, B, D Pzr Heater Groups From Service (Caution prior to Step 3.4.1) Pzr Htr Groups and Pzr Spray Controls should be operated with extreme caution to prevent NC System pressure transients. (Step 3.4.1) Ensure Boron Concentration difference between Pzr and NC System less than 50 ppm.	The operator reads the Caution and proceeds. The operator recognizes that this condition is already met (Initial Conditions), and proceeds.		
5	(Step 3.4.2) IF three Pzr Htr Groups in service AND desire to operate with two Pzr Htr Groups in service…..	The operator recognizes that this step is NOT applicable and proceeds.		
6	(Step 3.4.3) IF three Pzr Htr Groups in service AND desire to operate with one Pzr Htr Group in service…..	The operator recognizes that this step is NOT applicable and proceeds.		
*7	(Step 3.4.4) IF three Pzr Htr Groups in service AND desire to remove all Pzr Htr Groups from service, perform the following: (Step 3.4.4.1) Place one of the following in AUTO: A Pzr Htr Mode Select B Pzr Htr Mode Select D Pzr Htr Mode Select	The operator rotates either the A, B or D Pzr Htr Mode Select Switch counter - clockwise to AUTO.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
8	(Step 3.4.4.2) Check associated Pzr Htr Group in OFF. A Pzr Htr Group B Pzr Htr Group D Pzr Htr Group	The operator observes the Green status light LIT and the Red status light OFF for the heater group, whose Mode Select Switch was moved to AUTO in the previous step.		
9	(Step 3.4.4.3) Monitor Pzr pressure for 2 minutes.	The operator observes actual Pressurizer Pressure and Spray Valve position (Or equivalent) for 2 minutes and determines that Pzr Pressure has stabilized. **Examiner Cue:** **Two minutes has elapsed.**		
*10	(Step 3.4.4.4) Place second Pzr Htr Mode Select Switch in AUTO: A Pzr Htr Mode Select B Pzr Htr Mode Select D Pzr Htr Mode Select	The operator rotates either the A, B or D Pzr Htr Mode Select Switch counter-clockwise to AUTO.		
11	(Step 3.4.4.5) Check associated Pzr Htr Group in OFF. A Pzr Htr Group B Pzr Htr Group D Pzr Htr Group	The operator observes the Green status light LIT and the Red status light OFF for the heater group, whose Mode Select Switch was moved to AUTO in the previous step.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
12	(Step 3.4.4.6) Monitor Pzr pressure for 2 minutes.	The operator observes actual Pressurizer Pressure and Spray Valve position (Or equivalent) for 2 minutes and determines that Pzr Pressure has stabilized. **Examiner Cue:** **Two minutes has elapsed.**		
13	(Note prior to Step 3.4.4.7) Placing Pzr Press Master in manual makes automatic operation of 1NC-34A (Pzr PORV) unavailable and should be evaluated using Electronic Risk Assessment Tool. This assessment should be performed prior to placing Pzr Press Master in manual.	The operator reads the Note and proceeds.		
14	(Step 3.4.4.7) IF time allows AND Unit 1 in Modes 1-4, evaluate unavailability of 1NC-34A (Pzr PORV) using Electronic Risk Assessment Tool.	The operator informs the CRS. **Examiner Cue:** **As the CRS, indicate that the ERAT has been used, and the Pzr Press Master may be placed in MAN.**		
15	(Note prior to Step 3.4.4.8) Steps 3.4.4.8 – 3.4.4.10C should be performed without delay.	The operator reads the Note and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*16	(Step 3.4.4.8) Place third Pzr Htr Mode Select in AUTO: A Pzr Htr Mode Select B Pzr Htr Mode Select D Pzr Htr Mode Select	The operator rotates either the A, B or D Pzr Htr Mode Select Switch counter-clockwise to AUTO.		
17	(Step 3.4.4.9) Check associated Pzr Htr Group in OFF. A Pzr Htr Group B Pzr Htr Group D Pzr Htr Group	The operator observes the Green status light LIT and the Red status light OFF for the heater group, whose Mode Select Switch was moved to AUTO in the previous step.		
*18	(Step 3.4.4.10) On the DCS Work Station, Pressurizer and PRT graphic, perform the following: (Step 3.4.4.10 A) Place PZR PRESS MASTER in manual.	The operator observes the NC-Pressurizer and PRT DCS Screen and observes Pressurizer pressure. The operator selects Pzr Pressure Master and selects “M” (Turns RED).		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*19	(Step 3.4.4.10 B) Adjust PZR PRESS MASTER output until the following occurs: C Pzr Htr Group begins cycling 1NC-27C (A Loop Pzr Spray Control) Closes 1NC-29C (B Loop Pzr Spray Control) Closes	Using the NC-Pressurizer and PRT DCS Screen, the operator adjusts until Pzr Press Master output (**DOWN**) until the error signal is < 15 psig. The operator observes C Pzr Heater Group Red Status light cycling ON and OFF, and determines that the C Pzr Htr Group is cycling. The operator observes the 1NC-27C SLIMs Limit Switch and determines that 1NC-27C is CLOSED. The operator observes the 1NC-29C SLIMs Limit Switch and determines that 1NC-29C is CLOSED.		
*20	(Step 3.4.4.10 C) Place PZR PRESS MASTER in auto.	Using the NC-Pressurizer and PRT DCS Screen, the operator selects Pzr Pressure Master and selects “A” (Turns GREEN).		

Simulator Instructor NOTE: Execute & Activate Lesson Plan (Failure of Pzr Variable Heaters) (Alternate Path)

It is expected that MCB Annunciator 1AD6/D6 (PZR HTR CONTROLLER TROUBLE) will alarm.

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*21	(Step 3.4.4.11) Monitor Pzr pressure for 2 minutes.	The operator observes actual Pressurizer Pressure and Spray valve Position (Or equivalent) and determines that Pzr Pressure is lowering. **(Alternate Path)** The operator observes MCB Annunciator 1AD6/D6 and addresses ARP.		
22	(OP/1/A/6100/010 G, Immediate Action 1) Remove Group C Heater Group from automatic control by opening supply breaker.	The operator observes the C Pzr Heater Group Green Status light is LIT, and determines that the Group C Heater supply breaker is OPEN.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*23	(OP/1/A/6100/010 G, Immediate Action 2) Manually control pressure using other heater groups.	The operator recognizes that no Pzr htrs are energized and proceeds to Enclosure 4.6, Step 3.3.1 (Or Equivalent) to place one Pzr Htr Group in service. **Examiner Note:** **The operator may use one or more Pzr Heater Groups to maintain NC System Pressure within the normal band.** **The operator MUST place at least one Pzr Htr Group in service to complete the Critical nature of this task.** **The operator should realize the need to get one set of htrs on for pressure control and MAY start that one set of htrs based on ARP guidance to manually control pressure. If NOT, the required OP Steps of Section 3.3.1 are scripted.** **However, Section 3.7 of Enclosure 4.6 may be used as well.** **Additionally, the operator may use an Operator Prudent Action per Attachment 10.1 of OMP 4-3 to re-energize at least one Group of Pzr Heaters.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
		Examiner Note: **IF MCB Annunciator 1AD-6, C6, alarms before the operator energizes one set of Heaters, the Critical Step is Failed.**		
24	(Enclosure 4.6, Step 3.3) Placing A, B, D Pzr Heater Groups in service. (Caution prior to Step 3.3.1) Pzr Htr Groups and Pzr Spray Controls should be operated with extreme caution to prevent NC System pressure transients. (Step 3.3.1) IF desired to operate with one Pzr Htr group in service, perform the following: (Step 3.3.1.1) Place of the following in MAN: A Pzr Htr Mode Select B Pzr Htr Mode Select D Pzr Htr Mode Select	The operator reads the Caution, and proceeds. The operator rotates either the A, B or D Pzr Htr Mode Select Switch clockwise to MAN.		
25	(Step 3.3.1.2) Place the associated Pzr Htr Group in ON: A Pzr Htr Group B Pzr Htr Group D Pzr Htr Group	The operator depresses the ON pushbutton for the heater group, whose Mode Select Switch was moved to MAN in the previous step, and observes the Red status light LIT and the Green status light OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
26	(Step 3.3.1.3) Monitor Pzr pressure for 2 minutes.	The operator observes Pressurizer Pressure and Spray valve Position (Or equivalent) for 2 minutes and determines that Pzr Pressure has stabilized at 2235 ±15 psig.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Systems - Control Room JPM D

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ________________________ Date: ______________

INITIAL CONDITIONS:

- Unit 1 has just increased reactor power to 100% per OP/1/A/6100/003 (Controlling Procedure for Unit Operation).
- Chemistry has confirmed that the Boron Concentration difference between the Pzr and the NC System is 4 ppm.

INITIATING CUE:

- The CRS has directed you to remove Pzr Heater Groups A, B and D from service per Enclosure 4.6 (Operation of Pzr Heaters) of OP/1/A/6100/003, and ensure that NC System pressure is being controlled normally at 2235 psig.
- All outstanding Clearances that may impact performance of Enclosure 4.6 have been evaluated.

SIM JPM E

Facility:	McGuire	Task No.:	
Task Title:	Isolate the SI Accumulators during Degraded Core Cooling	JPM No.:	2018 Systems - Control Room JPM E (Alternate Path)
K/A Reference:	006 A4.02 (4.0/3.8)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Ensure Handout 1 is placed on CRS Desk.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 2.

Initial Conditions:

- A loss of coolant accident has occurred.
- Multiple equipment failures resulted in an ORANGE Path on CORE COOLING.
- The crew has completed Steps 1 through 16 of EP/1/A/5000/FR-C.2 (Response to Degraded Core Cooling).
- You are the BOP.

Initiating Cue: The CRS has directed you to continue with FR-C.2 starting with Step 17.

Task Standard: The operator will isolate Accumulators A, B and C; and vent Accumulator D per Step 17 of FR-C.2 when it is determined that it cannot be isolated.

Required Materials: None

General References: EP/1/A/5000/FR-C.2 (Response to Degraded Core Cooling), Rev 10

EP/1/A/5000/F-0 (Critical Safety Function Status Trees), Rev 6

OMP 4-3 (Use of Emergency And Abnormal Procedure and FLEX Support Guidelines), Rev 46

OP/1/A/6200/009 (Accumulator Operation), Rev 110

Handouts: Handout 1: EP/1/A/5000/FR-C.2 marked up for place-keeping through Step 16.
Handout 2: Blank copy of Pages 17-22 of EP/1/A/5000/FR-C.2.

Time Critical Task: NO

Validation Time: 6 minutes

Critical Step Justification	
Step 3	This step is critical because rotating the 1NI-54A power disconnect switch to ENABLE position and pressing the 1NI-54A CLOSE pushbutton is necessary to isolate Accumulator A.
Step 4	This step is critical because rotating the 1NI-76A power disconnect switch to ENABLE position and pressing the 1NI-76A CLOSE pushbutton is necessary to isolate Accumulator B.
Step 5	This step is critical because rotating the 1NI-65B power disconnect switch to ENABLE position and pressing the 1NI-65B CLOSE pushbutton is necessary to isolate Accumulator C.
Alternate Path Critical Step Justification	
Step 6	This step is critical because rotating the 1NI-88B power disconnect switch to ENABLE position and pressing the 1NI-88B CLOSE is necessary to determine that the 1D CLA cannot be isolated and must be vented.
Step 7	This step is critical because pressing the Train A&B Phase B RESET Pushbutton is necessary to vent the 1D CLA.
Step 8	This step is critical because pressing the 1VI-150B OPEN pushbutton is necessary to vent the 1D CLA.
Step 9	This step is critical because pressing the 1NI-84 OPEN pushbutton is necessary to vent the 1D CLA.
Step 10	This step is critical because adjusting the 1NI-83 controller to open the valve is necessary to vent the 1D CLA.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-70 (Degraded Core Cooling EP/1/A/5000/FR-C.2).
2. Insert the following to restore power to 1ETB and prevent pump restarts:
   - MAL-ND001B = BOTH (Failure of ND Pump B to Start)
   - LOA-NI015A = RACK_OUT (NI Pump 1B Control Power Rackout)
   - MAL-NV006B = BOTH (Failure of Charging Pump B to Start)
   - LOA-EP173 = RESET (In-Plant Lockout Reset)
   - LOA-DG014 = RESET (1B DSG 86D Lockout Reset)
3. Delete MAL-EP008B (Loss of 4160V Bus 1ETB)
4. Place in RUN
5. Start and stop the 1A NV Pump as needed to maintain RVLIS level while establishing the initial conditions.
6. Rack in the Breaker for the 1A ND Pump to gain control of the ND Pump (LOA-ND0002_RACKED_IN (Use 1A ND Pump as needed to maintain RVLIS level while establishing the above conditions).
7. Perform Steps 1-16 of EP/1/A/5000/FR-C.2, and ENSURE the following conditions exist:
   - CETs are between 200-1200°F
   - NC Subcooling is 0°F or negative
   - All NC Pumps are OFF
   - RVLIS is greater than ≈39%
   - FWST level > 95 inches
   - S/G pressures < 190 psig
   - Thots less than 388°F
8. Insert MAL-ND001A = BOTH (Failure of ND Pump A to start) and MAL-NV006A = BOTH (Failure of Charging Pump A to start)
9. Insert REM-NI0088B = 1 (D CLA Discharge Isolation [Fails to CLOSE])
10. Acknowledge all alarms.
11. Freeze the Simulator

<u>OR</u>

1. Reset to IC-236 (October, 2017)

2. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.

3. Leave Simulator in FREEZE until operator is ready to begin.

(Denote Critical Steps with an asterisk*)

Ensure Handout 1 is placed on CRS Desk.
Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 2.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(Step 17) Check if CLAs should be isolated: (Step 17.a) Check at least two NC T- Hots - LESS THAN 388°F.	The operator observes INCCR5850 and 5900 (Or Equivalent) and determines that at least two Thots are less than 388°F.		
2	(Step 17.b.1-2) Reset the following: • S/I. • Sequencers.	The operator observes the Train A S/I Yellow S/I RESET light is LIT. The operator observes the Train B S/I RESET Yellow S/I RESET light is LIT. The operator observes the Train A Yellow Sequencer RESET light is LIT. The operator observes the Train B Yellow Sequencer RESET light is LIT. **Note:** **The operator may press the RESET pushbuttons, however, SI and the Sequencers are already reset.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	(Step 17.c Bullet 1) Place the power disconnect switches to "ENABLE" and CLOSE the following valves: • 1NI-54A (A CL Accum Disch Isol)	The operator rotates the 1NI-54A power disconnect switch to ENABLE. The operator presses the 1NI-54A CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF. **Examiner Note:** **The CLA isolation can be completed in any order.**		
*4	(Step 17.c Bullet 2) Place the power disconnect switches to "ENABLE" and CLOSE the following valves: • 1NI-76A (C CL Accum Disch Isol)	The operator rotates the 1NI-76A power disconnect switch to ENABLE. The operator presses the 1NI-76A CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF.		
*5	(Step 17.c Bullet 3) Place the power disconnect switches to "ENABLE" and CLOSE the following valves: • 1NI-65B (B CL Accum Disch Isol)	The operator rotates the 1NI-65B power disconnect switch to ENABLE. The operator presses the 1NI-65B CLOSE pushbutton and observes the Green status light is LIT, and the Red status light is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*6	(Step 17.c Bullet 4) Place the power disconnect switches to "ENABLE" and CLOSE the following valves: • 1NI-88B (D CL Accum Disch Isol).	The operator rotates the 1NI-88B power disconnect switch to ENABLE. The operator presses the 1NI-88B CLOSE pushbutton and observes the Red status light remains LIT, and the Green status light is OFF. **(Alternate Path)**		
*7	(Step 17.c RNO c/c.1) Vent any unisolated CLA as follows: • Ensure Phase B reset.	The operator presses the Train A Phase B RESET Pushbutton and observes the Yellow Phase B RESET light is LIT. The operator presses the Train B Phase B RESET Pushbutton and observes the Yellow Phase B RESET light is LIT.		
*8	(Step 17.c RNO c.2) OPEN 1VI-150B (Lwr Cont Non-Ess Cont Outside Isol).	The operator presses the 1VI-150B OPEN pushbutton and observes the Red status light is LIT, and the Green status light is OFF.		
*9	(Step 17.c RNO c.3) OPEN isolation valve on affected CLA: • IF 1NI-88B did not close, THEN OPEN 1NI-84 (D CL Accum N2 Supply Isol).	The operator presses the 1NI-84 OPEN pushbutton and observes the Red status light is LIT, and the Green status light is OFF.		
*10	(Step 17.c RNO c.4) OPEN 1NI-83 (CL Accum N2 Hdr Atmos Vent Isol).	The operator rotates the 1NI-83 controller adjust knob and observes the controller output at 100%.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
11	(Step 17.c RNO c.5) IF CLA cannot be isolated OR vented, THEN…..	The operator recognizes that Accumulators A, B and C are isolated, and Accumulator D is vented; and proceeds.		
12	(Step 17.c RNO c.6) IF 1VI-150B was opened in step above, THEN perform the following: • WHEN CLA venting complete, THEN RECLOSE 1VI-150B.	The operator observes the NI Screen on the OAC and observes Accumulator D pressure slowly lowering. **CUE:** **Another operator will continue with this procedure.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Systems - Control Room JPM E

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- A loss of coolant accident has occurred.
- Multiple equipment failures resulted in an ORANGE Path on CORE COOLING.
- The crew has completed Steps 1 through 16 of EP/1/A/5000/FR-C.2 (Response to Degraded Core Cooling).
- You are the BOP.

INITIATING CUE: The CRS has directed you to continue with FR-C.2 starting with Step 17.

SIM JPM F

Facility:	McGuire	Task No.:	
Task Title:	Control Room Air Intake High Radiation Alarms	JPM No.:	2018 Systems - Control Room JPM F
K/A Reference:	061 AA2.01 (3.5/3.7)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM).

Initial Conditions:

- Units 1 and 2 are operating at 100% power.
- Annunciator 1RAD-2 B2, EMF 43B CR AIR INTAKE B HI RAD, alarmed 45 seconds ago.
- Annunciator 1RAD-1 B2, EMF 43A CR AIR INTAKE A HI RAD, alarmed 15 seconds ago.

Initiating Cue: The CRS has directed you to perform the Annunciator Response Procedures for both alarms.

Task Standard: The operator will determine that the Unit 2 intake presents a greater threat than Unit 1, and align the VC inlet to take suction on Unit 1 only; and then pressurize the Control Room from the B Train Outside Air Pressure Fan.

Required Materials: None

General References: OP/1/A/6100/010 Q (Annunciator Response for Panel 1RAD-1), Rev 67
OP/1/A/6100/010 R (Annunciator Response for Panel 1RAD-2), Rev 41

	OP/0/A/6450/011 (Control Area Ventilation / Chilled Water System), Rev 105 AD-HU-ALL-004 (Procedure And Work Instruction Use and Adherence), Rev 9
Handouts:	Handout 1: Enclosure 4.14 (Response When EMF43A or 43B In Trip 2 or Non-Functional) of OP/0/A/6450/011 (Control Area Ventilation / Chilled Water System) Handout 2: Enclosure 4.4 (Control Room Atmosphere Pressurization During Abnormal Conditions) of OP/0/A/6450/011 (Control Area Ventilation / Chilled Water System)
Time Critical Task:	NO
Validation Time:	14 minutes

Critical Step Justification	
Step 8	This step is critical only if JPM Step 8 is performed in lieu of JPM Step 10. This step is critical because observing EMF 43A and EMF 43B and determining that EMF 43B has the highest reading is necessary to determine that the operator must align the VC inlet to take suction on Unit 1 only.
Step 10	This step is critical only if JPM Step 8 is not performed. In this case, this step is critical because requesting RP to determine the Unit Intake with the highest rad levels is necessary to determine that the operator must align the VC inlet to take suction on Unit 1 only.
Step 13	This step is critical because pressing the 1VC-9A, 10A, 11B and 12B CLOSE pushbutton is necessary to align the VC inlet to take suction on Unit 1 only.
Step 14	This step is critical because determining that both EMF 43A and EMF 43B are valid alarms is necessary to pressurize the Control Room from the B Train Outside Air Pressure Fan.
Step 21	This step is critical because rotating the B Train CR Outside Air Press Fan Control Switch to the ON position is necessary to pressurize the Control Room from the B Train Outside Air Pressure Fan.
Step 22	This step is critical because presses the MAN pushbutton for #1 & #2 CRA Otsd Air Fan is necessary to pressurize the Control Room from the B Train Outside Air Pressure Fan.
Step 23	This step is critical because pressing the OFF pushbutton for CRA-OAD-3 and 4 is necessary to pressurize the Control Room from the B Train Outside Air Pressure Fan.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset simulator to IC-39 (100%).
2. Place in RUN
3. Adjust the output of EMF 43B to greater than the Trip II setpoint (Insert MAL-EMF-43B = 5400).
4. Adjust the output of EMF 43A to greater than the Trip II setpoint, but less than the value of EMF 43B (Insert MAL-EMF-43A = 4100).
5. Ensure 1RAD-1 B2 and 1RAD-2 B2 are both LIT.
6. Ensure Air Intake Valves from BOTH Units are OPEN.
7. Ensure that the B Train of VC/YC is operating.
8. Acknowledge all alarms.
9. Freeze the Simulator

OR

1. Reset to IC-237 (October, 2017)
2. Momentarily go to RUN to acknowledge Alarms then place Simulator in FREEZE.
3. Leave Simulator in FREEZE until operator is ready to begin.

(Denote Critical Steps with an asterisk)*

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM).

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(OP/1/A/6100/010 Q, 1RAD-1 B2 IA) Perform OP/0/A/6450/011 (Control Area Ventilation / Chilled Water System) Enclosure 4.14 (Response When EMF 43A and/or EMF 43B In Trip 2 or Non-Functional).	After checking the other ARP, the operator proceeds to OP/0/A/6450/011 Enclosure 4.14. **Examiner Note:** **The Immediate Actions for both ARPs are the same. The operator can address in either order (Step 1 and 2 can be done in any order).** **When operator seeks Enclosure 4.14, provide Handout 1.**		
2	(OP/1/A/6100/010 R, 1RAD-2 IA) Perform OP/0/A/6450/011 (Control Area Ventilation / Chilled Water System) Enclosure 4.14 (Response When EMF 43A and/or EMF 43B In Trip 2 or Non-Functional).	After checking the other ARP, the operator proceeds to OP/0/A/6450/011 Enclosure 4.14.		
3	(OP/0/A/6450/011 Enclosure 4.14, Step 2.1) EMF43A or EMF43B in Trip 2 Alarm or Non-Functional.	The operator observes that EMF-43A is in TRIP II. The operator observes that EMF-43B is in TRIP II.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
4	(Step 3.1) Evaluate all outstanding Clearances that may impact performance of this procedure.	The operator requests this information from the CRS. **Cue:** **There are no outstanding Clearances on this equipment.**		
5	(Step 3.2) Perform the following sections, as applicable: • Section 3.3, Response for EMF43A or EMF43B Non Functional • Section 3.4, Response for Trip 2 on EMF43A (Control Rm Air Intake Loc A) • Section 3.5, Response for Trip 2 on EMF43B (Control Rm Air Intake Loc B) • Section 3.6, Response for Trip 2 on EMF43A (Control Rm Air Intake Loc A) AND EMF43B (Control Rm Air Intake Loc B)	The operator observes that EMF-43A is in TRIP II. The operator observes that EMF-43B is in TRIP II. The operator proceeds to Section 3.6. **Examiner Note:** **The operator may go to Section 3.4 or 3.5. If so, the first step of both sections will direct the use of Section 3.6.**		
6	(Step 3.6) Response for Trip 2 on EMF43A (Control Rm Air Intake Loc A) AND EMF43B (Control Rm Air Intake Loc B) (Step 3.6.1) Notify RP of Trip 2 on both EMF43A and EMF43B.	The operator calls and notifies RP of the situation, and records. **Cue:** **RP Technician Don Smith acknowledges.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
7	(Note prior to Step 3.6.2) Both sets of air intakes should never be closed at same time.	The operator reads the Note and proceeds.		
*8	(Step 3.6.2) IF both Unit 1 and Unit 2 intake valves open, perform the following: (Step 3.6.2.1) Determine location with highest radiation hazard per one or both of the following: (Step 3.6.2.1.A) Check EMF readings in Control Room and determine location with highest radiation hazard.	The operator observes that both Unit 1 and Unit 2 intake valves are OPEN. The operator observes EMF 43A and EMF 43B and determines that EMF 43B has the highest reading. **Examiner Note:** **The operator must accomplish this step or JPM Step 10 (Step 3.6.2.1.B) to satisfy the Critical nature of this step.** **This Step is ONLY Critical if JPM Step 10 is NOT completed.**		
9	(Note prior to Step 3.6.2.1.B) Each unit's intake can be accessed from associated unit's D/G building roof. The intake is 2 candy cane shaped 18" pipes on Aux building roof, next to Reactor building.	The operator reads the Note and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*10	(Step 3.6.2.1.B) Notify RP to check VC intake radiation and determine location with highest radiation hazard.	The operator calls requests RP to survey the areas. **Cue:** **If asked, RP Technician Don Smith acknowledges and reports Unit 2 intake at 5 mr/hr, and Unit 1 intake at 3 mr/hr.** **Examiner Note:** **The operator must accomplish this step <u>OR</u> JPM Step 8 (Step 3.6.2.1.A) to satisfy the Critical nature of this step.** **This Step is ONLY Critical if JPM Step 8 is NOT completed.**		
11	(Step 3.6.2.2) IF both intake radiation hazards are the same,…..	The operator recognizes that the threat at Unit 2 is higher and that this step is NA.		
12	(Step 3.6.2.3) IF Unit 1 intake (monitored by EMF43A) is intake with highest radiation hazard….	The operator recognizes that the threat at Unit 2 is higher and that this step is NA.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*13	(Step 3.6.2.4) IF Unit 2 intake (monitored by EMF43B) is intake with highest radiation hazard ensure the following closed: • 1VC-9A (VC Outside Air Intake From Unit 2 Isol) • 1VC-10A (VC Outside Air Intake From Unit 2 Isol) • 1VC-11B (VC Outside Air Intake From Unit 2 Isol) • 1VC-12B (VC Outside Air Intake From Unit 2 Isol)	The operator presses the 1VC-9A CLOSE pushbutton, and observes the Green status light LIT, Red status light OFF. The operator presses the 1VC-10A CLOSE pushbutton, and observes the Green status light LIT, Red status light OFF. The operator presses the 1VC-11B CLOSE pushbutton, and observes the Green status light LIT, Red status light OFF. The operator presses the 1VC-12B CLOSE pushbutton, and observes the Green status light LIT, Red status light OFF. **Cue:** **If asked, indicate that a Concurrent Verification (CV) has been completed.** **Examiner NOTE:** **HVAC OAD-11 H-8 and H-9 are expected alarms.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*14	(Step 3.6.3) IF EMF43A (Control Rm Air Intake Loc A) AND EMF43B (Control Rm Air Intake Loc B) Trip 2 alarm valid (no loss of power), perform the following: (Step 3.6.3.1) Pressurize Control Room per Enclosure 4.4 (Control Room Atmosphere Pressurization During Abnormal Conditions).	The operator observes both instruments and determines that both EMF 43A and EMF 43B are valid alarms; and proceeds to Enclosure 4.4. **Examiner Note:** **When operator seeks Enclosure 4.4, provide Handout 2.**		
15	(OP/0/A/6450/011 Enclosure 4.4, Step 2.1) Control Room atmosphere has been determined to be in need of pressurization to protect Control Room personnel.	The operator recognizes that this Initial Condition has been satisfied during the performance of the Immediate Actions.		
16	(Step 2.2) VC / YC Train A OR B is selected and is in operation per this procedure.	The operator observes that the VC/YC Train B Mode Select Switch is in “B,” and that the VC/YC Train A Mode Select Switch is in “OFF,” and determines that the Train B is selected and in operation.		
17	(Step 3.1) Evaluate all outstanding Clearances that may impact performance of this procedure.	The operator requests this information from the CRS. **Cue:** **There are no outstanding Clearances on this equipment.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
18	(Step 3.2) Perform the following sections as applicable: • Section 3.3, Pressurize Control Room Using Outside Air Pressure Fans • Section 3.4, Securing Pressurization Of Control Room	The operator recognizes that Section 3.3 is required and proceeds.		
19	(Step 3.3) Pressurize Control Room using Outside Air Pressure Fans (Step 3.3.1) Ensure at least one the following groups of intake valves open: • 1VC-1A (VC Outside Air Intake From Unit 1 Isol) • 1VC-2A (VC Outside Air Intake From Unit 1 Isol) • 1VC-3B (VC Outside Air Intake From Unit 1 Isol) • 1VC-4B (VC Outside Air Intake From Unit 1 Isol) OR • 1VC-9A (VC Outside Air Intake From Unit 2 Isol) • 1VC-10A (VC Outside Air Intake From Unit 2 Isol) • 1VC-11B (VC Outside Air Intake From Unit 2 Isol) • 1VC-12B (VC Outside Air Intake From Unit 2 Isol)	The operator observes the Red status lights LIT for the Unit 1 valves. **Cue:** **If asked, indicate that a Concurrent Verification (CV) has been completed.**		
20	(Step 3.3.2) IF A Train VC/ YC operating, …..	The operator observes that the A Train of VC/YC is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*21	(Step 3.3.3) IF B Train VC / YC operating, place "B" Train CR Outside Air Press Fan" to "ON".	The operator rotates the B Train CR Outside Air Press Fan Control Switch to the ON position. The operator will observe the Red B Train CR Outside Air Press Fan status light is LIT. (Not Critical) The operator will observe the White B Train CR Filter Preheat Enabled status light is LIT. (Not Critical) The operator observes the CRA-OAPFT-2 Dampers Red status light is LIT, and the Green status light is OFF. (Not Critical) **Cue:** **If asked, indicate that a Concurrent Verification (CV) has been completed.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
22 *	(Step 3.3.4) Depress "MAN" for the following (to ensure fans off): • #1 CRA Otsd Air Fan • #2 CRA Otsd Air Fan	The operator presses the MAN pushbutton for #1 CRA Otsd Air Fan, and observes the Green status light is LIT, Red status light is OFF. The operator presses the MAN pushbutton for #2 CRA Otsd Air Fan, and observes the Green status light is LIT, Red status light is OFF. **Cue:** **If asked, indicate that a Concurrent Verification (CV) has been completed.**		
*23	(Step 3.3.5) Depress "OFF" for the following: • CRA-OAD-4 (CR Area Otsd Air Fans Damper) • CRA-OAD-3 (CR Area Otsd Air Fans Damper)	The operator presses the OFF pushbutton for CRA-OAD-4, and observes the Red status light is OFF. The operator presses the OFF pushbutton for CRA-OAD-3, and observes the Red status light is OFF.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
24	(Step 3.3.6) Check the following dark: • CRA-OAD-4 (CR Area Otsd Air Fans Damper) "OPEN" light • CRA-OAD-3 (CR Area Otsd Air Fans Damper) "OPEN" light	The operator observes CRA-OAD-4 light is OFF. The operator observes CRA-OAD-3 light is OFF. **Cue:** **Another operator will complete this procedure**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: _______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Systems - Control Room JPM F

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: ____________________

INITIAL CONDITIONS:

- Units 1 and 2 are operating at 100% power.
- Annunciator 1RAD-2 B2, EMF 43B CR AIR INTAKE B HI RAD, alarmed 45 seconds ago.
- Annunciator 1RAD-1 B2, EMF 43A CR AIR INTAKE A HI RAD, alarmed 15 seconds ago.

INITIATING CUE:

The CRS has directed you to perform the Annunciator Response Procedures for both alarms.

SIM JPM G

Facility:	McGuire	Task No.:	
Task Title:	Synchronize the Main Turbine Generator to the Grid	JPM No.:	2018 Systems - Control Room JPM G
K/A Reference:	045 A4.02 (2.7/2.6)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-2.

Initial Conditions:

- Unit 1 is at 15% power.
- A plant startup is in progress in accordance with Enclosure 4.1 (Power Increase) of OP/1/A/6100/003 (Controlling Procedure For Unit Operation); and the crew is currently at Step 3.32.17.
- All Clearances have been evaluated and will NOT impact Turbine Generator startup.
- The Main Turbine is operating at 1800 RPM.
- The crew is implementing OP/1/A/6300/001 (Turbine Generator Startup/Shutdown), and is currently at Step 3.16.
- The System Operation Center has been notified that Unit 1 will be paralleled to the grid.

Initiating Cue:

- The CRS has directed you to synchronize the Main Turbine Generator with the Electrical Grid via the 1A Generator Breaker, and load it to 50 MWe per Step 3.16 of Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown), and then complete Step 3.16.
- A peer-checking operator has been assigned to push and hold the SYNC pushbutton under your direction.

Task Standard: The operator will adjust the controls of the Turbine Generator and synchronize it to the Electrical Grid, load it to 50 MWe in Operator Auto, and complete Step 3.16 of Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown).

Required Materials: None

General References: OP/1/A/6100/003 (Controlling Procedure For Unit Operation), Rev 201
OP/1/A/6300/001 (Turbine Generator Startup/Shutdown), Rev 107
OP/1/A/6300/001 A (Turbine-Generator Load Change), Rev 13
OP/1/A/6100/010 B (Annunciator Response For Panel 1AD-1), Rev 50
AD-HU-ALL-004 (Procedure And Work Instruction Use and Adherence), Rev 9

Handouts: Handout 1: Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown) marked up for this JPM.
Handout 2: OP/1/A/6300/001 A (Turbine-Generator Load Change)

Time Critical Task: NO

Validation Time: 14 minutes

Note: The JPM should be pre-briefed in the Briefing Room. The Facility normally uses a Peer Checker (Surrogate) who is available push and hold the SYNC pushbutton, when directed by the operator.

Critical Step Justification	
Step 3	This step is critical because pressing the "Valve Position Limit Display" pushbutton is necessary to adjust the controls of the Turbine Generator and synchronize it to the Electrical Grid.
Step 5	This step is critical because pressing the "Valve Position Limit Lower " pushbutton until the "Variable Display" indicates 21% is necessary to adjust the controls of the Turbine Generator and synchronize it to the Electrical Grid.
Step 7	This step is critical because pressing and holding the 1A "SYNC" pushbutton is necessary to adjust the controls of the Turbine Generator and synchronize it to the Electrical Grid.
Step 8	This step is critical because adjusting Generator voltage such that "Station Run Voltage" is slightly higher than "Gen Incoming Voltage" is necessary to adjust the controls of the Turbine Generator and synchronize it to the Electrical Grid.

Critical Step Justification	
Step 10	This step is critical because adjusting Generator speed until Synchroscope hand moves smoothly and slowly in "FAST" direction is necessary to adjust the controls of the Turbine Generator and synchronize it to the Electrical Grid.
Step 14	This step is critical because pressing the 1A Breaker CLOSE pushbutton when the synchroscope indicates within 5 minutes before the 12 o'clock position is necessary to adjust the controls of the Turbine Generator and synchronize it to the Electrical Grid, and adjust the Turbine controls to load it to 50 MWe in Operator Auto,.
Step 15	This step is critical because releasing the "SYNC" pushbutton is necessary to load the Turbine to 50 MWe in Operator Auto.
Step 16	This step is critical because pressing the "MW IN" pushbutton is necessary to load the Turbine to 50 MWe in Operator Auto.
Step 17	This step is critical because pressing the "LOAD RATE" pushbutton is necessary to load the Turbine to 50 MWe in Operator Auto.
Step 18	This step is critical because entering 25 in "VARIABLE DISPLAY" is necessary to load the Turbine to 50 MWe in Operator Auto.
Step 19	This step is critical because pressing the "ENTER" pushbutton is necessary to load the Turbine to 50 MWe in Operator Auto.
Step 20	This step is critical because pressing the "REFERENCE" pushbutton is necessary to load the Turbine to 50 MWe in Operator Auto.
Step 21	This step is critical because entering 50 in "VARIABLE DISPLAY" is necessary to load the Turbine to 50 MWe in Operator Auto.
Step 22	This step is critical because pressing the "ENTER" pushbutton is necessary to load the Turbine to 50 MWe in Operator Auto.
Step 23	This step is critical because pressing the "GO" pushbutton is necessary to load the Turbine to 50 MWe in Operator Auto.
Step 25	This step is critical because pressing the Voltage Adjust RAISE/LOWER pushbutton as needed is necessary to load the Turbine to 50 MWe in Operator Auto while maintaining the appropriate power factor.
Step 26	This step is critical because pressing and holding the 1B "SYNC" pushbutton is necessary to complete Step 3.16 of Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown).
Step 27	This step is critical because pressing the 1B Breaker CLOSE pushbutton when the synchroscope indicates within 5 minutes before the 12 o'clock position is necessary to complete Step 3.16 of Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown).
Step 28	This step is critical because releasing the "SYNC" pushbutton is necessary to complete Step 3.16 of Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown).
Step 29	This step is critical because pressing the Valve Position Limit Display pushbutton is necessary to complete Step 3.16 of Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown).
Step 30	This step is critical because pressing the Valve Position Limit Raise pushbutton until the Variable Display indicates 120 is necessary to complete Step 3.16 of Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown).

SIMULATOR OPERATIONAL GUIDELINES

1. Reset Simulator to IC-15 (15% power Ready to Synchronize the Main Turbine with the Electrical Grid)

2. Complete Enclosure 4.1 of OP/1/A/6100/003 through Step 3.32.16.

3. Complete Enclosure 4.1 of OP/1/A/6300/001 through Step 3.15.

4. Ensure the following:

   - "Station Run Voltage" is slightly higher than "Gen Incoming Voltage".
   - Turbine Acceleration Rate is 10 RPM/Minute

5. Freeze Simulator.

OR

1. Reset Simulator to Temporary Snap IC-238 (October, 2017).

NOTE: During the performance of the JPM, the Simulator Instructor will be required to acknowledge spurious alarms unrelated to the task being performed.

(Denote Critical Steps with an asterisk)*

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-2.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
Simulator Instructor NOTE: Leave Simulator in FREEZE until operator is ready to begin.				
1	(Step 3.16) Perform manual synchronization of Generator to grid as follows: (Step 3.16.1) Obtain a copy of OP/1/A/6300/001 A (Turbine-Generator Load Change).	The operator recognizes that they have this procedure, and proceeds.		
2	(Step 3.16.2) Notify SOC (System Operation Center) Unit 1 to be paralleled to the grid. (704-382-4413 or dispatcher phone)	The operator recognizes that SOC has been notified, and proceeds.		
*3	(Step 3.16.3) Perform the following to limit Governor Valves travel: (Step 3.16.3.1) Depress "Valve Position Limit Display".	The operator presses the "Valve Position Limit Display" pushbutton.		
4	(Step 3.16.3.2) Check "Valve Position Limit Display" lit.	The operator observes the "Valve Position Limit Display" light is LIT.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(Step 3.16.3.3) Depress "Valve Position Limit Lower" until "Variable Display" indicates 21%.	The operator presses the "Valve Position Limit Lower " pushbutton until the "Variable Display" indicates 21% (0021). **NOTE:** **The operator may need to press the “Valve Position Limit Raise” pushbutton if overshoot occurs.**		
6	(Note prior to Step 3.16.4) "SYNC" must be depressed for indication on Synchroscope and "Station Run Voltage"/"Gen Incoming Voltage".	The operator reads the Note, and proceeds.		
*7	(Step 3.16.4) Depress AND hold "SYNC" for breaker to be closed.	The operator presses and holds the 1A "SYNC" pushbutton. **NOTE:** **The Surrogate operator may press and hold the SYNC pushbutton under the direction of the operator.**		
*8	(Step 3.16.5) Using "Voltage Adjust", ensure "Station Run Voltage" is slightly higher than "Gen Incoming Voltage".	The operator adjusts Generator voltage such that "Station Run Voltage" is slightly higher than "Gen Incoming Voltage".		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
9	(Notes prior to Step 3.16.6) Synchroscope hand should be moving less than 1 revolution in 20 seconds. Adjusting Generator speed in 1 rpm increments with Turbine in "Operator Auto" will result in Synchroscope hand moving smoothly and slowly. Synchroscope should be allowed to make at least one complete revolution.	The operator reads the Notes, and proceeds.		
*10	(Step 3.16.6) Adjust Generator speed per OP/1/A/6300/001 A (Turbine-Generator Load Change) until Synchroscope hand moves smoothly and slowly in "FAST" direction. (OP/1/A/6300/001 A, Step 3.3.1.2) • Depress “REFERENCE” • Enter desired Speed in “VARIABLE DISPLAY” • Depress “ENTER” • Depress “GO.”	The operator: • Depresses the REFERENCE pushbutton • Enters 1801 on the VARIABLE DISPLAY • Presses ENTER pushbutton The operator observes Demand at 1801. The operator depresses the GO pushbutton.		
11	(Note prior to Step 3.16.7) The following step prevents any "leading power factor" causing voltage transient to the Generator and Grid. [NCR01636240]	The operator reads the Note, and proceeds.		
12	(Step 3.16.7) IF a significant time delay (greater than 5 minutes) has occurred since performing Step 3.16.5, THEN…..	The operator recognizes that five minutes has NOT passed since the Generator voltage has been adjusted, and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
13	(Caution prior to Step 3.16.8) Step 3.16.10 should be performed without delay following Generator Breaker closure to prevent motoring the Generator. [NCR01649117]	The operator reads the Caution, and proceeds.		
*14	(Step 3.16.8) WHEN synchroscope indicates within 5 minutes before 12 o'clock position, THEN depress "CLOSE" for selected breaker until "CLSD" is lit.	When the synchroscope indicates within 5 minutes before the 12 o'clock position, the operator presses the 1A Breaker CLOSE pushbutton and observes the Red status light is LIT.		
*15	(Step 3.16.9) Release "SYNC".	The operator releases the "SYNC" pushbutton.		
*16	(Step 3.16.10) WHEN the selected Generator Breaker closes, THEN immediately load Generator by performing the following: [NCR01665384] (Step 3.16.10.1) Depress "MW IN".	The operator presses the "MW IN" pushbutton.		
*17	(Step 3.16.10.2) Depress "LOAD RATE".	The operator presses the "LOAD RATE" pushbutton.		
*18	(Step 3.16.10.3) Enter a Load Rate of 25 in "VARIABLE DISPLAY".	The operator enters 25 in "VARIABLE DISPLAY".		
*19	(Step 3.16.10.4) Depress "ENTER".	The operator presses the "ENTER" pushbutton.		
*20	(Step 3.16.10.5) Depress "REFERENCE".	The operator presses the "REFERENCE" pushbutton.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*21	(Step 3.16.10.6) Enter a Load of 50 in "VARIABLE DISPLAY".	The operator enters 50 in "VARIABLE DISPLAY".		
*22	(Step 3.16.10.7) Depress "ENTER".	The operator presses the "ENTER" pushbutton.		
*23	(Step 3.16.10.8) Depress "GO".	The operator presses the "GO" pushbutton, and observes Demand MWe rising to the Reference setpoint of 0050, and then stopping at 0050.		
24	(Step 3.16.10.9) Check Generator loaded by comparing actual load to "Demand" and "Reference" windows.	The operator observes and compares the "Demand" and "Reference" windows, and determines that the Generator is loaded to 50 MWe.		
*25	(Step 3.16.10.10) Using "Voltage Adjust", maintain Pwr Fact 0.90 - 0.95 (Lag).	The operator presses the Voltage Adjust RAISE/LOWER pushbutton as needed to maintain power factor between 0.9 and 0.95 (Lagging).		
*26	(Step 3.16.11) IF other Generator Breaker available, THEN place in service as follows: (Step 3.16.11.1) Depress AND hold "SYNC" for selected breaker.	The operator presses and holds the 1B "SYNC" pushbutton. **NOTE:** **The Surrogate operator may press and hold the SYNC pushbutton under the direction of the operator.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*27	(Step 3.16.11.2) WHEN Synchroscope for selected breaker in 12 o'clock position, THEN depress "CLOSE" for selected breaker until "CLSD" light is lit.	The operator observes that the synchroscope indicates the 12 o'clock position and presses the 1B Breaker CLOSE pushbutton and observes the Red status light is LIT.		
*28	(Step 3.16.11.3) Release "SYNC".	The operator releases the "SYNC" pushbutton.		
*29	(Step 3.16.12) Perform the following to allow full Governor Valve travel: (Step 3.16.12.1) Depress "Valve Position Limit Display" and check "Valve Position Limit Display" lit.	The operator presses the Valve Position Limit Display pushbutton and observes the White light is LIT.		
*30	(Step 3.16.12.2) Depress "Valve Position Limit Raise" until "Variable Display" indicates 120%.	The operator presses the Valve Position Limit Raise pushbutton until the Variable Display indicates 120. **NOTE:** **Another operator will continue with this procedure.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Systems - Control Room JPM G

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- Unit 1 is at 15% power.
- A plant startup is in progress in accordance with Enclosure 4.1 (Power Increase) of OP/1/A/6100/003 (Controlling Procedure For Unit Operation); and the crew is currently at Step 3.32.17.
- All Clearances have been evaluated and will NOT impact Turbine Generator startup.
- The Main Turbine is operating at 1800 RPM.
- The crew is implementing OP/1/A/6300/001 (Turbine Generator Startup/Shutdown), and is currently at Step 3.16.
- The System Operation Center has been notified that Unit 1 will be paralleled to the grid.

INITIATING CUE:

- The CRS has directed you to synchronize the Main Turbine Generator with the Electrical Grid via the 1A Generator Breaker, and load it to 50 MWe per Step 3.16 of Enclosure 4.1 (Startup with Turbine Control in "Operator Auto") of OP/1/A/6300/001 (Turbine Generator Startup/Shutdown), and then complete Step 3.16.
- A peer-checking operator has been assigned to push and hold the SYNC pushbutton under your direction.

SIM JPM H

Facility:	McGuire	Task No.:	
Task Title:	Align Alternate Makeup During Inadequate Core Cooling Conditions	JPM No.:	2018 Systems - Control Room JPM H
K/A Reference:	074 EA1.09 (3.7/3.8)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Ensure Handout 1 is placed on CRS Desk.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 2.

Initial Conditions:

- Unit 1 has had a LOCA.
- 1ETB is de-energized.
- All NV, NI and ND Pumps are either OOS, unavailable or have failed.
- A Red Path exists on the Core Cooling Critical Safety Function.
- The crew has entered EP/1/A/5000/FR-C.1, Response to Inadequate Core Cooling.
- You are an available operator in the Control Room.
- AO John is standing by to assist with in-plant operations if needed.
- The Standby Makeup Pump is NOT running.

Initiating Cue: The CRS has directed you to try to establish flow from all available sources per Enclosure 3 (Alternate Makeup Sources) of FR-C.1, while the crew continues in the body of the procedure.

Task Standard: The operator will initiate Enclosure 3 of FR-C.1 and start the Standby Makeup Pump per Enclosure 6 of FR-C.1.

Required Materials: None

General References: EP/1/A/5000/FR-C.1 (Response to Inadequate Core Cooling), Rev 10

OMP 4-3 (Use of Emergency And Abnormal Procedures And FLEX Support Guidelines), Rev 46

Handouts: Handout 1: EP/1/A/5000/FR-C.1 (Response to Inadequate Core Cooling) marked up for place-keeping through Step 3 RNO e.2.

Handout 2: Enclosure 3 (Alternate Makeup Sources) of FR-C.1.

Handout 3: Enclosure 6 (Standby Makeup Pump Startup) of FR-C.1.

Time Critical Task: NO

Validation Time: 3 minutes

Critical Step Justification	
Step 4	This step is critical because Phase A CIS must be reset to permit certain CIVs to be opened (Standby Makeup System valves).
Step 5	This step is critical because depressing the 1NV-842AC and 1NV-849AC OPEN pushbutton is necessary to coordinate with the AO to start the Standby Makeup Pump.
Step 7	This step is critical because it is necessary to coordinate with the AO to start the Standby Makeup Pump.

SIMULATOR OPERATIONAL GUIDELINES

1. Reset the Simulator to IC-69, Implementing FR-C.1

2. Place the 1A NI Pump OOS.

3. Simultaneously insert MALF NC008D = 1 (LB LOCA), MALF EP008B = 1 (1ETB Lockout), MALF NV029A (1A NV Pump Trips on overcurrent), and MALF ND001A (1A ND Pump fails to START).

4. Perform E-0 and Transition to E-1. Transition to FR-C.1 when Core Cooling CSFST turns Red.

5. Freeze the Simulator.

OR

1. Reset to IC-239 (October, 2017)

(Denote Critical Steps with an asterisk*)

Ensure Handout 1 is placed on CRS Desk.
Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 2.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Enclosure 3, Step 1) Check Standby Makeup pump - KNOWN TO BE RUNNING.	The operator recognizes that the Standby Makeup Pump is NOT running, and proceeds.		
2	(Enclosure 3, Step 1 RNO) Start Standby Makeup pump PER Enclosure 6 (Standby Makeup Pump Startup).	The operator proceeds to Enclosure 6 of FR-C.1. **Cue:** **When the operator locates the Enclosure, provide Handout 3 to the operator.**		
3	(Enclosure 6, Step 1) Ensure S/I is reset.	The operator observes the Yellow Train A S/I RESET light is LIT. The operator observes the Train B S/I RESET light is LIT. **Note:** **The operator may press the RESET pushbuttons, however, SI is already reset.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(Enclosure 6, Step 2) Ensure Phase A Isolation is reset.	The operator presses the Train A Phase A RESET Pushbutton and observes the Yellow Phase A RESET light is LIT. The operator presses the Train B Phase A RESET Pushbutton and observes the Yellow Phase A RESET light is LIT.		
*5	(Enclosure 6, Step 3) OPEN the following valves: 1NV-842AC (U1 Standby Makeup Pump Suction Isol) 1NV-849AC (U1 Standby Makeup Pump Cont Outside Isol).	The operator depresses the 1NV-842AC OPEN pushbutton and observes Red status light LIT, Green status light OFF. The operator depresses the 1NV-849AC OPEN pushbutton and observes Red status light LIT, Green status light OFF.		
6	(Enclosure 6, Step 4) Check 6900V bus 1TC - ENERGIZED.	The operator observes the UNIT 1 ELECTRICAL SYSTEMS MENU screen on the OAC (Or Equivalent), and determines that Bus 1TC is energized (Indicates 6.84 KV and Bus Bar is RED.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*7	(Enclosure 6, Step 5) Dispatch operator to SSF control panel to depress "ON" on Unit 1 Standby Makeup pump switch.	The operator contacts the AO and directs that they start the Standby Makeup Pump. **Booth Instructor:** **As AO, Acknowledge.** **Insert XSF_019_1, and report that the Standby Makeup Pump is running with 26 gpm.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Systems - Control Room JPM H

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

INITIAL CONDITIONS:

- Unit 1 has had a LOCA.
- 1ETB is de-energized.
- All NV, NI and ND Pumps are either OOS, unavailable or have failed.
- A Red Path exists on the Core Cooling Critical Safety Function.
- The crew has entered EP/1/A/5000/FR-C.1, Response to Inadequate Core Cooling.
- You are an available operator in the Control Room.
- AO John is standing by to assist with in-plant operations if needed.
- The Standby Makeup Pump is NOT running.

INITIATING CUE:

The CRS has directed you to try to establish flow from all available sources per Enclosure 3 (Alternate Makeup Sources) of FR-C.1, while the crew continues in the body of the procedure.

IN-PLANT JPM I

Facility:	McGuire	Task No.:	
Task Title:	Swap Battery Charger EVCA Power Supply from Unit 1 to Unit 2	JPM No.:	2018 Systems – In-Plant JPM I
K/A Reference:	APE 058 AA1.03 (3.1/3.3)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: X Actual Performance: _______

Classroom _______ Simulator _______ Plant X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- Unit 1 has just experienced a LOOP (Loss of Offsite Power).
- The 1A D/G will not start.
- 1ETA is de-energized.
- AP/1/A/5500/07 (Loss of Electrical Power), Case 1 has been entered.
- While performing Enclosure 7 (DC Bus Alignment), the RO notices that Vital Battery Charger EVCA is de-energized.

Initiating Cue: The CRS directs you to swap power supplies to the EVCA Battery Charger from Unit 1 to Unit 2 in accordance with Enclosure 22 (Swapping Battery Charger Power Supplies) of AP/1/A/5500/07 (Loss of Electrical Power).

THIS IS A TIME CRITICAL JPM

Task Standard: The operator aligns power to Battery Charger EVCA from Unit 2 within 15 minutes of dispatch.

Required Materials: PPE (Hardhat, Safety Glasses, Hearing Protection, Safety Shoes etc.)
Dosimetry

General References: AP/1/A/5500/07 (Loss of Electrical Power), Rev 38
PT/0/A/4600/113 (Operator Time Critical Task Verification), Enclosure 13.14 (Essential Battery Charger Power Supply), Rev 25
OMP 4-3 (Use Of Emergency And Abnormal Procedures And FLEX Support Guidelines), Rev 46

Handouts: Handout 1: Blank Copy of Enclosure 22 (Swapping Battery Charger Power Supplies) of AP/1/A/5500/07 (Loss of Electrical Power).

Time Critical Task: YES-15 Minutes
UFSAR 8.3.2.1.4.2 states that "should a loss of battery charger or an AC power source occur, a single battery is capable of supplying two channels for 1-hour while maintaining sufficient terminal voltage".
To ensure that the assumed battery life expectancy is not exceeded, AP-07 (along with other loss of power procedures) contains requirements to restore the associated battery charger to service within 1 hour of a loss of power.
PT/0/A/4600/113, Enclosure 13.15 (Essential Battery Charger Power Supply) is performed periodically to ensure that this time-critical time can be met and assumes that it takes 45 minutes to dispatch an operator and 15 minutes to complete the local actions.

Validation Time: 10 minutes

Notes: Start this JPM from the hallway outside of the Ops kitchen area. Record the Time Critical Completion Time (in JPM step number 10) when the Charger "DC Output" Breaker is closed in and DC volts are verified to be greater than or equal to 115 volts.

Critical Step Justification	
Step 6	This step is critical because opening the Normal breaker is necessary to align power to Battery Charger EVCA from Unit 2.
Step 7	This step is critical because rotating and removing the kirk key from breaker ECB1-1B is necessary to align power to Battery Charger EVCA from Unit 2.
Step 9	This step is critical because inserting the key into the Unit 2 supply breaker and closing it is necessary to align power to Battery Charger EVCA from Unit 2.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Caution prior to Step 1) This enclosure should be performed without delay to limit time battery is supplying DC bus.	The operator reads the Caution and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
2	(Step 1) Perform applicable section(s) as specified in Enclosure 7 (DC Bus Alignment): To swap power supplies to EVCA Battery Charger, perform Step 2. To swap power supplies to EVCB Battery Charger, perform Step 3. To swap power supplies to EVCC Battery Charger, perform Step 4. To swap power supplies to EVCD Battery Charger, perform Step 5. To swap power supplies to EVCS Battery Charger, perform one of the following: IF 1EMXH is aligned to EVCS, THEN swap power supplies to 1EMXH PER Step 6. OR IF 2EMXH is aligned to EVCS, THEN swap power supplies to 2EMXH PER Step 7.	The operator determines from initial conditions that Battery Charger EVCA is the desired charger and proceeds to step 2.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
3	(Step 2/2.a) To swap power supplies to EVCA Battery Charger, perform the following: Determine which unit is desired to supply EVCA: Unit 1 OR Unit 2	The operator determines from initial conditions that it is desired to supply Battery Charger EVCA from Unit 2, and places a check mark in front of Unit 2.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
4	(Steps 2.b.1-2) Have Control Room perform the following: <u>IF</u> Unit 1 ETA is energized, <u>THEN</u>……. <u>IF</u> Unit 2 ETA is energized, <u>THEN</u>:	The operator determines from initial conditions that 1ETA is NOT energized and proceeds to step 2.b.2. The operator contacts to Control Room and asks if 2ETA is energized.		
		Cue: **2ETA is energized.**		
	Ensure 2A D/G load sequencer reset.	The operator contacts the Control Room and directs RO to ensure 2A D/G Sequencer is reset and EVCA stop button on 2MC-8 is depressed.		
	Depress "STOP" for "EVCA Batt Charger" on 2MC-8.	**Cue:** **2A D/G sequencer is reset, AND STOP Pushbutton has been depressed.**		
5	(Note prior to Step 2.c) It may be necessary to apply pressure on the breaker rotary switch in the counterclockwise direction while operating kirk key device(s).	The operator reads the Note and proceeds to Step 2.c		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*6	(Step 2.c) OPEN the following breakers: ECB1-1B (Normal Inc Supply From MCC 1EMXA)	The operator opens the Normal breaker. **Cue:** **“Normal Supply” breaker handle rotated counter clockwise to the “OFF” position.**		
	ECB1-1C (Alt Inc Supply From MCC 2EMXA)	The operator observes the Alternate breaker. **Cue:** **Breaker handle is indicating “OFF”.**		
*7	(Step 2.d) Remove kirk key from breaker in step above.	The operator rotates and removes the kirk key from breaker ECB1-1B. **Cue:** **Kirk key rotated and removed.**		
8	(Step 2.e) IF Unit 1 to supply EVCA, ……	The operator determines from initial conditions that it is <u>NOT</u> desired to supply power to EVCA from Unit 1 and proceeds to step 2.f.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*9	(Step 2.f) IF Unit 2 to supply EVCA, THEN perform the following: Use kirk key and CLOSE ECB1-1C (Alt Inc Supply From MCC 2EMXA).	The operator inserts key into the Unit 2 supply breaker and closes it. **Cue:** **Kirk Key inserted. "Alternate Supply" breaker handle rotated clockwise to the "ON" position.**		
	Have Unit 2 Control Room operator start Battery Charger EVCA on 2MC-8.	The operator contacts the Control Room and requests that they start the Battery Charger EVCA on 2MC-8. **Cue:** **Unit 2 RO has started EVCA Batt. Charger from 2MC-8.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
10	(Step 2.g) IF EVCA battery charger DC volts are greater than or equal to 115 volts, THEN GO TO Step 2.i.	The operator checks EVCA battery charger DC output voltage. **Cue:** **Charger DC output voltage is 132 volts.** The operator proceeds to Step 2.i. **Stop Time for Time Critical Task:** ____________________		
11	(Step 2.i) Notify Control Room of status of EVCA Battery Charger.	The operator contacts the Control Room and informs the RO that the EVCA Battery Charger is running. **Cue:** **The RO acknowledges.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
12	(Step 2.j) IF another battery charger needs to be swapped, THEN perform the applicable step as directed in Step 1.	The operator recognizes that no other battery Chargers need to be re-energized. **Cue:** **No other chargers need to be swapped.**		
13	(Step 2.k) Exit this enclosure.	The operator exits the procedure.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________ **TIME CRITICAL STOP TIME:** ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Systems – In-Plant JPM I

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

INITIAL CONDITIONS:

- Unit 1 has just experienced a LOOP (Loss of Offsite Power).
- The 1A D/G will not start.
- 1ETA is de-energized.
- AP/1/A/5500/07 (Loss of Electrical Power), Case 1 has been entered.
- While performing Enclosure 7 (DC Bus Alignment), the RO notices that Vital Battery Charger EVCA is de-energized.

INITIATING CUE:

The CRS directs you to swap power supplies to the EVCA Battery Charger from Unit 1 to Unit 2 in accordance with Enclosure 22 (Swapping Battery Charger Power Supplies) of AP/1/A/5500/07 (Loss of Electrical Power).

THIS IS A TIME CRITICAL JPM

NOTE: No plant equipment should be operated during the performance of this JPM. All actions must be SIMULATED.

IN-PLANT JPM J

Facility:	McGuire	Task No.:	
Task Title:	Start # 1 Turbine Driven CA Pump	JPM No.:	2018 Systems – In-Plant JPM J
K/A Reference:	061 A2.04 (3.4/3.8)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: X Actual Performance: ______

Classroom ______ Simulator ______ Plant X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- Unit 1 is at 98% power when the OAC alarm M1A1276 (U1 CA Temp at Chk Vlv 1CA-37) is received.
- The RO reports that the temperature in the TD CA Pump discharge to 1D S/G is 223°F.
- The CRS has determined the #1 Turbine Driven CA Pump should be started to cool the piping to 1D S/G.

Initiating Cue:

- The CRS directs you to locally start Unit 1 Turbine Driven CA Pump per OP/1/A/6250/002, Enclosure 4.4 using a “Normal” start.
- The Initial Conditions have been met and all Clearances have been evaluated.
- A Pre-job Brief discussing reactivity management concerns has been performed.

Task Standard: The operator will start the Unit 1 TDCA Pump and align valves to provide cooling in accordance with Enclosure 4.4 of OP/1/A/6250/002.

Required Materials: PPE (Hardhat, Safety Glasses, Hearing Protection, Safety Shoes etc.)
Dosimetry

General References: OP/1/A/6250/002 (Auxiliary Feedwater System), Rev 132
AD-HU-ALL-0004 (Procedure And Work Instruction Use and Adherence), Rev 9

Handouts: Handout 1: Enclosure 4.4 (Manual Operation of #1 TD CA Pump) of OP/1/A/6250/002 (Auxiliary Feedwater System), marked up so that steps 3.1 and 3.2 are complete.

Time Critical Task: NO

Validation Time: 11 minutes

Critical Step Justification	
Step 6	This step is critical because rotating the C/R LOCAL Switch for the “#1 TD CA Pump” clockwise, and moving the “M-Local” switch for each valve downward is necessary to will start the Unit 1 TDCA Pump and align valves to provide cooling in accordance with Enclosure 4.4 of OP/1/A/6250/002.
Step 7	This step is critical because rotating the control knob for each valve counter-clockwise is necessary to will start the Unit 1 TDCA Pump and align valves to provide cooling in accordance with Enclosure 4.4 of OP/1/A/6250/002.
Step 13	This step is critical because rotating the “#1 TD CA Pump” control switch is necessary to will start the Unit 1 TDCA Pump and align valves to provide cooling in accordance with Enclosure 4.4 of OP/1/A/6250/002.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Step 3.3) IF #1 TD CA Pump to be operated locally, obtain key #172.	The operator should go to the Work Control Center to obtain a key, or will describe where to obtain the key. **Cue:** **Key 172 has been obtained.** **NOTE:** **Key 172 will not be needed to complete this JPM due the clear plexiglass cover on the Control Panel.**		
2	(Note prior to Step 3.4) If U1 TD CA Pump to be operated locally a Licensed Operator is required to perform all manipulations at the CA Pump Panel(s).	The operator reads the NOTE, and proceeds.		
3	(Step 3.4) Perform the following sections as applicable: • Section 3.5, Starting #1 TD CA Pump. • Section 3.6, Stopping #1 TD CA Pump.	The operator proceeds to Section 3.5.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
4	(Step 3.5) Starting #1 TD CA Pump (Step 3.5.1) Notify RP of #1 TD CA Pump start.	The operator notifies RP. **Cue:** **RP John Stover has been contacted.** The operator documents the name, current date & time.		
5	(Step 3.5.2) IF in Modes 1-3, declare #1 TD CA Pump INOPERABLE.	The operator calls the CR or WCC to inform the CRS of TD CA Pump inoperability. **Cue:** **The CRS reports that the TD pump has been declared inoperable.** **Initials DD**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
6	(Step 3.5.3) IF operating #1 TD CA Pump locally, perform the following at "Turbine Driven CA Pump Control Panel":			
*	• (Step 3.5.3.1) Place "#1 TD CA Pump" in "LOCAL".	The operator rotates the C/R LOCAL Switch for the "#1 TD CA Pump" clockwise.		
		Cue: **The Switch is in the LOCAL position and the White LOCAL light is LIT.**		
*	• (Step 3.5.3.2) Place the following in "M-Local": • 1CA-64 (TD CA Pump to S/G A) • 1CA-52 (TD CA Pump to S/G B) • 1CA-48 (TD CA Pump to S/G C) • 1CA-36 (TD CA Pump to S/G D)	The operator moves the "M-Local" switch for each valve downward.		
		Cue: **The Switch for each valves controller is in the M-LOCAL position.**		
* 7	(Step 3.5.4) Close the following: • 1CA-64AB (U1 TD CA Pump Disch to 1A S/G Control) • 1CA-52AB (U1 TD CA Pump Disch to 1B S/G Control) • 1CA-48AB (U1 TD CA Pump Disch to 1C S/G Control) • 1CA-36AB (U1 TD CA Pump Disch to 1D S/G Control)	The operator rotates the control knob for each valve counter-clockwise.		
		Cue: **Knob rotation counter-clockwise and the black needle indicates 0%, and that the Green "Closed" light is LIT for each valve.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
8	(Step 3.5.5) Drain moisture from #1 CA Pump Turbine stop valve as follows: (Step 3.5.5.1) Slowly open the following: • 1SA-39 (Unit 1 TD CA Pump Turb Stop Valve Above Seat Drn) • 1SA-40 (Unit 1 TD CA Pump Turb Stop Valve Below Seat Drn)	The operator rotates the handwheel counterclockwise for each valve. **Cue:** **The hand wheel has been rotated fully counter-clockwise.**		
	(Step 3.5.5.2) HOLD for at least 30 seconds, THEN close the following: • 1SA-39 (Unit 1 TD CA Pump Turb Stop Valve Above Seat Drn) • 1SA-40 (Unit 1 TD CA Pump Turb Stop Valve Below Seat Drn)	After 30 seconds, the operator rotates the handwheel clockwise for each valve. **Cue:** **The hand wheel has been rotated fully clockwise for each valve.**		
	(Step 3.5.5.3) IF water hammer occurred while draining moisture from #1 CA Pump Turbine Stop Valve…...	**Cue:** **If asked, indicate that no unusual noises, popping, or vibration occurred during draining.**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
9	(Step 3.5.6) Check the following open: • 1CA-2 (U1 CA Pumps Suct From CA Storage Tank Isol) • 1CA-7AC (U1 TD CA Pump Suction Isol)	The operator observes the 1CA-2 status light. **Cue:** **The RED "Open" light is LIT.** The operator observes the 1CA-7A status light. **Cue:** **The RED "Open" light is LIT.**		
10	(Caution prior to Step 3.5.7) Starting the TD CA Pump will increase Rx Power due to increased steam flow. Reducing turbine generator load may be required to maintain power level.	The operator reads the Caution and proceeds.		
11	(Notes prior to Step 3.5.7) • It is preferred to perform a normal start of the TD CA Pump • IF a slow start of the TD CA Pump is to be performed, Engineering should be available to provide guidance.	The operator reads the Notes and proceeds.		
12	(Step 3.5.7) Start #1 TD CA Pump per Step 3.5.7.1 or 3.5.7.2 (N/A step NOT performed)	Operator recognizes (from initial conditions) that a Normal start is desired and proceeds to step 3.5.7.1		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
13 *	(Step 3.5.7.1) IF normal start desired, perform the following: • (Step 3.5.7.1.A) Place “#1 TD CA Pump” in “START”.	The operator rotates the “#1 TD CA Pump” control switch clockwise. **Cue:** **The Switch is in the "START" position.**		
	• (Step 3.5.7.1.B) Check the following open: • 1SA-48ABC (1C S/G SM Supply to U1 TD CA Pump Turb Isol)	The operator observes the 1SA-48ABC status light. **Cue:** **The RED "Open" light is LIT.**		
	• 1SA-49AB (1B S/G SM Supply to U1 TD CA Pump Turb Isol)	The operator observes the 1SA-49AB status light. **Cue:** **The RED "Open" light is LIT.**		
	• (Step 3.5.7.1.C) Check recirc valve opens by “FLOW” lit.	The operator observes the recirc valve status light. **Cue:** **The RED "Flow" status light is LIT.**		
	• (Step 3.5.7.1.D) IF operating CA Pump to cool piping, allow pump to run for at least 10 minutes	**Cue:** **Another Operator will complete this procedure.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

Job Performance Measure No.: 2018 Systems – In-Plant JPM J

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ________________________ Date: ______________

INITIAL CONDITIONS:

- Unit 1 is at 98% power when the OAC alarm M1A1276 (U1 CA Temp at Chk Vlv 1CA-37) is received.
- The RO reports that the temperature in the TD CA Pump discharge to 1D S/G is 223°F.
- The CRS has determined the #1 Turbine Driven CA Pump should be started to cool the piping to 1D S/G.

INITIATING CUE:

- The CRS directs you to locally start Unit 1 Turbine Driven CA Pump per OP/1/A/6250/002, Enclosure 4.4 using a “Normal” start.
- The Initial Conditions have been met and all Clearances have been evaluated.
- A Pre-job Brief discussing reactivity management concerns has been performed.

NOTE: No plant equipment should be operated during the performance of this JPM. All actions must be SIMULATED.

IN-PLANT JPM K

Facility:	McGuire	Task No.:	
Task Title:	Makeup to the Unit 1 KC Surge Tanks	JPM No.:	2018 Systems – In-Plant JPM K
K/A Reference:	008 A2.02 (3.2/3.5)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: X Actual Performance: ______

Classroom ______ Simulator ______ Plant X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- The plant YM system is out of service to allow major modifications to be incorporated.
- Unit 1 is operating at 100% power when the KC Surge Tank A and B lo level computer alarms are received.
- The surge tank levels are 3.9 feet and decreasing.
- The operating crew has implemented AP/1/A/5500/21 (Loss of KC or KC System Leakage).
- Several operators have been dispatched to attempt to locate the leak.
- RN Pumps 1A and 1B are in service.

Initiating Cue: The CRS directs you to align makeup to both Unit 1 KC Surge Tanks per AP/1/A/5500/21 (Loss of KC or KC System Leakage), Enclosure 3 (Aligning RN Makeup to KC Surge Tank).

THIS IS A TIME CRITICAL JPM

Task Standard: The operator will manipulate valves and communicate with the Control Room to restore KC Surge Tank level to the allowable band in accordance with Enclosure 3 of AP/1/A/5500/21 within 10 minutes.

Required Materials: PPE (Hardhat, Safety Glasses, Hearing Protection, Safety Shoes etc.)
Dosimetry

General References: AP/1/A/5500/21 (Loss of KC or KC System Leakage), Rev 10

PT/0/A/4600/113 (Operator Time Critical Task verification) Enclosure 13.16 (Initiating Makeup to the KC Surge Tank or Isolate KC Header Leak), Rev 25

OMP 4-3 (Use Of Emergency And Abnormal Procedures And FLEX Support Guidelines), Rev 46

Handouts: Handout 1: AP/1/A/5500/21 (Loss of KC or KC System Leakage), Enclosure 3 (Aligning RN Makeup to KC Surge Tank).

Time Critical Task: YES – 10 Minutes

The operator is expected to locally initiate makeup within 10 minutes of dispatch using either YM or RN, or gets leak isolated prior to emptying surge tank for design basis leak of 50 gpm. If makeup is initiated in time to stabilize tank level prior to emptying, the time critical action is also met. This requires 20 minutes to dispatch operator to initiate makeup after going below 3 feet in surge tank, allowing 10 minutes for local action. (YM will be used if available, or RN makeup (credited) if told YM makeup is unavailable.)

Validation Time: 8 minutes

NOTE: This JPM should be started from just inside the RCA Entry Point.

Critical Step Justification	
Step 3	This step is critical because rotating the 1KC-494 and the 1KC-496 handwheel in the counter-clockwise direction is necessary to restore KC Surge Tank level in accordance with Enclosure 3 of AP/1/A/5500/21 within 10 minutes.
Step 5	This step is critical because rotating the 1KC-497 and the 1KC-499 handwheel in the counter-clockwise direction is necessary to restore KC Surge Tank level in accordance with Enclosure 3 of AP/1/A/5500/21 within 10 minutes.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Caution prior to Step 1) RN pump must be running while RN to KC emergency makeup is open, to prevent draining KC surge tank back to RN.	The operator reads the Caution and proceeds.		
2	(Step 1) Align one or both of the following flowpaths (Step 1.a or 1.b) as required: (Step 1.a) IF 1A RN Train to 1A KC Surge Tank makeup is desired, THEN perform the following: (Step 1.a.1) Ensure 1A RN Pump is on.	The operator recognizes that the 1A RN Pump is ON (Initial Condition).		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	(Step 1.a.2) Dispatch operator to perform the following: Unlock and open 1KC-494 (Unit 1 RN Assured Supply to 1A KC Surge Tank Compartment Isol) (aux. bldg, 733 + 10, HH-56, in corner west of 1B1 KC Pump)	The operator removes the lock on 1KC-494. **Cue:** **The Lock is removed.** The operator rotates the 1KC-494 handwheel in the counter-clockwise direction. **Cue:** **The handwheel rotates, the Stem rises out of the valve and then stops.**		
	Open 1KC-496 (1A KC Surge Tank Compartment RN Assured Supply Isol) (aux. bldg, 733 + 10, HH-56, in corner west of 1B1 KC Pump).	The operator rotates the 1KC-496 handwheel in the counter-clockwise direction. **Cue:** **The handwheel rotates, the Stem rises out of the valve and then stops.**		
4	(Step 1.b) IF 1B RN Train to 1B KC Surge Tank makeup is desired, THEN perform the following: (Step 1.b.1) Ensure 1B RN Pump is on.	The operator recognizes that the 1B RN Pump is ON (Initial Condition).		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(Step 1.b.2) Dispatch operator to perform the following: Unlock and open 1KC-497 (Unit 1 RN Assured Supply to 1B KC Surge Tank Compartment Isol) (aux. bldg, 733 + 10, HH-56, in corner west of 1B1 KC Pump)	The operator removes the lock on 1KC-497. **Cue:** **The Lock is removed.** The operator rotates the 1KC-497 handwheel in the counter-clockwise direction. **Cue:** **The handwheel rotates, the Stem rises out of the valve and then stops.**		
	Open 1KC-499 (1B KC Surge Tank Compartment RN Assured Supply Isol) (aux. bldg, 733 + 10, HH-56, in corner west of 1B1 KC Pump)	The operator rotates the 1KC-499 handwheel in the counter-clockwise direction. **Cue:** **The handwheel rotates, the Stem rises out of the valve and then stops.** **NOTE Time Critical STOP Time:** ____________		
6	(Step 2) IF AT ANY TIME an RN pump trips, THEN dispatch operator to isolate affected trains RN to KC makeup line opened in step 1.	The operator reads the Step and proceeds.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
7	(Step 3) Adjust makeup rate as required to prevent overflow of KC Surge Tank (approximately 8.5 Ft)	The operator calls the Control Room and asks for the 1A KC Surge Tank level.		
		Cue: **The 1A KC Surge Tank level is 4 Ft. and slowly increasing.**		
		The operator calls the Control Room and asks for the 1B KC Surge Tank level.		
		Cue: **The 1B KC Surge Tank level is 4 Ft. and slowly increasing.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________ **TIME CRITICAL STOP TIME:** ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Systems – In-Plant JPM K

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ________________________ Date: ______________

INITIAL CONDITIONS:

- The plant YM system is out of service to allow major modifications to be incorporated.
- Unit 1 is operating at 100% power when the KC Surge Tank A and B lo level computer alarms are received.
- The surge tank levels are 3.9 feet and decreasing.
- The operating crew has implemented AP/1/A/5500/21 (Loss of KC or KC System Leakage).
- Several operators have been dispatched to attempt to locate the leak.
- RN Pumps 1A and 1B are in service.

INITIATING CUE:

The CRS directs you to align makeup to both Unit 1 KC Surge Tanks per AP/1/A/5500/21 (Loss of KC or KC System Leakage), Enclosure 3 (Aligning RN Makeup to KC Surge Tank).

THIS A TIME CRITICAL JPM

NOTE: No plant equipment should be operated during the performance of this JPM. All actions must be SIMULATED.

JPM A1a RO

Facility:	McGuire	Task No.:	
Task Title:	Calculate Boration Needed for a Specified Rod Change	JPM No.:	2018 Admin – JPM A1a RO
K/A Reference:	2.1.25 (3.9)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: __X__

Classroom __X__ Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-2.

Initial Conditions:	• Unit #1 Reactor Power is at 50%, Steady State. • Core burnup is 125 EFPD. • NC Boron Concentration = 950 PPM. • Present Control Rod Height is Bank “D” at 165 steps. • Desired Control Rod Height is Bank “D” at 210 steps. • BA Tank boron concentration is 7000 ppm.
Initiating Cue:	The CRS has directed you to determine the amount of boric acid needed to obtain the desired Control Rod Height using the McGuire Unit 1 Data Book and the Reactor Engineering Data (RED) - Control Room Data.
Task Standard:	The operator will determine that a Boric Acid Addition of approximately 255.6 gallons is required in accordance with the attached KEY.
Required Materials:	Calculator

General References:	OP/0/A/6100/006 (Reactivity Balance Calculation), Rev 80 OP/1/A/6100/022 (Unit 1 Data Book), Rev 481 MCEI-0400-301 (Reactor Engineering Data (RED) - Control Room Data), Rev 0 MCEI-0400-349 (Unit 1 Cycle 26 Core Operating Limits Report), Rev 0
Handouts:	Handout 1: OP/1/A/6100/022 (Unit 1 Data Book) Enclosure 4.3 – Section 5.1 Boration and Dilution Tables Handout 2: OP/1/A/6100/022 (Unit 1 Data Book) Enclosure 4.3 – Section 6
Time Critical Task:	NO
Validation Time:	15 minutes

Critical Step Justification	
Step 1	This step is critical because correctly using Table 7 is necessary to determine the change in reactivity due to rod withdrawal.
Step 2	This step is critical because correctly using Table 7 is necessary to determine the change in reactivity due to rod withdrawal.
Step 3	This step is critical because correctly using the data obtained from Table 7 is necessary to determine the change in reactivity due to rod withdrawal.
Step 4	This step is critical because correctly using Table 3 is necessary to determine the Differential Boron Worth for the current plant conditions.
Step 7	This step is critical because correctly using the Boration and Dilution Tables is necessary to determine that a Boric Acid Addition of approximately 255.6 gallons is required.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-2.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*1	Operator determines **165 steps** integral rod worth using the 51-150 EFPD column of RED Book – Control Room Data, Table 7, IRW in Overlap, HFP, Equilibrium Xe, Sm.	Initial inserted reactivity worth = **153 pcm**		
*2	Operator determines **210 steps** integral rod worth using the 51-150 EFPD column of RED Book – Control Room Data, Table 7, IRW in Overlap, HFP, Equilibrium Xe, Sm.	Desired Rod height inserted reactivity worth = **15 pcm**		
*3	Operator determines the change in reactivity required for the rod insertion	Change in reactivity to be compensated due to rod insertion = **15 pcm** **-153 pcm** **-138 pcm**		
*4	Using RED Book – Control Room Data, Table 3, HFP, ARO Critical Boron Concentration, Differential Boron Worths, ITC and Pressure Coefficients, the operator determines the Differential Boron Worth for present conditions (125 EFPD)	The operator determines the Differential Boron Worth from the table to be = **-6.02 pcm/ppm**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
5	Using the Differential Boron Worth and the Change in reactivity, determines the change in Boron Concentration	The operator determines the change in Boron Concentration to be = **-138 /-6.02 pcm/ppm** = **22.9 ppm**		
6	Operator determines Boron Concentration required	Change in Boron = **950 + 22.9 ppm** **= 972.9 ppm**		
*7	Using OP/1/A/6100/22, Enclosure 4.3 Section 5.1 Boron and Dilution Tables, determines the Boric Acid addition	Using Present Boron Concentration 950 ppm and the Desired Boron Concentration of 972.9 ppm, determines from Table that change from 950-972.9 ppm will require the addition of **255.48 gallons** of Boric Acid. OR Calculation: 67388 x Ln(6050/6027.3) = **255.6 gallons**. **(253.04 to 258.16 is acceptable)** See Attached Key		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

Job Performance Measure No.: 2018 Admin – JPM A1a RO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________________ Date: ____________________

KEY:

Tables:

Page 14 of 20
Intersect Present Cb of 950 ppm with Desired Cb 970 ppm and determine 223 gallons.
Intersect Present Cb of 950 ppm with Desired Cb 980 ppm and determine 335 gallons.

335 gallons - 223 gallons = 112 gallons/10ppm = 11.2 gallons/ppm

223 gallons (at 970) + [11.2 gallons/ppm x 2.9 ppm] = 255.48

Calculation:

G = V x Ln [(C-Bi)/(C-Bf)]

Where:

G	Volume of boric acid required for boration
V	Equivalent System Volume = 67388 Gallons (Constant)
C	Concentration of Boric Acid being added = 7000 ppm (Constant)
Bi	Present NCS Boron Concentration (ppm B)
Bf	Desired NCS Boron Concentration (ppm B)

G = 67388 gallons x Ln [(7000 ppmB – 950 ppmB)/(7000-972.9 ppmB)]

G = 67388 gallons x Ln [(6050 ppmB)/(6027.1 ppmB)]

G = 67388 gallons x Ln [1.003766] = **255.6** gallons

(253.04 to 258.16 is acceptable)

NOTE: The acceptable range is based on ±1% of the calculated value.

INITIAL CONDITIONS:

- Unit #1 Reactor Power is at 50%, Steady State.
- Core burnup is 125 EFPD.
- NC Boron Concentration = 950 PPM.
- Present Control Rod Height is Bank “D” at 165 steps.
- Desired Control Rod Height is Bank “D” at 210 steps.
- BA Tank boron concentration is 7000 ppm.

INITIATING CUE:

The CRS has directed you to determine the amount of boric acid needed to obtain the desired Control Rod Height using the McGuire Unit 1 Data Book and the Reactor Engineering Data (RED) - Control Room Data.

JPM A1b RO

Facility:	McGuire	Task No.:	
Task Title:	Calculate QPTR with an Inoperable Power Range Instrument	JPM No.:	2018 Admin – JPM A1b RO
K/A Reference:	2.1.7 (4.4)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-2.

Initial Conditions:

- At 0000 the Unit 1 OAC failed and is not operating.
- The vendor is being consulted concerning repairs.
- It is estimated it will take approximately 15 hours to complete repairs.
- On unit 1 at 0600 Power Range N41 upper detector failed.
- An attempt to use the Moveable Incore Detector System to determine QPTR has failed due to a failure of the main incoming breaker.
- A breaker is on order and will not be on site for seven to ten days.
- Unit 1 power has been reduced to 74%.
- Power Range N41 has been declared inoperable and removed from service by procedure.

Initiating Cue:

- The CRS has directed you to calculate QPTR in accordance with Step 12.16 of PT/1/A/4600/21A, Loss of Operator Aid Computer while in Mode 1. (Determine all calculations to two (2) decimal places)
- Identify all Technical Specification LCOs that are NOT met.

Task Standard:	The operator will calculate the QPTR (See Attached Key) and determine that Technical Specification LCO 3.2.4 is not met.
Required Materials:	Calculator McGuire Technical Specifications should be available to the operator
General References:	PT/1/A/4600/021A (Loss of Operator Aid Computer while in Mode 1), Rev 41 OP/1/A/6100/022 (Unit 1 Data Book), Rev 481 McGuire Technical Specifications (LCO 3.2.4/Amendment 184/166)
Handouts:	Handout 1: PT/1/A/4600/021A (Loss of Operator Aid Computer while in Mode 1) marked up to step 12. Handout 2: OP/1/A/6100/022 (MNS Unit #1 Data Book), Enclosure 4.3, Table 2.2 (Excore Currents and Voltages Correlated to 100% Full Power at Various Axial Offsets) – Unit 1 Cycle 26
Time Critical Task:	NO
Validation Time:	20 minutes

Critical Step Justification	
Step 4	This step is critical because recording the correct amperage reading for each detector is necessary to calculate the QPTR.
Step 5	This step is critical because recording the correct calibration current is necessary to calculate the QPTR.
Step 6	This step is critical because calculating and recording the average RF is necessary to calculate the QPTR.
Step 7	This step is critical because calculating and recording the average RF for the A Detectors is necessary to calculate the QPTR.
Step 8	This step is critical because calculating and recording the average RF for the B Detectors is necessary to calculate the QPTR.
Step 9	This step is critical because calculating the PR-42A Tilt is necessary to calculate the QPTR.
Step 10	This step is critical because calculating the PR-42B Tilt is necessary to calculate the QPTR.
Step 11	This step is critical because calculating the PR-43A Tilt is necessary to calculate the QPTR.
Step 12	This step is critical because calculating the PR-43B Tilt is necessary to calculate the QPTR.
Step 13	This step is critical because calculating the PR-44A Tilt is necessary to calculate the QPTR.
Step 14	This step is critical because calculating the PR-44B Tilt is necessary to calculate the QPTR.
Step 15	This step is critical because comparing each Detector's calculated Tilt to the TS LCO limit of $\leq$ 1.02 and determining that at least one quadrant is >1.02 is necessary determine that Technical Specification LCO 3.2.4 is not met.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-2.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Step 12.16) IF QPTR Alarm inoperable AND greater than 50% RTP, perform the following: (Step 12.16.1) If all Power Range (PR) channel inputs to QPTR operable, ……	The operator determines from initial conditions QPTR Alarm is inoperable, Unit 1 is at 100% power and all PR channels are NOT operable. The operator recognizes that this is not the case and continues.		
2	(Step 12.16.2) IF input from one PR channel is inoperable, perform the following: (Step 12.16.2.1) IF less than 75% RTP, perform the following: Calculate QPTR on Enclosure 13.5 (Calculation Sheet For Quadrant Power Tilt) Part B using other 3 PR channels. Record PR channels used within 12 hours and every 12 hours thereafter until QPTR Alarm operable or inoperable PR input operable.	The operator proceeds to Enclosure 13.5 (Calculation Sheet for Quadrant Power Tilt) Part B.		
3	(Enclosure 13.5 Part B) Complete the Form	The operator enters the current Date and Time at the top of the form.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(Enclosure 13.5 Part B) Measured Current - From NI cabinet's current meter (located on respective PRB Drawers). Ensure Detector Milliamp Range Switches are in "0.5" position and read 0-500 microamp scale.	The operator identifies the three operable Power Range Instruments as PR-42, PR-43 and PR-44 on Enclosure 13.5, Part B. The operator records the correct amperage reading for each detector (From the JPM Cue Page) in the **Measured Current** row for each of the six (6) detectors as follows: PR-42A = **296** PR-42B = **312** PR-43A = **299** PR-43B = **315** PR-44A = **299** PR-44B = **308**		
*5	(Enclosure 13.5 Part B) Calibration Current - From most recent calibration data using "0" Incore Axial Offset Current in Data Book, Table 2.2 ("IT" for detector "A", "IB" for detector "B").	The operator locates OP/1/A/6100/022, Enclosure 4.3, Table 2.2, Excore Currents and Voltages Correlated to 100% Full Power at Various Axial Offsets. The operator records the correct calibration current (Table 2.2) in the **Calibration Current** row for each of the six (6) detectors as follows: PR-42A = **135.2** PR-42B = **150.9** PR-43A = **141.5** PR-43B = **164.8** PR-44A = **137.7** PR-44B = **164.6**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*6	(Enclosure 13.5 Part B) Relative Flux (RF) – Divide line 1 by line 2 to calculate Relative Flux (RF) for each upper (A) and lower (B) detector.	The operator correctly calculates the average RF and records the in the **Relative Flux (RF)** row for each of the six (6) detectors as follows: PR-42A = 296/135.2 = **2.19** PR-42B = 312/150.9 = **2.07** PR-43A = 299/141.5 = **2.11** PR-43B = 315/164.8 = **1.91** PR-44A = 299/137.7 = **2.17** PR-44B = 308/164.6 = **1.87**		
*7	(Enclosure 13.5 Part B) Quadrant Power Tilts: Calculate by dividing each upper relative flux by the average upper relative flux and dividing each lower relative flux by the average lower relative flux. Avg RF of A Detectors	The operator records the RF of each of the three (3) A detectors and calculates the Avg RF of A Detectors as follows: **(2.19+2.11+2.17)/3 = 2.16**		
*8	(Enclosure 13.5 Part B) Quadrant Power Tilts: Calculate by dividing each upper relative flux by the average upper relative flux and dividing each lower relative flux by the average lower relative flux. Avg RF of B Detectors	The operator records the RF of each of the three (3) B detectors and calculates the Avg RF of B Detectors as follows: **(2.07+1.91+1.87)/3 = 1.95**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*9	(Enclosure 13.5 Part B) Quadrant Power Tilts: Calculate by dividing each upper relative flux by the average upper relative flux and dividing each lower relative flux by the average lower relative flux. PR-42A Tilt	The operator calculates the PR-42A Tilt as follows: **2.19/2.16 = 1.01 ± .01** And records this value.		
*10	(Enclosure 13.5 Part B) Quadrant Power Tilts: Calculate by dividing each upper relative flux by the average upper relative flux and dividing each lower relative flux by the average lower relative flux. PR-42B Tilt	The operator calculates the PR-42B Tilt as follows: **2.07/1.95 = 1.06 ± .01** And records this value.		
*11	(Enclosure 13.5 Part B) Quadrant Power Tilts: Calculate by dividing each upper relative flux by the average upper relative flux and dividing each lower relative flux by the average lower relative flux. PR-43A Tilt	The operator calculates the PR-43A Tilt as follows: **2.11/2.16 = 0.98 ± .01** And records this value.		
*12	(Enclosure 13.5 Part B) Quadrant Power Tilts: Calculate by dividing each upper relative flux by the average upper relative flux and dividing each lower relative flux by the average lower relative flux. PR-43B Tilt	The operator calculates the PR-43B Tilt as follows: **1.91/1.95 = 0.98 ± .01** And records this value.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*13	(Enclosure 13.5 Part B) Quadrant Power Tilts: Calculate by dividing each upper relative flux by the average upper relative flux and dividing each lower relative flux by the average lower relative flux. PR-44A Tilt	The operator calculates the PR-44A Tilt as follows: **2.17/2.16 = 1.00 ± .01** And records this value.		
*14	(Enclosure 13.5 Part B) Quadrant Power Tilts: Calculate by dividing each upper relative flux by the average upper relative flux and dividing each lower relative flux by the average lower relative flux. PR-44B Tilt	The operator calculates the PR-44B Tilt as follows: **1.87/1.95 = 0.96 ± .01** And records this value.		
*15	(Technical Specification 3.2.4) The QPTR shall be ≤ 1.02.	The operator compares each Detector's calculated Tilt to the TS LCO limit of ≤ 1.02 and determines that at least one quadrant is >1.02 and • Refers to LCO 3.2.4 OR • Informs the CRS of the condition.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Admin – JPM A1b RO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________ Date: ________________

KEY:

Part B Page 3 of 4

	PR-42		PR-43		PR-44	
	A	**B**	**A**	**B**	**A**	**B**
Measured Current	296	312	299	315	299	308
Calibration Current	135.2	150.9	141.5	164.8	137.7	164.6
Relative Flux (RF)	2.19	2.07	2.11	1.91	2.17	1.87

Part B Page 4 of 4

Avg RF of A Detectors = $\boxed{2.19}$ + $\boxed{2.11}$ + $\boxed{2.17}$ = 2.16

Avg RF of B Detectors = $\boxed{2.07}$ + $\boxed{1.91}$ + $\boxed{1.87}$ = 1.95

PR-42A Tilt RFA = $\frac{\text{RF of PR-42A}}{}$ = $\frac{2.19}{2.16}$ 1.01*

PR-42B Tilt RFB = $\frac{\text{RF of PR-42B}}{}$ = $\frac{2.07}{1.95}$ 1.06*

PR-43A Tilt RFA = $\frac{\text{RF of PR-43A}}{}$ = $\frac{2.11}{2.16}$ .98*

PR-43B Tilt RFB = $\frac{\text{RF of PR-43B}}{}$ = $\frac{1.91}{1.95}$ 0.98*

PR-44A Tilt RFA = $\frac{\text{RF of PR-44A}}{}$ = $\frac{2.17}{2.16}$ 1.00*

PR-44B Tilt RFB = $\frac{\text{RF of PR-44B}}{}$ = $\frac{1.87}{1.95}$ 0.96*

* $\pm$ .01

INITIAL CONDITIONS:	• At 0000 the Unit 1 OAC failed and is not operating. • The vendor is being consulted concerning repairs. • It is estimated it will take approximately 15 hours to complete repairs. • On unit 1 at 0600 Power Range N41 upper detector failed. • An attempt to use the Moveable Incore Detector System to determine QPTR has failed due to a failure of the main incoming breaker. • A breaker is on order and will not be on site for seven to ten days. • Unit 1 power has been reduced to 74%. • Power Range N41 has been declared inoperable and removed from service by procedure.
INITIATING CUE:	• The CRS has directed you to calculate QPTR in accordance with Step 12.16 of PT/1/A/4600/21A, Loss of Operator Aid Computer while in Mode 1. (Determine all calculations to two (2) decimal places) • Identify all Technical Specification LCOs that are NOT met.

The following Detector Currents are observed on the NI cabinet current meters:

NI-41 detector:

A (left) 0

B (right) 0

NI-42 detector:

A (left) 296

B (right) 312

NI-43 detector:

A (left) 299

B (right) 315

NI-44 detector:

A (left) 299

B (right) 308

JPM A2 RO

Facility:	McGuire	Task No.:	
Task Title:	Perform NC Loop Operability Verification in Mode 4	JPM No.:	2018 Admin – JPM A2 RO
K/A Reference:	2.2.12 (3.7)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- The Plant is in Mode 5 with NCS Temperature at 188°F and stable.
- S/G Narrow Range Levels are as follows:
  - 1A = 10%
  - 1B = 35%
  - 1C = 15%
  - 1D = 25%
- The following plant conditions exist:
  - Power is available to both 1ETA and 1ETB.
  - ND Pump 1A is running maintaining NCS Temperature < 200°F.
  - ND Pump 1B is OFF.
  - The WCCSRO has reported 1B ND Pump Air Handling Unit has failed to meet acceptance criteria during surveillance testing.
  - Both ND Pump Breakers are in the CONNECT position with control power ON (all breaker indications are normal)
  - All NC Pumps are OFF.
  - Except where noted below, all NC Pump Normal Feeder Breakers and Safety Breakers are Racked In (all breaker indications are normal)

- The 1B NCP is tagged out for motor maintenance.
- The 1D NCP Safety Breaker is Racked Out for breaker maintenance.

- 1TA, 1TB and 1TD are energized via their Normal Feeder Breaker (all breaker indications are normal).
- 1TC is energized via its Standby Feeder Breaker (Normal Feeder Breaker is OPEN and RACKED OUT).

Initiating Cue: The CRS has directed you to perform Enclosure 13.5 (NC Loop Operability Verification in Mode 4) of PT/1/A/4600/003 C (Weekly Surveillance Items), in preparation to transition to Mode 4.

Task Standard: The operator will complete Enclosure 13.5 in accordance with the provided KEY.

Required Materials: All General References should be available to the operator.

General References: PT/1/A/4600/003 C (Weekly Surveillance Items), Rev 74

PT/1/A/4204/011 (1B ND Pump Air Handling Unit Performance Test), Rev 20

OP/1/A/6100/SU-9 (Mode 4 Checklist) Rev 73

McGuire Technical Specifications (LCO 3.4.6/Amendment 216/197 and 261/241)

AD-HU-ALL-0004 (Procedure and Work Instruction Use and Adherence) Rev 9

Handouts: Handout 1: PT/1/A/4600/003 C (Weekly Surveillance Items) Procedure body and Enclosure 13.5 (NC Loop Operability in Mode 4))

Time Critical Task: NO

Validation Time: 10 minutes

NOTE: An Answer KEY is provided as a separate document.

Critical Step Justification	
Step 3	This step is critical because assessing the operability of each of the NCS and ND loops is necessary to complete Enclosure 13.5 correctly.
Step 4	This step is critical because assessing the electrical breaker alignment for the NCS Pump not in operation is necessary to complete Enclosure 13.5 correctly.
Step 5	This step is critical because making the correct conclusion of “no discrepancy” is necessary to complete Enclosure 13.5 correctly.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ___________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Enclosure 13.5, Step 1.1) IF performing routine weekly surveillances, record the following: Mode of Operation: _____ Date: __________	The operator places an **<u>N/A</u>** in the signoff space and proceeds.		
2	(Step 1.2) IF performing this procedure in preparation for a Mode change, record the following: Mode to be entered: ____ Date: __________	The operator enters **<u>4</u>** in the Mode to be entered and **<u>Today's Date</u>** in the Date Block, and **<u>initials the signoff space</u>**.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	(Step 1.3) Check two of the following Loops operable and one (of the operable) in operation:	The operator recognizes that NC Loop A is NOT OPERABLE because the SG NR Level is too low. The operator recognizes that NC Loop B is NOT OPERABLE because the 1B NCP is tagged out for motor maintenance. The operator recognizes that **NC Loop C** is OPERABLE, and **places a check in the Checkbox in Column 1 (OPERABLE)**. The operator recognizes that NC Loop D is NOT OPERABLE because the 1D NCP Safety Breaker is Racked Out for breaker maintenance. The operator recognizes that **ND Loop A** is OPERABLE and in operation, and **places a check in the Checkbox in Column 1 (OPERABLE) and 2 (In Operation)**. The operator recognizes that ND Loop B is NOT OPERABLE because the 1B ND PUMP AHU has just failed its surveillance. The operator **initials the signoff space**.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(Step 1.4) IF two of the operable Loops in Step 1.3 are NOT in operation, complete the following for the operable pump NOT in operation.	The operator recognizes that the 1C NC Pump must be assessed using Table 13.5-1. The operator recognizes that except where noted, all NC Pump Normal Feeder Breakers and Safety Breakers are Racked In (all breaker indications are normal). There are no noted exceptions for the 1C NC Pump Breakers. Consequently, the operator **places a check in the four YES Checkboxes for the NC Pump 1C**. The operator recognizes that 1TA, 1TB and 1TD are energized via their Normal Feeder Breaker (all breaker indications are normal); and that 1TC is energized via its Standby Feeder Breaker (all breaker indications are normal); and that according to Note 2 this is acceptable to meet the 1NC Pump requirements. The operator **places a check in the YES Checkbox for the Normal or Standby Fdr Bkr Racked In and checks YES in the second Checkbox for 1TC**.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(Step 1.5) Initial one of the following: No Discrepancy Discrepancy Sheet Attached (IF any Acceptance Criteria NOT met, it is identified as a discrepancy, evaluated per Tech Spec/SLC and appropriate corrective action taken.)	The operator **initials the “No Discrepancy” signoff** space. **Examiner NOTE:** **See provided KEY.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Admin – JPM A2 RO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- The Plant is in Mode 5 with NCS Temperature at 188°F and stable.
- S/G Narrow Range Levels are as follows:
  - 1A = 10%
  - 1B = 35%
  - 1C = 15%
  - 1D = 25%
- The following plant conditions exist:
  - Power is available to both 1ETA and 1ETB.
  - ND Pump 1A is running maintaining NCS Temperature < 200°F.
  - ND Pump 1B is OFF.
  - The WCCSRO has reported 1B ND Pump Air Handling Unit has failed to meet acceptance criteria during surveillance testing.
  - Both ND Pump Breakers are in the CONNECT position with control power ON (all breaker indications are normal)
  - All NC Pumps are OFF.
  - Except where noted below, all NC Pump Normal Feeder Breakers and Safety Breakers are Racked In (all breaker indications are normal)
    - The 1B NCP is tagged out for motor maintenance.
    - The 1D NCP Safety Breaker is Racked Out for breaker maintenance.
  - 1TA, 1TB and 1TD are energized via their Normal Feeder Breaker (all breaker indications are normal).
  - 1TC is energized via its Standby Feeder Breaker (Normal Feeder Breaker is OPEN and RACKED OUT).

INITIATING CUE:

The CRS has directed you to perform Enclosure 13.5 (NC Loop Operability Verification in Mode 4) of PT/1/A/4600/003 C (Weekly Surveillance Items), in preparation to transition to Mode 4.

JPM A3 RO

Facility:	McGuire	Task No.:	
Task Title:	Predict Radiation Levels While Responding to a Damaged Spent Fuel Pool	JPM No.:	2018 Admin – JPM A3 RO
K/A Reference:	2.3.14 (3.4)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: __X__

Classroom __X__ Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM) and Handout 1.

Initial Conditions:

- Due to an Earthquake, Unit 2 tripped from 100% power.
- Unit 1 is 11 days into a Refueling Outage and a full core off-load has just been completed.
- A Loss of Offsite Power has occurred, and only one EDG is running on each unit.
- The Unit 1 Spent Fuel Pool has sustained damage, and is leaking.
- The crew is implementing several EPs/APs simultaneously including AP/1/A/5500/41 (Loss of Spent Fuel Pool Cooling or Level).
- The TSC is manned.
- All attempts to add makeup water to the Unit 1 Spent Fuel Pool have been unsuccessful.
- The Control Room Spent Fuel Pool Level and Temperature instrumentation are unavailable.
- It is expected that the ability to add makeup water to the Spent Fuel Pool will be regained within four hours.

- An operator who has just left the Spent Fuel Pool Area has reported that during the 30 minutes that he was in the Spent Fuel Pool Area, the Aztec Level Gauge dropped about 2 feet, and the present level is 20 feet above the top of the Spent Fuel.

Initiating Cue: The OSC Coordinator has directed you to refer to Enclosure 13 (Spent Fuel Pool Radiation Level vs. Water level Above Fuel) of AP/1/A/5500/41 (Loss of Spent Fuel Pool Cooling or Level), and determine the expected radiation levels one hour, two hours, three hours and four hours from now, based on the last known leak rate.

Task Standard: The operator will use Enclosure 13 of AP/1/A/5500/41 and determine that the expected radiation levels will be as identified on the attached KEY.

Required Materials: Calculator

General References: AP/1/A/5500/41 (Loss of Spent Fuel Pool Cooling or Level), Rev 14
EP/1/A/5000/G-1 (Generic Enclosures), Rev 40

Handouts: Handout 1: Enclosure 13 (Loss of Spent Fuel Pool Cooling or Level) of AP/1/A/5500/41 (Loss of Spent Fuel Pool Cooling or Level)

Time Critical Task: NO

Validation Time: 10 minutes

Critical Step Justification	
Step 1	This step is critical because determining the radiation level at 1 hour is necessary to complete the assigned task.
Step 2	This step is critical because determining the radiation level at 2 hours is necessary to complete the assigned task.
Step 3	This step is critical because determining the radiation level at 3 hours is necessary to complete the assigned task.
Step 4	This step is critical because determining the radiation level at 4 hours is necessary to complete the assigned task.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM) and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*1	(Enclosure 13) Determine expected radiation levels in Spent Fuel Pool area in 1 hour.	The operator recognizes that the present level of the Spent Fuel Pool is 20 feet above the Fuel, and uses this as a reference. The operator recognizes that the Spent Fuel Pool is lowering at a rate of 4 feet per hour, and will be approximately 16 feet above the Spent Fuel Pool in one hour. The Operator uses Enclosure 13, locates the Dose Rate at 20 feet and 15 feet, and then approximates between these two values for 16 feet. When this is accomplished the operator will determine that the expected Dose Rate in one hour is approximately **0.76 mrem/hr (±50%) [See Key on Page 8]**.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*2	(Enclosure 13) Determine expected radiation levels in Spent Fuel Pool area in 2 hours.	The operator recognizes that the Spent Fuel Pool is lowering at a rate of 4 feet per hour, and will be approximately 12 feet above the Spent Fuel Pool in two hours. The Operator uses Enclosure 13, locates the Dose Rate at 12.5 feet and 10 feet, and then approximates between these two values for 12 feet. When this is accomplished the operator will determine that the expected Dose Rate in two hours is approximately **150 mrem/hr (±50%) [See Key on Page 8]**.		
*3	(Enclosure 13) Determine expected radiation levels in Spent Fuel Pool area in 3 hours.	The operator recognizes that the Spent Fuel Pool is lowering at a rate of 4 feet per hour, and will be approximately 8 feet above the Spent Fuel Pool in three hours. The Operator uses Enclosure 13, locates the Dose Rate at 12.5 feet and 10 feet, and then approximates between these two values for 8 feet. When this is accomplished the operator will determine that the expected Dose Rate in three hours is approximately **8.73 Rem/hr (±50%)[See Key on Page 8].**		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(Enclosure 13) Determine expected radiation levels in Spent Fuel Pool area in 4 hours.	The operator recognizes that the Spent Fuel Pool is lowering at a rate of 4 feet per hour, and will be approximately 4 feet above the Spent Fuel Pool in four hours. The Operator uses Enclosure 13, locates the Dose Rate at 4 feet, and determines that the expected Dose Rate in four hours is approximately **1580 Rem/hr (±50%)[See Key on Page 8].**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: _______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Admin – JPM A3 RO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT _______

Examiner's Signature: ________________________ Date: ______________

KEY:

1 Hour – 16 feet

Dose rate at 20 feet 1.21×10^{-6} R/hr x 10^3mrem/hr/R/hr = .001 mrem/hr
Dose rate at 15 feet 9.51×10^{-4} R/hr x 10^3mrem/hr/R/hr = .951 mrem/hr
Assume Dose Rate rises linearly as level drops between 20 and 15 feet.
.951 mrem/hr - .001 mrem/hr / 5 feet= .19 mrem/hr/ft
Since the rise in radiation level from level dropping one foot from 20 feet is 0.19 mrem/hr, the expected Dose Rate at 16 feet is 4 x 0.19 mrem/hr higher than the Dose Rate at 20 feet; or .76 mrem/hr. (.38 -1.14 mrem/hr)

2 Hours – 12 feet

Dose rate at 12.5 feet 2.52×10^{-2} R/Hr x 10^3mrem/hr/R/Hr = 25.2 mrem/hr
Dose rate at 10 feet 6.49×10^{-1} R/Hr x 10^3mrem/hr/R/Hr = 649 mrem/hr
Assume Dose Rate rises linearly as level drops between 12.5 and 10 feet.
649 mrem/hr – 25.2 mrem/hr / 2.5 feet= 249.5 mrem/hr/ft
Since the rise in radiation level from level dropping one foot from 12.5 feet is 249.5, the expected Dose Rate at 12 feet is 0.5 times that or 124.8 mrem/hr higher than the Dose Rate at 12.5 feet (25.2 mrem/hr), or 150 mrem/hr. (75 - 225 mrem/hr)

3 Hours - 8 feet

This is a direct read from the Table.
Dose rate at 8 feet 8.73×10^{0} R/Hr = 8.73 Rem/hr (4.4 – 13.1 Rem/hr)

4 Hours – 4 feet

This is a direct read from the Table.
Dose rate at 4 feet 1.58×10^{3} R/Hr = 1580 Rem/hr (790 - 2370 Rem/hr)

INITIAL CONDITIONS:

- Due to an Earthquake, Unit 2 tripped from 100% power.
- Unit 1 is 11 days into a Refueling Outage and a full core off-load has just been completed.
- A Loss of Offsite Power has occurred, and only one EDG is running on each unit.
- The Unit 1 Spent Fuel Pool has sustained damage, and is leaking.
- The crew is implementing several EPs/APs simultaneously including AP/1/A/5500/41 (Loss of Spent Fuel Pool Cooling or Level).
- The TSC is manned.
- All attempts to add makeup water to the Unit 1 Spent Fuel Pool have been unsuccessful.
- The Control Room Spent Fuel Pool Level and Temperature instrumentation are unavailable.
- It is expected that the ability to add makeup water to the Spent Fuel Pool will be regained within four hours.
- An operator who has just left the Spent Fuel Pool Area has reported that during the 30 minutes that he was in the Spent Fuel Pool Area, the Aztec Level Gauge dropped about 2 feet, and the present level is 20 feet above the top of the Spent Fuel.

INITIATING CUE:

The OSC Coordinator has directed you to refer to Enclosure 13 (Spent Fuel Pool Radiation Level vs. Water level Above Fuel) of AP/1/A/5500/41 (Loss of Spent Fuel Pool Cooling or Level), and determine the expected radiation levels one hour, two hours, three hours and four hours from now, based on the last known leak rate.

JPM A1a SRO

Facility:	McGuire	Task No.:	
Task Title:	Perform/Review a Manual NC Leakage Calculation	JPM No.:	2018 Admin – JPM A1a SRO
K/A Reference:	2.1.25 (4.2)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue, and associated Datasheet (Last two (2) Pages of this JPM); and Handouts 1-4.

Initial Conditions:

- Unit 1 is at 100% power.
- The Unit 1 OAC point M1L4554 (U1 Unidentified Leakage > 1 GPM in CONT) is out of service.
- PT/1/A/4200/040 (Reactor Coolant Leakage Detection) has been completed showing that total NCS Leakage is 1.6 gpm.
- A manual NC System leakage calculation is in progress in accordance with PT/1/A/4150/001B (Reactor Coolant Leakage Calculation)
- Enclosure 13.2 (NC Leakage Determination Using Manual Calculations) of PT/1/A/4150/001B (Reactor Coolant Leakage Calculation) has been completed through Step 1.9.

Initiating Cue:

- Using Enclosure 13.2 (NC Leakage Determination Using Manual Calculations), AND the attached Datasheet, complete the NC System Leakage Calculation, through Step 1.11.
- Identify all required action(s), if any, that apply as a result of the NC Leakage Calculation.

Task Standard:	The operator will complete all calculations in accordance with the provided Key, identify that the Unidentified RCS Leakage Technical Specification has been exceeded, and the required ACTION.
Required Materials:	Calculator
General References:	PT/1/A/4200/040 (Reactor Coolant Leakage Detection), Rev 15 OP/1/A/6150/004 (Pressurizer Relief Tank), Rev 58 OP/1/A/6500/001 (Liquid Waste System), Rev 98 PT/1/A/4150/001B (Reactor Coolant Leakage Calculation), Rev 95 McGuire Unit 1 Technical Specifications (LCO 3.4.13, Operational Leakage), Amendment 237
Handouts:	Handout 1: PT/1/A/4150/001B (Reactor Coolant Leakage Calculation) marked up for this JPM. Handout 2: PT/1/A/4150/001B (Reactor Coolant Leakage Calculation) Enclosure 13.2 (NC Leakage Determinations Using Manual Calculations) marked up for this JPM. Handout 3: Enclosure 13.3 (NCDT Volume) of PT/1/A/4150/001B (Reactor Coolant Leakage Calculation) Handout 4: Enclosure 13.4 (PRT Volume) of PT/1/A/4150/001B (Reactor Coolant Leakage Calculation)
Time Critical Task:	NO
Validation Time:	40 minutes
NOTE:	An Answer KEY is provided as a separate document.

Critical Step Justification	
Step 1	This step is critical because recording the correct plant data is necessary to complete all calculations in accordance with the provided Key.
Step 2	This step is critical because determining that the change in NCS Tave during the surveillance is < 0.25°F is necessary to determine that the surveillance is valid.
Step 3	This step is critical because determining the correct VCT leakage Rate is necessary to determine Total NCS Leakage.
Step 4	This step is critical because determining the correct PZR leakage Rate is necessary to determine Total NCS Leakage.
Step 5	This step is critical because determining the Total NCS Leakage is necessary to complete all calculations in accordance with the provided Key.
Step 6	This step is critical because determining the change in PRT volume is necessary to determine Total PRT Leakage.
Step 7	This step is critical because determining the correct PRT leakage Rate is necessary to complete all calculations in accordance with the provided Key.
Step 8	This step is critical because determining the change in NCDT volume is necessary to determine Total NCDT Leakage.
Step 9	This step is critical because determining the correct NCDT leakage Rate is necessary to complete all calculations in accordance with the provided Key.
Step 10	This step is critical because calculating the Identified Leakage is necessary to complete all calculations in accordance with the provided Key.
Step 11	This step is critical because calculating the Unidentified Leakage is necessary to complete all calculations in accordance with the provided Key.
Step 12	This step is critical because calculating the Total NC Pumps #1 Seal Leakoff is necessary to complete all calculations in accordance with the provided Key.
Step 13	This step is critical because calculating the Total Accumulative Leakage is necessary to complete all calculations in accordance with the provided Key.
Step 15	This step is critical because reporting that LCO 3.4.13 has been exceeded and identifying that Condition A of TS LCO 3.4.13 is met, is necessary to identify that the Unidentified RCS Leakage Technical Specification has been exceeded, and the required ACTION.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue, and associated Datasheet (Last two (2) Pages of this JPM); and Handouts 1-4.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*1	(Enclosure 13.2, Steps 1.10.1 through 6, 8 through 13, 22, 23, 26 and 1.11.1) Record raw data.	The operator transposes raw data from the Data Sheet provided.		
*2	(Enclosure 13.2, Step 1.10.14) Calculate change in NC System Tave:	The operator calculates the change in NC System Tave to be -**0.1ºF**, and records.		
*3	(Enclosure 13.2, Step 1.10.15) Calculate VCT Leakage Rate:	The operator calculates the VCT Leakage Rate to be **4.37 gpm**, and records.		
*4	(Enclosure 13.2, Step 1.10.16) Calculate PZR Leakage Rate:	The operator calculates the PZR Leakage Rate to be **0.99 gpm**, and records.		
*5	(Enclosure 13.2, Step 1.10.17) Calculate Total Leakage:	The operator calculates the Total Leakage to be **5.36 gpm**, and records.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*6	(Enclosure 13.2, Step 1.10.18) Using Enclosure 13.4 (PRT Volume), record the following: Initial PRT Volume Final PRT Volume	The operator uses Enclosure 13.4 and an initial PRT Level of 79.0 %, and determines that initial PRT Volume is **<u>11034.1 gal</u>**, and records. The operator uses Enclosure 13.4 and a final PRT Level of 80.0 %, and determines that final PRT Volume is **<u>11163.3 gal</u>**, and records.		
*7	(Enclosure 13.2, Step 1.10.19) Calculate PRT Leakage Rate:	The operator calculates the PRT Leakage Rate to be **<u>1.79 gpm</u>**, and records.		
*8	(Enclosure 13.2, Step 1.10.20) Using Enclosure 13.3 (NCDT Volume), record the following: Initial NCDT Volume Final NCDT Volume	The operator uses Enclosure 13.3 and an initial NCDT Level of **<u>51%</u>**, and determines that initial NCDT Volume is **<u>180.2 gal</u>**, and records. The operator uses Enclosure 13.3 and a final NCDT Level of **<u>56%</u>**, and determines that final NCDT Volume is **<u>198.2 gal</u>**, and records.		
*9	(Enclosure 13.2, Step 1.10.21) Calculate NCDT Leakage Rate:	The operator calculates the NCDT Leakage Rate to be **<u>.25 gpm</u>**, and records.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*10	(Enclosure 13.2, Step 1.10.24) Calculate Corrected Identified Leakage:	The operator calculates the Identified Leakage to be **2.04 (±5%) gpm**, and records.		
*11	(Enclosure 13.2, Step 1.10.25) Calculate Unidentified Leakage:	The operator calculates the Unidentified Leakage to be **3.32 (±5%) gpm**, and records.		
*12	(Enclosure 13.2, Step 1.10.26) Determine Total NC Pump #1 Seal Leakoff flow:	The operator calculates the Total NC Pumps #1 Seal Leakoff to be **13.75 (±5%) gpm**, and records.		
*13	(Enclosure 13.2, Step 1.10.27) Calculate Total Accumulative Leakage:	The operator calculates the Total Accumulative Leakage to be **18.86 (±5%) gpm**, and records.		
14	(Enclosure 13.2) Calculated By/ Date/Time:	The operator places their name in the Calculated by BLOCK, and signs. The operator enters the Date and Time.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*15	Technical Specification LCO 3.4.13: RCS operational LEAKAGE shall be limited to: a. No pressure boundary LEAKAGE; b. 1 gpm unidentified LEAKAGE; c. 10 gpm identified LEAKAGE; d. 389 gallons per day total primary to secondary LEAKAGE through all steam generators (SGs); and e. 135 gallons per day primary to secondary LEAKAGE through any one steam generator (SG). APPLICABILITY: MODES 1, 2, 3, and 4.	The operator returns the completed Enclosure 13.2 and reports that LCO 3.4.13 has been exceeded because there is greater than 1 gpm unidentified LEAKAGE. The operator identifies that CONDITION A is met, RCS Operational LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE; AND that the REQUIRED ACTION is to Reduce LEAKAGE to within limits, within 4 hours. **Examiner NOTE:** **See provided KEY.**		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Admin – JPM A1a SRO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

Data Sheet

Start Time	**0900**	[redacted]
Stop Time	**1012**	
[redacted]		
	Initial	**Final**
VCT Level	**57.6**	**41.3**
Pzr Level	**55.2**	**54.3**
NC Tave (From OAC)	**585.1**	**585.0**
PRT Level	**79.0**	**80.0**
NCDT Level	**51**	**56**
[redacted]		
NC Sample Purge Flow value recorded in Narrative Log		**0**
Any quantified (measured) leakage that has been identified		**0**
[redacted]		
NC Pump 1A #1 Seal Leakoff Flow		**3.1**
NC Pump 1B #1 Seal Leakoff Flow		**3.4**
NC Pump 1C #1 Seal Leakoff Flow		**3.8**
NC Pump 1D #1 Seal Leakoff Flow		**3.2**
[redacted]		
1EMF71 Reading		**1.5**
1EMF72 Reading		**1.3**
1EMF73 Reading		**1.7**
1EMF74 Reading		**1.1**

INITIAL CONDITIONS:

- Unit 1 is at 100% power.
- The Unit 1 OAC point M1L4554 (U1 Unidentified Leakage > 1 GPM in CONT) is out of service.
- PT/1/A/4200/040 (Reactor Coolant Leakage Detection) has been completed showing that total NCS Leakage is 1.6 gpm.
- A manual NC System leakage calculation is in progress in accordance with PT/1/A/4150/001B (Reactor Coolant Leakage Calculation)
- Enclosure 13.2 (NC Leakage Determination Using Manual Calculations) of PT/1/A/4150/001B (Reactor Coolant Leakage Calculation) has been completed through Step 1.9.

INITIATING CUE:

- Using Enclosure 13.2 (NC Leakage Determination Using Manual Calculations), AND the attached Datasheet, complete the NC System Leakage Calculation, through Step 1.11.
- Identify all required action(s), if any, that apply as a result of the NC Leakage Calculation.

JPM A1b SRO

Facility:	McGuire	Task No.:	
Task Title:	Determine License Status	JPM No.:	2018 Admin – JPM A1b SRO
K/A Reference:	2.1.4 (3.8)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

Initial Conditions:

- You are evaluating the work histories of three Licensed Senior Reactor Operators.
- All three have off-shift assignments at the plant, are current in License Operator Requalification Training, and have had a medical examination in the past 2 years.
- None of the 3 has worked any shift since 3/1/18.
- Active/Inactive status and time on shift since January 1, 2018 is as follows for each of the Senior Reactor Operators:
  (Work History Table Provided)

Initiating Cue:

- Determine if each of the Senior Reactor Operators is eligible to work the CRS position on the 0700 - 1900 shift on April 30, 2018.
- Record your answer below (yes or no).

Task Standard: The operator will determine that SROs Tom Perry and Andy Miller are eligible, and that SRO Charlie Ribal is NOT eligible to work the CRS position on the 0700 - 1900 shift on April 30, 2018.

Required Materials: Calculator

General References: AD-OP-ALL-1000 (Conduct of Operations), Rev 9
NSD-512 (Maintenance of RO/SRO NRC Licenses), Rev 7

Handouts: Handout 1: NSD-512 (Maintenance of RO/SRO NRC Licenses)

Time Critical Task: NO

Validation Time: 15 minutes

Critical Step Justification	
Step 1	This step is critical because determining that Tom Perry is eligible to work the CRS position on the 0700 - 1900 shift on April 30, 2018 is necessary to complete the assigned Task.
Step 2	This step is critical because determining that Charlie Ribal is NOT eligible to work the CRS position on the 0700 - 1900 shift on April 30, 2018 is necessary to complete the assigned Task.
Step 3	This step is critical because determining that Andy Miller is eligible to work the CRS position on the 0700 - 1900 shift on April 30, 2018 is necessary to complete the assigned Task.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handout 1.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*1	Determine the Active / Inactive status of Tom Perry's SRO License.	The operator reviews the requirements of Section 512.7 of NSD 512, and determines that the license is Active because the operator worked the required 5 complete twelve hour shifts in a qualifying license position, including one as the CRS or SM, during the previous quarter (1/2, 1/3, 1/5, 1/6 and 2/14), and that **YES,** he is eligible to work the CRS position on the 0700 - 1900 shift on April 30, 2018.		
*2	Determine the Active / Inactive status of Charlie Ribal's SRO License.	The operator reviews the requirements of Section 512.7 of NSD 512, and determines that the license is Inactive because the operator did NOT work the required 5 complete twelve hour shifts in a qualifying license position during the previous quarter (1/1, 1/3, 1/5, 1/14 ONLY), and that **NO,** he is NOT eligible to work the CRS position on the 0700 - 1900 shift on April 30, 2018.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	Determine the Active / Inactive status of Andy Miller's SRO License.	The operator reviews the requirements of Section 512.8 of NSD 512, and determines that the license is active because activation occurred in the previous quarter; and that **YES,** he is eligible to work the CRS position on the 0700 - 1900 shift on April 30, 2018.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: _______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Admin – JPM A1b SRO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- You are evaluating the work histories of three Licensed Senior Reactor Operators.
- All three have off-shift assignments at the plant, are current in License Operator Requalification Training, and have had a medical examination in the past 2 years.
- None of the 3 has worked any shift since 3/1/18.
- Active/Inactive status and time on shift since January 1, 2018 is as follows for each of the Senior Reactor Operators:

Tom Perry	**License was active on January 1, 2018.**	
	1/2/18	Worked 0700-1900 shift as CRS.
	1/3/18	Worked 0700-1900 shift as the Unit 1 OATC.
	1/4/18	Worked 0700-1900 shift as Unit 1 Plant SRO
	1/5/18	Worked 0700-1900 shift as the Unit 2 BOP.
	1/6/18	Worked 0700-1900 shift as Unit 2 OATC.
	2/14/18	Worked 1900-0700 shift as Unit 2 BOP.
	2/17/18	Worked 1900-0700 shift as Unit 2 STA.
Charlie Ribal	**License was active on January 1, 2018.**	
	1/1/18	Worked 0700-1900 shift as CRS.
	1/2/18	Worked 0700-1500 shift as CRS.
	1/3/18	Worked 0700-1900 shift as CRS.
	1/5/18	Worked 0700-1900 shift as CRS.
	1/14/18	Worked 1900-0700 shift as SM.
	2/2/18	Worked 0700-1900 shift as Unit 1 Plant SRO
Andy Miller	**License was inactive on January 1, 2018.**	
	1/5/18 thru 1/9/18 worked 40 hours under the direction of the CRS and completed all requirements for license reactivation.	
	2/12/18	Worked 0700-1900 shift as Unit 2 BOP.
	2/13/18	Worked 0700-1900 shift as Unit 2 BOP.
	2/15/18	Worked 0700-1900 shift as Unit 2 OATC.
	2/16/18	Worked 1900-0700 shift as Unit 1 BOP.
	2/21/18	Worked 1900-0700 shift as Unit 1 OATC.

INITIATING CUE:

- Determine if each of the Senior Reactor Operators is eligible to work the CRS position on the 0700 - 1900 shift on April 30, 2018.
- Record your answer below (yes or no).

Tom Perry: ______________________

Charlie Ribal: ______________________

Andy Miller: ______________________

JPM A2 SRO

Facility:	McGuire	Task No.:	
Task Title:	Determine Procedure Sections that Must be Performed	JPM No.:	2018 Admin – JPM A2 SRO
K/A Reference:	2.2.12 (4.1)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM) and Handout 1.

Initial Conditions:

- A plant startup is in progress in accordance with OP/1/A/6100/003 (Controlling Procedure for Unit Operation).
- The crew has just stabilized the plant at 3.6% power and is in a 10-minute hold.
- The BOP reports that the following OAC points have changed from Green to Magenta on the OAC Display Screen:
  - M1L1470, Xenon/Samarium Calcs Program Status
  - M1P1555, Max Rod Deviation Shutdown Bank E
  - M1A1234, Lower Cont Ambient Air Temp B
- All other equipment is operating normally.
- No unexpected alarms have occurred.

Initiating Cue:

The CRS has directed you to assess the OAC Points using PT/1/A/4600/021B (Loss of Operator Aid Computer while in Mode 2).

Identify the following:

- Procedure sections that must be performed.
- Personnel and/or organizations that must be notified.
- Procedure Enclosures or other procedures that must be performed.

Task Standard:	The operator will identify the five procedure Sections that must be performed as 12.2, 12.5, 12.9, 12.10 and 12.13; identify that the Engineering OAC Group must be notified, and that Enclosure 13.2 Part A needs to be performed (See KEY on Page 7 of 8).
Required Materials:	None
General References:	OP/1/A/6100/003 (Controlling Procedure for Unit Operation), Rev 201 PT/1/A/4600/021B (Loss of Operator Aid Computer while in Mode 2), Rev 27
Handouts:	Handout 1: Blank Copy of PT/1/A/4600/021B (Loss of Operator Aid Computer while in Mode 2)
Time Critical Task:	NO
Validation Time:	20 minutes

Critical Step Justification	
Step 2	This step is critical because using Enclosure 13.5 is necessary to identify the five procedure Sections that must be performed.
Step 3	This step is critical because evaluating an out-of-service M1L1470 is necessary to identify the five procedure Sections that must be performed.
Step 4	This step is critical because evaluating an out-of-service M1P1555 is necessary to identify the five procedure Sections that must be performed.
Step 5	This step is critical because evaluating an out-of-service M1A1234 is necessary to identify the five procedure Sections that must be performed.
Step 6	This step is critical because identifying the procedure sections that must be performed is necessary to complete the task.
Step 7	This step is critical because identifying the personnel and/or organizations that must be notified is necessary to complete the task.
Step 8	This step is critical because identifying the procedure Enclosures that must be performed is necessary to complete the task.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM) and Handout 1.

START TIME: ___________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
1	(Notes prior to Step 12.1) A magenta OAC point indicates "Failed" or "Bad Quality". Some of these also indicate a partial loss of OAC. Turn On Code "GD OAC" may be used to find OAC points in Enclosure 13.5 (OAC Point List For Partial Loss Of OAC).	The operator reads the NOTES and proceeds.		
*2	(Step 12.1) IF this procedure is entered due to a "Failed" OR "Bad Quality" OAC point, go to Enclosure 13.5 (OAC Point List For Partial Loss Of OAC) to determine applicable sections of procedure to perform. All other sections of procedure may be marked NA.	The operator proceeds to Enclosure 13.5.		
*3	(Enclosure 13.5) Determine applicable sections of procedures to be performed due to Bad Quality on M1L1470, Xenon/Samarium Calcs Program Status	The operator determines that procedure sections 12.2 and 12.13 need to be performed.		
*4	(Enclosure 13.5) Determine applicable sections of procedures to be performed due to Bad Quality on M1P1555, Max Rod Deviation Shutdown Bank E	The operator determines that procedure sections 12.2, 12.5 and 12.9 need to be performed.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(Enclosure 13.5) Determine applicable sections of procedure to perform due to Bad Quality on M1A1234, Lower Cont Ambient Air Temp B	The operator determines that procedure sections 12.2 and 12.10 need to be performed.		
*6	Identify procedure sections that must be performed.	The operator identifies that procedure sections 12.2, 12.5, 12.9, 12.10 and 12.13 need to be performed. See KEY on Page 7 of 8		
*7	Identify personnel and/or organizations that must be notified.	The operator reviews procedure sections 12.2, 12.5, 12.9, 12.10 and 12.13, and determines that the Engineering OAC Group must be notified (Section 12.2). See KEY on Page 7 of 8		
*8	Identify procedure Enclosures that must be performed.	The operator reviews procedure sections 12.2, 12.5, 12.9, 12.10 and 12.13, and determines that Enclosure 13.2 Part A needs to be performed (Section 12.9). See KEY on Page 7 of 8		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Admin – JPM A2 SRO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

KEY:

Procedure Sections:	12.2, 12.5, 12.9, 12.10 and 12.13
Notifications:	Engineering OAC Group
Procedure Enclosures or other Procedures:	Enclosure 13.2 Part A

INITIAL CONDITIONS:

- A plant startup is in progress in accordance with OP/1/A/6100/003 (Controlling Procedure for Unit Operation).
- The crew has just stabilized the plant at 3.6% power and is in a 10-minute hold.
- The BOP reports that the following OAC points have changed from Green to Magenta on the OAC Display Screen:
  - M1L1470, Xenon/Samarium Calcs Program Status
  - M1P1555, Max Rod Deviation Shutdown Bank E
  - M1A1234, Lower Cont Ambient Air Temp B
- All other equipment is operating normally.
- No unexpected alarms have occurred.

INITIATING CUE:

The CRS has directed you to assess the OAC Points using PT/1/A/4600/021B (Loss of Operator Aid Computer while in Mode 2).

Identify the following:

- Procedure sections that must be performed.
- Personnel and/or organizations that must be notified.
- Procedure Enclosures or other procedures that must be performed.

Procedure Sections:

____

____

____

Notifications:

____

____

____

Procedure Enclosures or other Procedures:

____

____

____

____

____

JPM A3 SRO

Facility:	McGuire	Task No.:	
Task Title:	Approve a Liquid Release Permit	JPM No.:	2018 Admin – JPM A3 SRO
K/A Reference:	2.3.6 (3.8)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ________

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue and List of Out-of-Service Equipment (Last Two Pages of this JPM), and Handouts 1-2.

Initial Conditions:

- Unit 1 and Unit 2 are in Mode 1 at 100% power.
- There are no on-going liquid radiation releases.
- Attachment 1 ('B' WMT Release Using 'B' WMT Pump) of OP/0/B/6200/607 (Liquid Waste Release – WMT 'B' with WMT Pump 'B') is in progress in preparation for release of the B Waste Monitor Tank.
- Attachment 10 ('B' WMT Release Authorization) has been initiated.
- RP has just delivered the LWR package # 2018067 to the Control Room.
- All available RC Pumps are running.

Initiating Cue:

- You are directed to review and approve LWR Package # 2018067 by performing Steps 9-12 of Attachment 10 ('B' WMT Release Authorization) of OP/0/B/6200/607.
- If LWR Package # 2018067 cannot be approved, identify why not.

Task Standard: The operator will determine that LWR Package # 2018067 cannot be approved because the recommended Release Rate is GREATER THAN the Allowable Release Rate and 0EMF49 has NOT been source checked.

Required Materials: Calculator

General References: OP/0/B/6200/607 (Liquid Waste Release – WMT B With WMT Pump B), Rev 11

OP/1/A/6500/001 (Liquid Waste System), Rev 99

Handouts: Handout 1: Attachment 10 (‘B’ WMT Release Authorization) of OP/0/B/6200/607 (Liquid Waste Release – WMT ‘B’ With WMT Pump ‘B’) marked up through Step 8.

Handout 2: LWR Discharge Document (Adjusted such that Recommended Release Rate is > Allowable Release Rate (Reversed), and 0EMF49 Source Check Block is BLANK).

Time Critical Task: NO

Validation Time: 11 minutes

Critical Step Justification	
Step 1	This step is critical because determining the operability/functionality of release instrumentation is necessary to determine whether or not LWR Package # 2018067 can be approved.
Step 3	This step is critical because evaluating LWR 2018067 is necessary to determine whether or not LWR Package # 2018067 can be approved.
Step 4	This step is critical because identifying the reasons why LWR 2018067 cannot be approved is necessary to complete the task.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue and List of Out-of-Service Equipment (Last Two Pages of this JPM), and Handouts 1-2.

START TIME: ____________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*1	(Attachment 10, Step 9) Determine functionality status of the following components: 0WMLP5140 (B WMT Pump Disch Flow) Yes ☐ No ☐ 1WP-35 (WMT & VUCDT to RC Cntrl) Yes ☐ No ☐ 1WP-37 (Liquid Waste to RC Cntrl) Yes ☐ No ☐ 0EMF-49 (Liquid Waste Disch Radiation Monitor) Yes ☐ No ☐ 0WMFS5440 (0EMF49 Outlet Flow) [8.7.4] Yes ☐ No ☐	The operator reviews the equipment OOS List and determines that 0WMLP5140 is OPERABLE and checks YES. The operator reviews the equipment OOS List and determines that 1WP-35 is OPERABLE and checks YES. The operator reviews the equipment OOS List and determines that 1WP-37 is OPERABLE and checks YES. The operator reviews the equipment OOS List and determines that 0EMF49 is OPERABLE and checks YES. The operator reviews the equipment OOS List and determines that 0WMFS5440 is OPERABLE and checks YES.		
2	(Step 10) IF any component listed in Step 9 is NON-FUNCTIONAL, THEN…..	The operator recognizes that all required equipment is OPERABLE, and that this step is NA.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*3	(Step 11) Ensure the following items on LWR Document are complete: • Number of "RC Pumps Running" is greater than OR equal to "RC Pumps Assigned To This Release • "Number of "RC Pumps Running" is greater than OR equal to "Total RC Pumps Required (all concurrent releases)" • "Recommended Release Rate (GPM)" is less than "Allowable Release Rate (GPM)" • 0EMF-49L (Waste Liquid Low Range Radiation Monitor Module) is FUNCTIONAL AND in service. • 0EMF-49 (Liquid Waste Disch Radiation Monitor) source check performed. • "Expected CPM" is less than "TRIP 1 SETPOINT" AND "TRIP 2 SETPOINT". • Review of Special Instructions provided on LWR Permit. [8.7.12]	The operator recognizes that there are 7 RC Pumps operating which is greater than the 1RC pump required by LWR Package # 2018067. The operator recognizes that there are NO concurrent releases. The operator recognizes that the "Recommended Release Rate (gpm)" is **GREATER THAN** "Allowable Release Rate (gpm)" and determines that this must be corrected. The operator reviews the equipment OOS List and determines that 0EMF49 is OPERABLE, and in service. The operator reviews LWR paperwork and determines that 0EMF49 has **NOT** been source checked. The operator observes that the "Expected CPM" is less than "Trip 1 Setpoint" and "Trip 2 Setpoint". The operator reviews the Special Instructions provided on the LWR Permit, and determines that all Special Instructions are met (None).		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*4	(Step 12) WHEN approved for release, THEN place signature, date, AND time of Control Room Supervisor authorization on LWR Document.	The operator does NOT initial Step 12, and identifies that LWR Package # 2018067 can **NOT** be approved until the "Recommended Release Rate (gpm)" is less than the "Allowable Release Rate (gpm)" and 0EMF49 has been source checked.		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Admin – JPM A3 SRO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

Out-of-Service Equipment

Common Unit Equipment:

Fire Alarm Control Panel (FACP) – 2 (Admin Building) – Ongoing Testing
'A' NB Evaporator Feed Pump – Failed Bearing
0EMF43A (CR Air Intake A Rad Monitor) – Circuit Failure
SKSS Inverter – Ongoing Maintenance
0WMFT5130 (A Waste Monitor Tank Pump Disch Flow) – Failed transmitter
Fire Hydrant 10 (W of Main Shop) – Will Not Operate
0VSWT0001 (A VS Compressor Water Separator Water Trap) – Leaking Petcock

Unit 1:

Glycol Pump B – Ongoing Maintenance
MCB Annunciator 1AD-2, A8 (OTDT Runback / Rod Stop Alert) – Alarm does NOT function
1RNP 5360 (1A Component Cooling HX Outlet Flow) – Failed High
1B LLI Pump – Oil Level in Reduction Gear Low

Unit 2:

2RWS-13 (Raw Water Skid Coupon Rack A Influent) – Packing Leak
Fireworks FDS Zone 24 Smoke Detector (Unit 2 Seal Oil System) – Failed
2EMF44 (Cont Vent Drn Tank Rad Monitor) – Detector Failure
2C RC Pump – Motor Replacement
2TLP5010 (Stm Seal Header Press) – Failed Low

Note: All other equipment is OPERABLE/FUNCTIONAL.

INITIAL CONDITIONS:	• Unit 1 and Unit 2 are in Mode 1 at 100% power. • There are no on-going liquid radiation releases. • Attachment 1 ('B' WMT Release Using 'B' WMT Pump) of OP/0/B/6200/607 (Liquid Waste Release – WMT ‘B’ with WMT Pump ‘B’) is in progress in preparation for release of the B Waste Monitor Tank. • Attachment 10 ('B' WMT Release Authorization) has been initiated. • RP has just delivered the LWR package # 2018067 to the Control Room. • All available RC Pumps are running.
INITIATING CUE:	• You are directed to review and approve LWR Package # 2018067 by performing Steps 9-12 of Attachment 10 (‘B’ WMT Release Authorization) of OP/0/B/6200/607. • If LWR Package # 2018067 cannot be approved, identify why not.

JPM A4 SRO

Facility:	McGuire	Task No.:	
Task Title:	Provide an Updated PAR	JPM No.:	2018 Admin – JPM A4 SRO
K/A Reference:	2.4.44 (4.4)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-3.

Initial Conditions:

- Unit 1 is at 100% power.
- A LOCA inside containment has occurred on Unit 2.
- The Emergency Coordinator declared a General Emergency per RP/0/A/5700/000 (Classification of Emergency).
- An Emergency Release from Containment is in progress due to a piping penetration failure.
- An Emergency Notification Form, along with the initial PAR was sent at the appropriate time.
- This is NOT a Rapidly Progressing Severe Accident (RPSA)
- The following conditions exist 30 minutes after the start of the event:
  - The wind speed is 5 mph.
  - The wind direction is 291.6°.
- An RP Dose Assessment will be completed in 20 minutes.
- Security Reports that there are no security related events in progress, and site evacuation is progressing as expected.
- The Communicator is reporting that off-site agencies are reporting that evacuations are proceeding as expected.

Initiating Cue:	Due to a change in meteorological conditions, prepare an EXPANDED PAR and submit the Emergency Notification Form to the Emergency Coordinator for approval. **THIS IS A TIME CRITICAL JPM**

Task Standard: The operator will determine the Expanded PAR for the current conditions and complete the Emergency Power Plant Emergency Notification Form per the provided KEY within 15 minutes.

Required Materials: None

General References: RP/0/A/5700/000 (Classification of Emergency), Rev 29

RP/0/B/5700/029 (Notifications to Offsite Agencies from the Control Room), Rev 23

McGuire Nuclear Station Classification of Emergency EAL Wallchart, Rev 29

Nuclear Power Plant Emergency Notification Form

Handouts: Handout 1: Blank Nuclear Power Plant Emergency Notification Form

Handout 2: RP/0/B/5700/029 (Notifications to Offsite Agencies from the Control Room)

Handout 3: Initial Emergency Notification Form previously completed to declare General Emergency based on EAL # FG1.1

Time Critical Task: YES-15 Minutes: According to Step 4.2.a of RP/0/B/5700/029, "Initial notifications to the State(s) AND counties must be made within 15 minutes of the event declaration using the ENF." According to Step 4.2.b of RP/0/B/5700/029, any change in PAR is considered an Initial Notification.

Validation Time: 14 minutes

Critical Step Justification	
Step 1	This step is critical because determining that an Expanded PAR is required is necessary to complete the assigned task.
Step 2	This step is critical because determining that a Hostile Action Based event is NOT in progress is necessary to complete the assigned task.
Step 3	This step is critical because determining that a known offsite impediment to evacuation is NOT in progress is necessary to complete the assigned task.
Step 4	This step is critical because determining that a short-term release is NOT in progress is necessary to complete the assigned task.
Step 5	This step is critical because determining that GE Conditions still exist is necessary to complete the assigned task.
Step 6	This step is critical because using Table 1 with a wind direction of 291.6^{o} is necessary to complete the assigned task.
Step 7	This step is critical because determining that Offsite Projected Dose projections or field measurements that exceeded PAGs, have NOT been made is necessary to complete the assigned task.
Step 8	This step is critical because completing the ENF is necessary to complete the assigned task.

(Denote Critical Steps with an asterisk*)

Provide Candidate with Initial Conditions/Cue (Last Page of this JPM), and Handouts 1-3.

START TIME: ___________

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*1	(RP/0/B/5700/029, Attachment 3, Expanded PAR Determination) Continuous Assessment Evaluate PAR based on changes in any of the following: • Increase in dose assessment projected values • Increase in field team measured values • Shift in 15-minute average wind direction resulting in additional sectors being affected (Table 3 on page 3) • Offsite Agencies provides information that offsite impediments no longer exist • Hostile action based event has been terminated • IF RPSA, when safer to do so consider evacuation of SIP PAZs based upon radiological assessment and discussions with Offsite Agencies	Using Page 2 of 4 of Attachment 3, the operator enters the Flowchart from the Initial PAR. By comparing the sectors evacuated during the initial PAR, and the sectors required for wind direction 291.6, the operator recognizes that there has been a shift in the 15-minute average wind direction resulting in additional sectors being affected.		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*2	(RP/0/B/5700/029, Attachment 3, Expanded PAR Determination) Is this a Hostile Action Based event in progress?	The operator recognizes that there is NOT a Hostile Action Based event in progress, and proceeds (Initial Conditions).		
*3	(RP/0/B/5700/029, Attachment 3, Expanded PAR Determination) Is there a known offsite impediment to evacuation? (See Note 2: Offsite Agencies have provided prior knowledge of offsite impediments to evacuation (such as flooding, bridge/road closure, adverse weather, traffic control not in place, etc.) AND specifically requested that the site NOT issue an evacuation PAR)	The operator recognizes that there is NOT a known offsite impediment to evacuation, and proceeds (Initial Conditions).		
*4	(RP/0/B/5700/029, Attachment 3, Expanded PAR Determination) Is this a short-term release in progress? (See Note 3: A short-term release is one that can be accurately projected to be < three hours and controlled by the licensee. This consideration would typically apply to controlled venting of containment).	The operator recognizes that there is NOT a short-term release in progress, and proceeds (Initial Conditions).		

STEPS	ELEMENTS	STANDARD	S/U	COMMENTS REQUIRED FOR UNSAT
*5	(RP/0/B/5700/029, Attachment 3, Expanded PAR Determination) GE Conditions? (See Note 4: Plant conditions exist which would require the classification of a General Emergency per the EALs. This does NOT include consideration of offsite dose-base EALs.)	The operator recognizes that a General Emergency has been declared (Initial Conditions).		
*6	(RP/0/B/5700/029, Attachment 3, Expanded PAR Determination) (See Note 1: Protective Action Zones (PAZs) are defined in Table 1 on page 3. SIP is Shelter in Place. (IF a PAZ has been accurately selected for evacuation, it shall remain selected)) Evacuate 2-mile Radius Evacuate 2-5 miles Downwind.	The operator uses Table 1, and a Wind Direction of 291.6º, determines that PAZ A, B, C, D, L, and M must be evacuated. The operator recognizes that PAZ R has already been evacuated, and cannot be removed.		
*7	(RP/0/B/5700/029, Attachment 3, Expanded PAR Determination) Offsite Projected Dose projections or field measurements exceeded PAGs? Table 2	The operator recognizes that the RP Dose Projected Dose Assessments are still about 20 minutes away.		
*8	(Directed Action) Submit the Emergency Notification Form to the Emergency Coordinator for approval.	The operator submits the ENF to the Examiner in accordance with the provided KEY (Separate document).		

Terminating Cue: **Evaluation on this JPM is complete.**

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2018 Admin – JPM A4 SRO

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- Unit 1 is at 100% power.
- A LOCA inside containment has occurred on Unit 2.
- The Emergency Coordinator declared a General Emergency per RP/0/A/5700/000 (Classification of Emergency).
- An Emergency Release from Containment is in progress due to a piping penetration failure.
- An Emergency Notification Form, along with the initial PAR was sent at the appropriate time.
- This is NOT a Rapidly Progressing Severe Accident (RPSA)
- The following conditions exist 30 minutes after the start of the event:
    - The wind speed is 5 mph.
    - The wind direction is 291.6°.
- An RP Dose Assessment will be completed in 20 minutes.
- Security Reports that there are no security related events in progress, and site evacuation is progressing as expected.
- The Communicator is reporting that off-site agencies are reporting that evacuations are proceeding as expected.

INITIATING CUE: Due to a change in meteorological conditions, prepare an EXPANDED PAR and submit the Emergency Notification Form to the Emergency Coordinator for approval.

THIS IS A TIME CRITICAL JPM