ML21350A041

Facility: SURRY **Date of Exam: 2021**

Tier	Group	RO K/A Category Points												SRO-Only Points		
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	Total	A2	G*	Total
1. Emergency & Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	18	3	3	6
	2	1	2	1				1	2			2	9	2	2	4
	Tier Totals	4	5	4				4	5			5	27	5	5	10
2. Plant Systems	1	1	3	2	3	3	2	3	3	2	3	3	28	3	2	5
	2	1	1	0	1	1	1	1	1	1	1	1	10	2	1	3
	Tier Totals	2	4	2	4	4	3	4	4	3	4	4	38		3	8

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

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

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

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

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

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

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

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

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

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

G* Generic K/As

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

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
007EK2.03	Reactor Trip - Stabilization - Recovery / 1	3.5	3.6		✔										Reactor trip status panel
008AA1.02	Pressurizer Vapor Space Accident / 3	4.1	3.9							✔					HPI pump to control PZR level/pressure
009EK3.15	Small Break LOCA / 3	3.2	3.2			✔									Closing of RCP thermal barrier outlet valves
011EG2.4.31	Large Break LOCA / 3	4.2	4.1											✔	Knowledge of annunciators alarms, indications or response procedures
022AA2.01	Loss of Rx Coolant Makeup / 2	3.2	3.8								✔				Whether charging line leak exists
025AA1.18	Loss of RHR System / 4	2.6	2.8							✔					LPI header cross-connect valve controller and indicators
027AK2.03	Pressurizer Pressure Control System Malfunction / 3	2.6	2.8		✔										Controllers and positioners
029EK2.06	ATWS / 1	2.9	3.1		✔										Breakers, relays, and disconnects.
038EK1.02	Steam Gen. Tube Rupture / 3	3.2	3.5	✔											Leak rate vs. pressure drop
054AK3.02	Loss of Main Feedwater / 4	3.4	3.7			✔									Matching of feedwater and steam flows
055EG2.1.19	Station Blackout / 6	3.9	3.8											✔	Ability to use plant computer to evaluate system or component status.

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
057AA2.04	Loss of Vital AC Inst. Bus / 6	3.7	4	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	ESF system panel alarm annunciators and channel status indicators
058AK3.01	Loss of DC Power / 6	3.4	3.7	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Use of dc control power by D/Gs
077AA2.04	Generator Voltage and Electric Grid Disturbances / 6	3.6	3.6	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	VARs outside the capability curve
WE04EA1.3	LOCA Outside Containment / 3	3.8	4.0	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Desired operating results during abnormal and emergency situations.
WE05EG2.2.37	Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4	3.6	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to determine operability and/or availability of safety related equipment
WE11EK1.3	Loss of Emergency Coolant Recirc. / 4	3.6	4.0	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Emergency Coolant Recir).
WE12EK1.3	Steam Line Rupture - Excessive Heat Transfer / 4	3.4	3.7	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Annunciators and conditions indicating signals, and remedial actions associated with the (Uncontrolled Depressurization of all Steam Generators).

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
005AA2.03	Inoperable/Stuck Control Rod / 1	3.5	4.4								✔				Required actions if more than one rod is stuck or inoperable
028AK2.03	Pressurizer Level Malfunction / 2	2.6	2.9		✔										Controllers and positioners
032AG2.2.37	Loss of Source Range NI / 7	3.6	4.6											✔	Ability to determine operability and/or availability of safety related equipment
033AK3.02	Loss of Intermediate Range NI / 7	3.6	3.9			✔									Guidance contained in EOP for loss of intermediate-range instrumentation
060AA2.03	Accidental Gaseous Radwaste Rel. / 9	3.2	3.9								✔				The steps necessary to isolate a given radioactive-gas leak, using P&IDs
061AK2.01	ARM System Alarms / 7	2.5	2.6		✔										Detectors at each ARM system location
067AA1.09	Plant Fire On-site / 8	3	3.3							✔					Plant fire zone panel (including detector location)
076AG2.2.12	High Reactor Coolant Activity / 9	3.7	4.1											✔	Knowledge of surveillance procedures.
WE09EK1.2	Natural Circ. / 4	3.3	3.7	✔											Normal, abnormal and emergency operating procedures associated with (Natural Circulation Operations).

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
003A2.02	Reactor Coolant Pump	3.7	3.9								✓				Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP
003K5.03	Reactor Coolant Pump	3.1	3.5					✓							Effects of RCP shutdown on T-ave., including the reason for the unreliability of T-ave. in the shutdown loop
004K4.16	Chemical and Volume Control	2.6	3.0				✓								Temperature at which the temperature control valve automatically diverts flow from the demineralizer to the VCT; reason for this diversion
005A1.05	Residual Heat Removal	3.3	3.3							✓					Detection of and response to presence of water in RHR emergency sump
006K5.02	Emergency Core Cooling	2.8	2.9					✓							Relationship between accumulator volume and pressure
007A1.03	Pressurizer Relief/Quench Tank	2.6	2.7							✓					Monitoring quench tank temperature
008G2.4.6	Component Cooling Water	3.7	4.7											✓	Knowledge symptom based EOP mitigation strategies.
010K5.01	Pressurizer Pressure Control	3.5	4.0					✓							Determination of condition of fluid in PZR, using steam tables
012A2.03	Reactor Protection	3.4	3.7								✓				Incorrect channel bypassing
013K2.01	Engineered Safety Features Actuation	3.6	3.8		✓										ESFAS/safeguards equipment control
022A2.01	Containment Cooling	2.5	2.7								✓				Fan motor over-current

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
022K2.01	Containment Cooling	3.0	3.1	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Containment cooling fans
026A4.01	Containment Spray	4.5	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	CSS controls
039K1.02	Main and Reheat Steam	3.3	3.3	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Atmospheric relief dump valves
059G2.1.32	Main Feedwater	3.8	4.0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to explain and apply all system limits and precautions.
059G2.4.1	Main Feedwater	4.6	4.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of EOP entry conditions and immediate action steps.
061A1.02	Auxiliary/Emergency Feedwater	3.3	3.6	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	S/G pressure
061K6.01	Auxiliary/Emergency Feedwater	2.5	2.8	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	Controllers and positioners
062K3.01	AC Electrical Distribution	3.5	3.9	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Major system loads
063A4.01	DC Electrical Distribution	2.8	3.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	Major breakers and control power fuses
063K3.02	DC Electrical Distribution	3.5	3.7	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Components using DC control power
064K6.07	Emergency Diesel Generator	2.7	2.9	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	Air receivers

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
073K4.01	Process Radiation Monitoring	4.0	4.3	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	Release termination when radiation exceeds setpoint
073K4.02	Process Radiation Monitoring	3.3	3.9	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	Letdown isolation on high-RCS activity
076A3.02	Service Water	3.7	3.7	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	Emergency heat loads
076K2.01	Service Water	2.7	2.7	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Service water
078A4.01	Instrument Air	3.1	3.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	Pressure gauges
103A3.01	Containment	3.9	4.2	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	Containment isolation

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
001A1.08	Control Rod Drive	2.6	3.0							✔					Verification that CRDS temperatures are within limits before starting
002K4.10	Reactor Coolant	4.2	4.4				✔								Overpressure protection
011K2.02	Pressurizer Level Control	3.1	3.2		✔										PZR heaters
017A2.02	In-core Temperature Monitor	3.6	4.1								✔				Core damage
041K6.03	Steam Dump/Turbine Bypass Control	2.7	2.9						✔						Controller and positioners, including ICS, S/G, CRDS
045A4.01	Main Turbine Generator	3.1	2.9										✔		Turbine valve indicators (throttle, governor, control, stop, intercept), alarms and annunciators
055G2.2.44	Condenser Air Removal	4.2	4.4											✔	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
056K1.03	Condensate	2.6	2.6	✔											MFW
068K5.04	Liquid Radwaste	3.2	3.5					✔							Biological hazards of radiation and the resulting goal of ALARA
072A3.01	Area Radiation Monitoring	2.9	3.1									✔			Changes in ventilation alignment

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
G2.1.14	Conduct of operations	3.1	3.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trip, mode changes, etc.
G2.1.20	Conduct of operations	4.6	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to execute procedure steps.
G2.2.18	Equipment Control	2.6	3.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of the process for managing maintenance activities during shutdown operations.
G2.2.44	Equipment Control	4.2	4.4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	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
G2.3.11	Radiation Control	3.8	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to control radiation releases.
G2.3.5	Radiation Control	2.9	2.9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to use radiation monitoring systems
G2.3.7	Radiation Control	3.5	3.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to comply with radiation work permit requirements during normal or abnormal conditions
G2.4.1	Emergency Procedures/Plans	4.6	4.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of EOP entry conditions and immediate action steps.
G2.4.32	Emergency Procedures/Plans	3.6	4.0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of operator response to loss of all annunciators.
G2.4.4	Emergency Procedures/Plans	4.5	4.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
015AA2.01	RCP Malfunctions / 4	3	3.5								✔				Cause of RCP failure
026AG2.4.11	Loss of Component Cooling Water / 8	4.0	4.2											✔	Knowledge of abnormal condition procedures.
040AG2.4.18	Steam Line Rupture - Excessive Heat Transfer / 4	3.3	4.0											✔	Knowledge of the specific bases for EOPs.
056AG2.4.41	Loss of Off-site Power / 6	2.9	4.6											✔	Knowledge of the emergency action level thresholds and classifications.
062AA2.06	Loss of Nuclear Svc Water / 4	2.8	3.1								✔				The length of time after the loss of SWS flow to a component before that component may be damaged
065AA2.03	Loss of Instrument Air / 8	2.6	2.9								✔				Location and isolation of leaks

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
003AG2.4.21	Dropped Control Rod / 1	4.0	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of the parameters and logic used to assess the status of safety functions
036AA2.03	Fuel Handling Accident / 8	3.1	4.2	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Magnitude of potential radioactive release
037AG2.4.6	Steam Generator Tube Leak / 3	3.7	4.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge symptom based EOP mitigation strategies.
068AA2.04	Control Room Evac. / 8	3.7	4	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	S/G pressure

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
004G2.4.11	Chemical and Volume Control	4.0	4.2											✔	Knowledge of abnormal condition procedures.
006G2.4.50	Emergency Core Cooling	4.2	4.0											✔	Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.
012A2.02	Reactor Protection	3.6	3.9								✔				Loss of instrument power
059A2.12	Main Feedwater	3.1	3.4								✔				Failure of feedwater regulating valves
064A2.21	Emergency Diesel Generator	2.6	2.9								✔				Significance and interpretation of opening of ring bus during test

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
035G2.4.31	Steam Generator	4.2	4.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of annunciators alarms, indications or response procedures
071A2.05	Waste Gas Disposal	2.5	2.6	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Power failure to the ARM and PRM Systems
086A2.04	Fire Protection	3.3	3.9	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Failure to actuate the FPS when required, resulting in fire damage

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
G2.1.2	Conduct of operations	4.1	4.4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of operator responsibilities during all modes of plant operation.
G2.2.1	Equipment Control	4.5	4.4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.
G2.2.13	Equipment Control	4.1	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of tagging and clearance procedures.
G2.3.12	Radiation Control	3.2	3.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of radiological safety principles pertaining to licensed operator duties
G2.3.13	Radiation Control	3.4	3.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of radiological safety procedures pertaining to licensed operator duties
G2.4.20	Emergency Procedures/Plans	3.8	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of operational implications of EOP warnings, cautions and notes.
G2.4.5	Emergency Procedures/Plans	3.7	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of the organization of the operating procedures network for normal, abnormal and emergency evolutions.

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)	Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery / 1		R					R- EK2.03		
000008 (APE 8) Pressurizer Vapor Space Accident / 3				R			R- AA1.02		
000009 (EPE 9) Small Break LOCA / 3			R				R- EK3.15		
000011 (EPE 11) Large Break LOCA / 3						R	R- EG2.4.31		
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4					S		S- AA2.01		
000022 (APE 22) Loss of Reactor Coolant Makeup / 2					R		R- AA2.01		
000025 (APE 25) Loss of Residual Heat Removal System / 4				R			R- AA1.18		
000026 (APE 26) Loss of Component Cooling Water / 8						S	S- AG2.4.11		
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3		R					R- AK2.03		
000029 (EPE 29) Anticipated Transient Without Scram / 1		R					R- EK2.06		
000038 (EPE 38) Steam Generator Tube Rupture / 3	R						R- EK1.02		
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4	R					S	R- EK1.3 S- AG2.4.18		
000054 (APE 54; CE E06) Loss of Main Feedwater /4			R				R- AK3.02		
000055 (EPE 55) Station Blackout / 6						R	R- EG2.1.19		
000056 (APE 56) Loss of Offsite Power / 6						S	S- AG2.4.41		
000057 (APE 57) Loss of Vital AC Instrument Bus / 6					R		R- AA2.04		
000058 (APE 58) Loss of DC Power / 6			R				R- AK3.01		
000062 (APE 62) Loss of Nuclear Service Water / 4					S		S- AA2.06		
000065 (APE 65) Loss of Instrument Air / 8					S		S- AA2.03		
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6					R		R- AA2.04		
(W E04) LOCA Outside Containment / 3				R			R- EA1.3		
(W E11) Loss of Emergency Coolant Recirculation / 4	R						R- EK1.3		
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4						R	R- EG2.2.37		
K/A Category Totals: RO	3	3	3	3	3	3	Group Point Total:		18/6
SRO					3	3			

ES-401							PWR Examination Outline Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)		Form ES-401-2
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000001 (APE 1) Continuous Rod Withdrawal / 1									
000003 (APE 3) Dropped Control Rod / 1						S	S- G2.4.21		
000005 (APE 5) Inoperable/Stuck Control Rod / 1					R		R- AA2.03		
000024 (APE 24) Emergency Boration / 1									
000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2		R					R- AK2.03		
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7						R	R- AG2.2.37		
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7			R				R- AK3.02		
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8					S		S- AA2.03		
000037 (APE 37) Steam Generator Tube Leak / 3						S	S- AG2.4.6		
000051 (APE 51) Loss of Condenser Vacuum / 4									
000059 (APE 59) Accidental Liquid Radwaste Release / 9									
000060 (APE 60) Accidental Gaseous Radwaste Release / 9					R		R- AA2.03		
000061 (APE 61) Area Radiation Monitoring System Alarms / 7		R					R- AK2.01		
000067 (APE 67) Plant Fire On Site / 8				R			R- AA1.09		
000068 (APE 68; BW A06) Control Room Evacuation / 8					S		S- AA2.04		
000069 (APE 69; W E14) Loss of Containment Integrity / 5									
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4									
000076 (APE 76) High Reactor Coolant Activity / 9						R	R-G2.2.12		
000078 (APE 78*) RCS Leak / 3									
(W E01 & E02) Rediagnosis & SI Termination / 3									
(W E13) Steam Generator Overpressure / 4									
(W E15) Containment Flooding / 5									
(W E16) High Containment Radiation /9									
(BW A01) Plant Runback / 1									
(BW A02 & A03) Loss of NNI-X/Y/7									
(BW A04) Turbine Trip / 4									
(BW A05) Emergency Diesel Actuation / 6									
(BW A07) Flooding / 8									
(BW E03) Inadequate Subcooling Margin / 4									
(BW E08; W E03) LOCA Cooldown—Depressurization / 4									
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4	R						R- EK1.2		
(BW E13 & E14) EOP Rules and Enclosures									
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4									
(CE A16) Excess RCS Leakage / 2									
(CE E09) Functional Recovery									
(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4									
K/A Category Point Totals: RO	1	2	1	1	2	2	Group Point Total:		9/4
SRO					2	2			

ES-401												PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)		Form ES-401-2
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump					R			R				R-A2.02 R-K5.03		
004 (SF1; SF2 CVCS) Chemical and Volume Control				R							S	R-K4.16 S-G2.4.11		
005 (SF4P RHR) Residual Heat Removal							R					R-A1.05		
006 (SF2; SF3 ECCS) Emergency Core Cooling					R						S	R-K5.02 S-G2.4.50		
007 (SF5 PRTS) Pressurizer Relief/Quench Tank							R					R-A1.03		
008 (SF8 CCW) Component Cooling Water											R	R-G2.4.6		
010 (SF3 PZR PCS) Pressurizer Pressure Control					R							R-K5.01		
012 (SF7 RPS) Reactor Protection								R S				R-A2.03 S-A2.02		
013 (SF2 ESFAS) Engineered Safety Features Actuation		R										R-K2.01		
022 (SF5 CCS) Containment Cooling		R						R				R-A2.01 R-K2.01		
025 (SF5 ICE) Ice Condenser											N/A			
026 (SF5 CSS) Containment Spray										R		R-A4.01		
039 (SF4S MSS) Main and Reheat Steam	R											R-K1.02		
059 (SF4S MFW) Main Feedwater								S			R R	R-G2.1.32 R-G2.4.1 S-A2.12		
061 (SF4S AFW) Auxiliary/Emergency Feedwater						R	R					R-A1.02 R-K6.01		
062 (SF6 ED AC) AC Electrical Distribution			R									R-K3.01		
063 (SF6 ED DC) DC Electrical Distribution			R							R		R-A4.01 R-K3.02		
064 (SF6 EDG) Emergency Diesel Generator						R		S				R-K6.07 S-A2.21		
073 (SF7 PRM) Process Radiation Monitoring				R R								R-K4.01 R-K4.02		
076 (SF4S SW) Service Water		R							R			R-A3.02 R-K2.01		
078 (SF8 IAS) Instrument Air										R		R-A4.01		
103 (SF5 CNT) Containment									R			R-A3.01		
053 (SF1; SF4P ICS*) Integrated Control										N/A				
K/A Category Point Totals: RO	1	3	2	3	3	2	3	3	2	3	3	Group Point Total:		28/5
SRO								3			2			

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

Plant Systems—Tier 2/Group 2 (RO/SRO)

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
001 (SF1 CRDS) Control Rod Drive							R					R- A1.08		
002 (SF2; SF4P RCS) Reactor Coolant				R								R- K4.10		
011 (SF2 PZR LCS) Pressurizer Level Control		R										R- K2.02		
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation														
016 (SF7 NNI) Nonnuclear Instrumentation														
017 (SF7 ITM) In-Core Temperature Monitor								R				R- A2.02		
027 (SF5 CIRS) Containment Iodine Removal														
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control														
029 (SF8 CPS) Containment Purge														
033 (SF8 SFPCS) Spent Fuel Pool Cooling														
034 (SF8 FHS) Fuel-Handling Equipment														
035 (SF 4P SG) Steam Generator											S	S-G2.4.31		
041 (SF4S SDS) Steam Dump/Turbine Bypass Control						R						R- K6.03		
045 (SF 4S MTG) Main Turbine Generator										R		R- A4.01		
055 (SF4S CARS) Condenser Air Removal											R	R-G2.2.44		
056 (SF4S CDS) Condensate	R											R- K1.03		
068 (SF9 LRS) Liquid Radwaste					R							R- K5.04		
071 (SF9 WGS) Waste Gas Disposal								S				S - A2.05		
072 (SF7 ARM) Area Radiation Monitoring									R			R- A3.01		
075 (SF8 CW) Circulating Water														
079 (SF8 SAS**) Station Air														
086 Fire Protection								S				S-A2.04		
050 (SF 9 CRV*) Control Room Ventilation														
K/A Category Point Totals: RO	1	1	0	1	1	1	1	1	1	1	1	Group Point Total:		10/3
SRO								2			1			

Facility: SURRY Date of Exam: August 2021

Category	K/A #	Topic	RO IR	RO #	SRO-only IR	SRO-only #
1. Conduct of Operations	2.1.14	Plant-wide announcements	3.1			
	2.1.20	Execute procedure steps	4.6			
	2.1.					
	2.1.2	Operator Responsibilities - all modes			4.4	
	2.1.					
	2.1.					
	Subtotal		2		1	
2. Equipment Control	2.2.18	Managing maintenance during SD ops	2.6			
	2.2.44	Interpret CR indications	4.2			
	2.2.					
	2.2.1	Pre-startup procedures			4.4	
	2.2.13	Tagging and Clearance procedures			4.3	
	2.2.					
	Subtotal		2		2	
3. Radiation Control	2.3.5	Use rad mon'g systems	2.9			
	2.3.7	Comply w/ RWPs	3.5			
	2.3.11	Ability to control rad releases	3.8			
	2.3.12	Rad safety principles to licensed duties			3.7	
	2.3.13	Rad safety procedures to licensed duties			3.8	
	2.3.					
	Subtotal		3		2	
4. Emergency Procedures/Plan	2.4.1	EOP entry and Immed Action Steps	4.6			
	2.4.4	Recognize abnormal indications - entry EOP/AOP	4.5			
	2.4.32	Loss of all annunciators	3.6			
	2.4.					
	2.4.5	Organization of procedures network			4.3	
	2.4.20	Operational Implications EOP cautions, Notes			4.3	
	Subtotal		3		2	
Tier 3 Point Total			10	10	7	7

Facility: Surry Date of Examination: 8/23/2021

Examination Level: RO ☒ SRO ☐ Operating Test Number: SR2021-301

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R,M	Perform manual Calorimetric
Conduct of Operations		
Equipment Control	R,M	Perform manual VCT leakrate Calculation
Radiation Control	R,D	Verify RWP adequate
Emergency Plan	R,N	Prepare EPIP-2.01 for loss of DEENS

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

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

Facility: Surry	Date of Examination: 8/23/2021
Examination Level: RO ☐ SRO ☒	Operating Test Number: SR2021-301

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R,N	Review CC PT
Conduct of Operations	S,N	Determine Backup Cooling method per OSP-ZZ-004
Equipment Control	R,D	Calculate Partial pressure and make TS call
Radiation Control	R,N	Perform Containment Entry Checklist
Emergency Plan	R,D	Classify GE and determine PAR

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

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

Facility: Surry		Date of Examination: 10/04/2021
Examination Level: RO ■ SRO ☐		Operating Test Number: SR2021-301
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations (al)	R,M	Perform a Quadrant Power Tilt Calculation *(0-AP-1.00, Attachment 6, Steps 1 – 9)*
Conduct of Operations (m)	R,N	Determine Core Crew Requirements **(Completed 8/24/21)** *(OP-AA-100)*
Equipment Control (an)	R,M	Review 1-OPT-CH-001, 'A' Charging pump PT
Radiation Control (o)	R,M	Verify RWP adequate *(Rad Work Permit, VPAP-2101 Section 6.3)* ***(Completed 8/23/21)***
Emergency Plan		

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

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

Surry Makeup JPM Summary

A.1.a This JPM is modified from the bank JPM performed on the 2017 NRC exam and 2019 Audit exam. A control rod had fully dropped in the core. The crew has enteed 0-AP-1.00, ROD CONTROL MALFUNCTION. The applicant is to determine the Quadrant Power Tilt Ratio (QPTR) by performing 0-AP-1.00 Attachment 6, CALCULATION OF EXCORE QUADRANT POWER TILT RATIOS. The critical tasks include: recording the correct normalized detector current from the NI/Rad Monitor info page, calculating the correct upper and lower detector flux tilt ratios, and converting the ratios to “percent flux tilt” values. With a different dropped rod, all detector values will modified from the bank JPM; the final value for QPTR will also be modified.

A.1.b. This JPM was administered on 8/24/21.

A.2 This JPM is modified from the bank JPM performed on the 2017 Audit exam (The bank JPM was for the “B” Charging Pump). This JPM involves review of a completed performance test of the 1A Charging Pump. The critical tasks include identifying the following: an SQC stopwatch used for the PT was out of calibration, a vibration point is in the inoperable range limit, and one MOV exceeds its open stroke time limit. The applicant must also to determine that the “A” CH pump does NOT result in a Tech Spec LCO clock.

A.3 This JPM was administered on 8/23/21.

Facility: Surry		Date of Examination: 08/23/2021
Exam Level: RO ☒ SRO-I ☐ SRO-U ☐		Operating Test No.: SR 2021-301

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U

System/JPM Title	Type Code*	Safety Function
a. Perform AP-3.00 to Emergency Borate the RCS During ES-0.1 (Faulted) [024AA1.17 (3.9/3.9)]	D/S/A/L	1
b. Transfer the SI System to Cold Leg Recirc [006 A3.08 (4.2/4.3)]	N/EN/A/L/S	2
c. Depressurize the RCS with Aux Spray due to loss of RCPs in AP-24.01 [010A4.01 (3.7/3.5)]	D/S/L	3
d. Respond to a Loss of Decay Heat Removal (005 A2.03 2.9/3.1)	M/A/L/S	4P
e. Place Containment H2 Analyzer in service [028A4.03 (3.1/3.3)]	D/S/L	5
f. Respond to a #3 EDG Start Failure [064A4.06 (3.9/3.9)]	D/S/A/EN	6
g. Adjust the PRNIs IAW 1-OPT-RX-001 [015 A1.01 (3.5/3.8)]	D/S	7
h. Realign MCR Ventilation in AP-22.00 [036AA1.01 (3.3/3.8)]	N/S	8

In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U

System/JPM Title	Type Code*	Safety Function
i. Locally swap U-2 MDAFW pump suctions to Fire Water [(061 K4.01 4.1/4.2)]	N,L,E,R	4S
j. Locally Start an EDG [068AA1.31 (3.9/4.0)]	D/E/A/L/EN	6
k. MCR Pressure Bndry Verification in AP-22.00 [036AA1.01 (3.3/3.8)]	N/E/L	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	5 (4–6)
(C)ontrol room	
(D)irect from bank	6 (≤ 9)
(E)mergency or abnormal in-plant	3 (≥ 1)
(EN)gineered safety feature	3 (≥ 1 control room system)
(L)ow-Power/Shutdown	8 (≥ 1)
(N)ew or (M)odified from bank including 1(A)	5 (≥ 2)
(P)revious 2 exams	0 (≤ 3) (randomly selected)
(R)CA	1 (≥ 1)
(S)imulator	

Facility: Surry	Date of Examination: 08/23/2021
Exam Level: RO ☐ SRO-I ☒ SRO-U ☐	Operating Test No.: SR 2021-301

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U

System/JPM Title	Type Code*	Safety Function
a. Perform AP-3.00 to Emergency Borate the RCS During ES-0.1 (Faulted) [024AA1.17 (3.9/3.9)]	D/S/A/L	1
b. Transfer the SI System to Cold Leg Recirc [006 A3.08 (4.2/4.3)].	N/EN/A/L/S	2
c. Depressurize the RCS with Aux Spray due to loss of RCPs in AP-24.01 [010A4.01 (3.7/3.5)]	D/S/L	3
d. Respond to a Loss of Decay Heat Removal (005 A2.03 2.9/3.1)	M/A/L/S	4P
e. Place Containment H2 Analyzer in service [028A4.03 (3.1/3.3)]	D/S/L	5
f. Respond to a #3 EDG Start Failure [064A4.06 (3.9/3.9)]	D/S/A/EN	6
g. Adjust the PRNIs IAW 1-OPT-RX-001 [015 A1.01 (3.5/3.8)]	D/S	7

In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U

System/JPM Title	Type Code*	Safety Function
i. Locally swap U-2 MDAFW pump suctions to Fire Water [(061 K4.01 4.1/4.2)]	N,L,E,R	4S
j. Locally Start an EDG [068AA1.31 (3.9/4.0)]	D/E/A/L/EN	6
k. MCR Pressure Bndry Verification [036AA1.01 (3.3/3.8)]	N/E/L	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	5 (4–6)
(C)ontrol room	
(D)irect from bank	6 (≤ 8)
(E)mergency or abnormal in-plant	3 (≥ 1)
(EN)gineered safety feature	3 (≥ 1 control room system)
(L)ow-Power/Shutdown	8 (≥ 1)
(N)ew or (M)odified from bank including 1(A)	4 (≥ 2)
(P)revious 2 exams	0 (≤ 3) (randomly selected)
(R)CA	1 (≥ 1)
(S)imulator	

Facility: Surry Date of Examination: 8/23/2021
Exam Level: RO ☐ SRO-I ☐ SRO-U ☒ Operating Test No.: SR 2021-301

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U

System/JPM Title	Type Code*	Safety Function
a. Perform AP-3.00 to Emergency Borate the RCS During ES-0.1 (Faulted) [024AA1.17 (3.9/3.9)]	D/S/A/L	1
b. Transfer the SI System to Cold Leg Recirc [006 A3.08 (4.2/4.3)]	N/EN/A/L/S	2
c. Depressurize the RCS with Aux Spray due to loss of RCPs in AP-24.01 [010A4.01 (3.7/3.5)]	D/S/L	3

In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U

System/JPM Title	Type Code*	Safety Function
i. Locally swap U-2 MDAFW pump suctions to Fire Water [(061 K4.01 4.1/4.2)]	N,L,E,R	4S
j. Locally Start an EDG [068AA1.31 (3.9/4.0)]	D/E/A/L/EN	6

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions, all five SRO-U systems must serve different safety functions, and in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for R /SRO-I/SRO-U
(A)lternate path	3 (2–3)
(C)ontrol room	
(D)irect from bank	3 (≤ 4)
(E)mergency or abnormal in-plant	2 (≥ 1)
(EN)gineered safety feature	2 (≥ 1 control room system)
(L)ow-Power/Shutdown	5 (≥ 1)
(N)ew or (M)odified from bank including 1(A)	2 (≥ 1)
(P)revious 2 exams	0 (≤ 2) (randomly selected)
(R)CA	1 (≥ 1)
(S)imulator	

Facility: Surry	Date of Examination: 10/04/2021
Exam Level: RO ☒ SRO-I ☐ SRO-U ☐	Operating Test No.: SR 2021-301

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U

System/JPM Title	Type Code*	Safety Function
a. Re-establish Normal Charging following SI [006A4.01, (4.1/3.9] [004A3.11, (3.6,3.4)] *(1-ES-1.1, steps 1-7),*	D/EN/L/S	1
b. Respond to RCP Seal Failure IAW 1-AP-9.00 [003A2.09 (3.5,3.9)] *(1-AP-9.00, 1-E-0)*	D/A/L/S	2
c. Re-establish Normal Letdown following SI [E02.EK3.3 (3.9,3.9)] *(1-ES-1.1, step 15)*	D/A/L/S	3
d. Condensate pump flr with ATWS [056A2.04, (2.6,2.8)] [029EA1.09, (4.0, 3.6); EA1.13 (4.1,3.9)] *(1-OP-CN-001, 5.4.5) (1-FR-S.1, steps 1 - 3)*	N/A/S	4S
e. Perform E-0 Attachment 4 [WE14 EA1.3 (3.3/3.8)] *(1-E-0, Att 4)*	D/L/EN/S	5
f. Load AAC EDG onto 1J bus. [056A3.02 (4.4,4.7)] *(0-AP-17.06, steps 1-6)*	D/L/S	6
g. Transfer 'A' SF/FF Channels to BLUE following corrective maint. [016A2.01, (3.0,3.1)]. *(1-OP-RP-001, Step 5.4.5, AP-53.00)*	N/A/S	7
h. Realign MCR Ventilation in AP-22.00 [036G2.1.44 (3.9/3.8)] *(0-AP-22.00 Steps 1-10)* ***Completed 8/23/21***	N/S	8

In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U

System/JPM Title	Type Code*	Safety Function
i. Locally Swap U-2 AFW to Fire Water [061 K4.01 4.1/4.2] *(2-FR-H.1,Att 1, step 4)*	D/L/E/R	4S
j. Transfer Semi-vital bus power supply [APE056AA2.44 94.3/4.4)] *(2-AP-10.05, step 11)*	D/E	6
k. Initiate #2 EDG Cardox [086A2.04, (3.3,3.9)] *(0-OP-FP-006, 5.1)*	N/A	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	5 (4–6)
(C)ontrol room	
(D)irect from bank	6 (≤ 9)
(E)mergency or abnormal in-plant	3 (≥ 1)
(EN)gineered safety feature	3 (≥ 1 control room system)
(L)ow-Power/Shutdown	8 (≥ 1)
(N)ew or (M)odified from bank including 1(A)	5 (≥ 2)
(P)revious 2 exams	0 (≤ 3) (randomly selected)
(R)CA	1 (≥ 1)
(S)imulator	

Surry Makeup JPM Summary

a. This is a bank JPM that was last performed on the 2015 Audit exam. A spurious SI had just occurred a few minutes ago. SI Reduction criteria has been satisfied, and crew is ready to xfer to ES-1.1 SI termination. The applicant is to re-establish normal charging flow by performing ES-1.1, steps 1 through 7. The critical tasks include; isolating HHSI, re-opening Charging isolations and FCV, and establishing at least 40 gpm charging flow.

b. This is a bank, alternate-path, JPM that was last performed on the 2020 Op Eval. This JPM starts by having the applicant perform actions per 1-AP-9.00, RCP ABNORMAL CONDITIONS, for a failed RCP Seal. During performance of this procedure (step 7) a second RCP Seal will fail resulting in Delta P across one stage exceeding 2000 psid. Per Step 5 (Continuous action step) the applicant will be required to trip the reactor and perform 1-E-0.

c. This is a bank, alternate-path, JPM that was last performed on the 2014 NRC Exam. The non-alternate path version of this JPM was last performed on the 2021 audit. This version will fail to establish normal letdown, requiring excess letdown to be put in service per 1-OP-CH-006.

d. Condensate pump failure with ATWS. This is a new, alternate-path JPM. The applicant will pre-brief 1-OP-CN-001 for swapping Condensate pumps. The standby Condensate pump is first started followed by securing the designated Condensate pump. The secured pump's discharge check valve sticks open resulting in a total loss of Condensate flow. The applicant will recognize the loss of feedwater and perform AP-21.00 which will direct a reactor trip. The reactor will fail to trip requiring FR-S.1 immediate actions to be performed. Rods will be initially in MAN for I&C troubleshooting, therefore the applicant will need to take rods to AUTO at step 1. At FR-S.1 step 2 the applicant will trip the Turbine. The JPM ends after the applicant performs the immediate actions.

e. The JPM was last performed on the 2016 NRC exam. A large break LOCA had just occurred, and the applicant will check Phase II and Phase III containment isolation valves have closed. The applicant will identify that 1-RM-TV-100B, 1-CC-TV-105C, and 1-IA-TV-101A did not close as required and will close them. Also the applicant identifies that 1-SW-P-5D,SW pump did not start as specified and will start the pump. And finally the applicant will identify that 1-CW-MOV-106C should have closed and closes this valve.

f. The JPM was last performed on the 2015 Audit exam. A loss of all emergency bus power has occurred on Unit 1. The applicant is given a 10 minute time critical action to load the AAC on the 1J Emergency bus using 0-AP-17.06. The applicant will perform a switch alignment for the 1J Bus, including various components across the control room benchboard, EDG #3 control panel, and the Vertical board. AMSAC will need to be reset in order to open the "B" MDAFW breaker. Breaker 15J8 will need to be closed within the 10 minutes to meet the time critical action.

g. This is a new Alternate Path JPM, which will be pre-briefed. It begins with the "A" S/G SGWLCS channels aligned to Channel 4 (all other SGWLCS channels are aligned to Channel 3). Repairs were just completed on an "A" S/G SGWLCS instrument, and the applicant is to align "A" S/G instrumentation to Channel 3 using 1-OP-RP-001. The "A" MFRV will be placed in manual and the associated Steam and Feed flow selector switches will be aligned to Channel 3. When the "A" MFRV is placed back in AUTO, a SGWLCS failure will occur (FF fails high), requiring the applicant to perform the Immediate Actions of 0-AP-53.00 to stabilize "A" S/G Level.

h. This JPM was administered on 8/23/21.

i. This JPM was last performed on the 2016 NRC exam. A loss of secondary heat sink is in progress on Unit 2, with a loss of inventory for the normal and alternate suctions to the AFW pumps. The applicant will perform step 4 of 2-FR-H.1 Attachment 1, to align emergency suction to the Turbine Driven AFW pump using the firemain. The applicant will align firemain to the U2 safeguards, open the TDAFW emergency suction, and isolate the TDAFW normal suction.

j. This JPM was last performed on the 2019 Audit exam. A loss of Semi-Vital bus (SVB) occurred on Unit 2 and the team is performing 2-AP-10.05. The applicant will perform step 11 of 2-AP-10.05 to open the 1H feeder breaker, operate the manual SVB throw over switch, then close the 1J feeder breaker to reenergize the SVB.

k. This is a new JPM. The applicant is responding to a fire in #2 EDG room, with a failure of LP CO2 manual actuation from the Main Control Room. The applicant will perform 0-OP-FP-006 to attempt Manual initiation outside the EDG room using the pushbutton. The applicant must recognize CO2 actuation did not occur, and manually operate the override lever both at the EDG room and by the LP CO2 tank.

EPE007 EK2.02 - Reactor Trip
Knowledge of the interrelations between a reactor trip and the following: (CFR 41.7 / 45.7)
Breakers, relays and disconnects ....

Initial Conditions:

- Unit 1 was at 100%.
- The crew responded to “A” RCS Loop T_{HOT} failing low.
- All actions have been completed for 0-AP-53.00, LOSS OF VITAL INSTRUMENTATION/CONTROLS.
- I&C has placed the associated bistables for “A” Loop T_{AVE} and ΔT in TRIP and the following annunciators are lit:

LOCATION	LEGEND
1E-C6	RX TRIP CH 1 OT ΔT LOOP 1A
1E-C7	RX TRIP CH 1 OP ΔT LOOP 1A
1G-F3	OT ΔT TURB RNBK & ROD STOP CH 1
1G-F4	OP ΔT TURB RNBK & ROD STOP CH 1
1H-A1	HI ΔT LOOP 1A
1H-A3	HI-LO TAVG LOOP 1A
1H-D4	LO TAVG INTERLK LOOP 1A

Current Conditions (30 minutes later):

- Power Range NI N-44 indication has lowered to 0%.
- The team is performing 1-AP-4.00, NI MALFUNCTION.

Which one of the following correctly completes the below statements?

1) Based on current conditions, placing the N-44 bistables in TRIP __(1)__ cause a reactor trip to occur.
2) Based on current conditions, verifying P-7 permissive status lights within one hour __(2)__ required.

A. 1) will not
   2) is not

B. 1) will
   2) is not

C. 1) will not
   2) is

D. 1) will
   2) is

General Discussion

For a failure of "A" Loop Hot Leg Temperature, all associated bistables are required to be placed in TRIP within 72 hours. This includes relays for Overpower Delta-T (OTDT) Reactor trip. PRNIs N-41, N-42, and N-43 also have bistables associated with OTDT, which has a 2/3 coincidence for initiating a Reactor trip. In this scenario, N-44 has failed and is the only PRNI channel that does not provide input to the OTDT circuitry. Placing its associated bistables in trip will NOT cause an automatice reactor trip in this scenario.
Reactor Operators are required to know the applicability of the 1 hour LCO for verifying Reactor Protection permissives. None of the Reactor Protection signals affected require this one hour LCO to be entered. Other inputs, such as Turbine Impulse Pressure or Intermediate Range Nis, require a one hour LCO to verify P-7 permissive status lights with only one channel failed.

Tier 1 Group 1
Objective: ND-93.3-LP-14C. ND-93.3-LP-15B.

Answer A Discussion

CORRECT.

Answer B Discussion

1) is incorrect but plausible if the Candidate confuses the bistables associated with the other PRNI channels. In that case, a 2/3 coincidence would have been received for OTDT Reactor trip. 2) is correct.

Answer C Discussion

1) is incorrect but plausible if the Candidate confuses the bistables associated with the other PRNI channels. In that case, a 2/3 coincidence would have been received for OTDT Reactor trip. 2) is incorrect but plausible if the Candidate confuses the associated bistables for N-44 as stated above, or confuses which instruments require this one hour LCO with only one channel failed.

Answer D Discussion

1) is correct. 2) is incorrect but plausible if the Candidate confuses the associated bistables for N-44 as stated above, or confuses which instruments require this one hour LCO with only one channel failed.

Basis for meeting the KA

Must demonstrate knowledge of the different bistable trips associated with N44 and correcly determine the impact on causing a reactor trip.

Basis for Hi Cog

This question is written at the Analysis level. The operator must analyze the interrelationships for different reactor protection inputs and determine it's impact on reactor trip. Also determine if the subsequent failures result in a Tech Spec LCO to verify permissive relays.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

1-AP-4.00
Tech Specs
1-IPT-CC-RC-T-412

Student References Provided

EPE007 EK2.02 - Reactor Trip
Knowledge of the interrelations between a reactor trip and the following: (CFR 41.7 / 45.7)
Breakers, relays and disconnects ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 1.

APE008 AA1.02 - Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open)
Ability to operate and / or monitor the following as they apply to the Pressurizer Vapor Space Accident: (CFR 41.7 / 45.5 / 45.6)
HPI pump to control PZR level/pressure ....

Initial Conditions:

The Crew has tripped Unit 1 from 100% due to a stuck open PRZR Safety Valve.

- The crew is performing the actions of 1-ES-1.2, POST LOCA COOLDOWN AND DEPRESSURIZATION.
- Both LHSI pumps have been stopped.
- Normal Charging has been re-aligned and one Charging pump has been stopped.
- All RCPs are OFF.
- The crew has performed steps to depressurize the RCS to minimize Subcooling.
- RCS subcooling is 39°F and stable.

Current Conditions (15 minutes later):

- RCS Subcooling is 25°F and trending LOWER.
- PRZR level is 65% and trending HIGHER.

Based on these indications, what action will be taken in accordance with 1-ES-1.2?

A. Manually start CHG pumps and align HHSI flow path to the RCS.

B. Start one RCP to collapse any RCS voids.

C. Manually initiate SI and verify all safeguards equipment has actuated.

D. Turn on PRZR heaters to stabilize PRZR Pressure.

General Discussion

Explanation: Per ES-1.2, following depressurization conditions will be evaluated to determine if SI needs to be reinitiated. In this case subcooling is below 30° F and is lowering, therefore CHG pumps should be started and HHSI flow path restored. LHSI is not needed because conditions indicate that this is a SBLOCA, and starting LHSI pumps when pressure is above shutoff head would not be effective. This is also a Continuous Action Page (CAP) requirement to manually start SI pumps following SI termination or SI Flow reduction if RCS subcooling is < 30 °F, or PRZR level cannot be maintained greater than 22%.

Tier 1 Group 1
Objective: ND-95.3-LP-9-B

Answer A Discussion

CORRECT.

Answer B Discussion

Incorrect because pressurizer level and subcooling is inadequate to start an RCP (68%, 55 DEG. F). Plausible because ES-1.2 has a continuous action steps to start an RCP when available.

Answer C Discussion

Incorrect but plausible because this would correct the problem, but this is not in accordance with the procedure ES-1.2. LHSI is not needed and starting LHSI pumps at this time would complicate recovery actions because both are running at shutoff head..

Answer D Discussion

Incorrect because the Continuous Action Page directs starting of Charging pumps. Plausible because there is a step in a different EOP (Step 5 of 1-ES-0.3, Natural Circulation Cooldown With Steam Void In Rx Vessel) that would direct this action to energize PRZR heaters to stabilize PRZR Pressure. This is another EOP that involves response with no RCPs in operation. This would be a correct action if a Safety Injection initiation had not occurred in this scenario.

Basis for meeting the KA

Question requires knowledge of when to start a HHSI pump to restore pressure/pressurizer level, therefore this question meets the K/A.

Basis for Hi Cog

Question requires analysis of multiple conditions to determine the outcome, therefore this is written at a high cog level.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	2006 NA Retake, Q 12.

Development References	Student References Provided
1-ES-1.2	

APE008 AA1.02 - Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open)

Ability to operate and / or monitor the following as they apply to the Pressurizer Vapor Space Accident: (CFR 41.7 / 45.5 / 45.6)

HPI pump to control PZR level/pressure ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 2.

EPE009 EK3.15 - Small Break LOCA
Knowledge of the reasons for the following responses as the apply to the small break LOCA: (CFR 41.5 / 41.10 / 45.6 / 45.13)
Closing of RCP thermal barrier outlet valves ....

Given the following:

- The following annunciators are alarming:
  - 1C-A2, RCP 1A THERMAL BARRIER HI FLOW.
  - 1C-A3, RCP 1A THERMAL BARRIER CC HI TEMP.
- "A" RCP Thermal Barrier CC flow is offscale high (>60 gpm).
- The following Trip Valves are OPEN:
  - 1-CC-TV-120A, RCP 1A THERMAL BARRIER CC OUTLET TRIP VALVE.
  - 1-CC-TV-140A, RCP THERMAL BARRIER CC RET INSIDE TRIP VALVE.
  - 1-CC-TV-140B, RCP THERMAL BARRIER CC RET OUTSIDE TRIP VALVE.

Which ONE of the following correctly answers the below questions?

1) Per ARPs 1C-A2 and 1C-A3, which valve(s) must the team close to respond to the event?
2) What is the reason the ARP directs the team to close 1-CC-TV-120A, RCP THERMAL BARRIER CCW SYSTEM?

A. 1) 1-CC-TV-120A only.
   2) It is the minimum required Containment isolation boundary.

B. 1) 1-CC-TV-120A and 1-CC-TV-140A/-140B.
   2) It is the minimum required Containment isolation boundary.

C. 1) 1-CC-TV-120A only.
   2) Contain the break within an RCS pressure-rated boundary.

D. 1) 1-CC-TV-120A and 1-CC-TV-140A/-140B.
   2) Contain the break within an RCS pressure-rated boundary.

General Discussion

The RCP Thermal Barrier (TB) is a possible cause of a small break LOCA. The CC piping in the immediate vicinity is rated for RCS pressure, with a relief valve set at 2485#. This piping is isolated upstream by a check valve and downstream by 1-CC-TV-120A/B/C. These TVs automatically close if their respective RCP TB flow exceeds 50 gpm for 10 seconds. Downstream, there are TB header isolation valves, 1-CC-TV-140A/B. Because 1-CC-TV-120A/B/C fail open on a loss of air or power, they cannot be credited as Containment isolation valves. ARPs 1C-A2 and 1C-A3 direct closing the associated TV-120 AND both header isolation TVs 140A/B, which isolated TB CC to all RCPs short term. The 140A/B TVs are reopened after a Containment entry is be made to close a manual TB CC valve for the respective RCP.

Tier 1 Group 1.
Objective: NC-88.5-LP-1C.

Answer A Discussion

1) is incorrect because 1-CC-TV-140A/B are also required by ARP 1C-A2/-A3. Plausible because closing only 1-CC-TV-120A will isolate the tube break. 2) is incorrect because 1-CC-TV-120A cannot be used as containment isolation. This valve fails open on a loss of air or power; a containment entry is required to manually isolate the "A" RCP Thermal Barrier to allow restoration of flow to the "B" and "C" RCPs. Plausible if the Candidate confuses the function of 1-CC-TV-140A/-140B.

Answer B Discussion

1) is correct. 2) is incorrect because 1-CC-TV-120A cannot be used as containment isolation. This valve fails open on a loss of air or power; a containment entry is required to manually isolate the "A" RCP Thermal Barrier to allow restoreation of flow to the "B" and "C" RCPs. Plausible if the Candidate confuses the function of 1-CC-TV-140A/140B.
Part 1) is plausible with part 2) because the RO has immediate access to 1-CC-TV-120A (TV-140A/B are located around at the Vertical Board). Also plausible because in opther procedures, multiple layers are used to isolate a flowpath (ex: Main FW pumps tripped AND Main FRVs isolated).

Answer C Discussion

1) is incorrect because 1-CC-TV-140A/B are also required by ARP 1C-A2/-A3. Plausible because closing only 1-CC-TV-120A will isolate the tube break. 2) is correct.

Answer D Discussion

CORRECT.

Basis for meeting the KA

Relates operation of RCP Thermal Barrier isolation valves to required Annunciator Response Procedure actions. Also evaluates the reason for the closest isolation Trip Valve.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
ARP 1C-A2

Student References Provided

EPE009 EK3.15 - Small Break LOCA
Knowledge of the reasons for the following responses as the apply to the small break LOCA: (CFR 41.5 / 41.10 / 45.6 / 45.13)
Closing of RCP thermal barrier outlet valves ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 3

EPE011 2.4.31 - Large Break LOCA
EPE011 GENERIC
Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

Given the following:

- A Large Break LOCA has occurred on Unit 1 and the crew is presently performing 1-E-1, LOSS OF REACTOR OR SECONDARY COOLANT.
- Annunciator 1A-A7, RWST LO LVL has just alarmed.
- RWST level is 19.0% and lowering.
- The STA reports that conditions for a Containment Orange path, FR-Z.1 are met.

Based on the given conditions, which ONE of the following answers the questions below?

1) What actions will the crew take?
2) As RWST level continues to lower to the RMT actuation level, what is the minimum number of channels for RMT to actuate?

A. 1) Transition to ES-1.3 immediately and perform the first 5 steps of ES-1.3, then transition to FR-Z.1.
   2) Two (2).

B. 1) Transition to ES-1.3 immediately and perform the first 5 steps of ES-1.3, then transition to FR-Z.1.
   2) Three (3).

C. 1) Transition to FR-Z.1 immediately; transition to ES-1.3 when entry conditions are met.
   2) Three (3).

D. 1) Transition to FR-Z.1 immediately; transition to ES-1.3 when entry conditions are met.
   2) Two (2).

General Discussion

Explanation:1) Per E-1, and the annunciator A-A7, when RWST level is < 20%, the crew is to transition to ES-1.3. A note before step 1 of ES-1.3 states that "Steps 1 - 5 should be performed without delay." FRs should NOT be implemented before completion of these steps. Therefore ES-1.3 should be entered immediately, following completion of steps 1-5, FR-Z.1 should be performed. 2) When 2 of 4 RMT (Recirc Manual Transfer) channels reach 13.5% as indicated by annunciators RMT CH TRIP/BYPASS then RMT will actuate automatically.

Tier 1 Group 1
Objective:ND-91-LP-2D

Answer A Discussion

CORRECT.

Answer B Discussion

1) Correct. 2) Incorrect because the logic is 2 of 4 channels. Plausible because the operator could confuse this logic coincidence such as Hi –Hi CLS which is a 3 of 4 logic.

Answer C Discussion

1) Incorrect but plausible if the Operator doesn’t believe that ES-1.3 entry conditions are met, or confuses priority of ES-1.3 (1st 5 steps over FRs). 2) Incorrect because the logic is 2 of 4 channels. Plausible because the operator could confuse this logic coincidence such as Hi –Hi CLS which is a 3 of 4 logic.

Answer D Discussion

1) Incorrect but plausible if the Operator doesn’t believe that ES-1.3 entry conditions are met, or confuses priority of ES-1.3 (1st 5 steps over FRs).

Basis for meeting the KA

Question requires knowledge of annunciators that direct entry into EOP procedures (1A-A7 RWST LO LEVEL), and annunciators that will notify the operator that the RMT coincidence is about to be met (1A-A2/B2/C2/D2).

Basis for Hi Cog

Question requires analysis of several annunciators and RWST level indication therefore question is written at the Comprehension level.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	Bank Question 1281

Development References
1A-A7, 1A-A2, 1-E-1, ES-1.3.

Student References Provided

EPE011 2.4.31 - Large Break LOCA
EPE011 GENERIC
Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 4

APE022 AA2.01 - Loss of Reactor Coolant Makeup

Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup: (CFR 43.5/ 45.13)

Whether charging line leak exists . . . .

Given the following:

- Unit 1 is at 100% power.
- The Unit 1 RO has just observed the following:
  - Annunciators 1C-D3/-E3/-F3, RCP 1A/1B/1C SEAL WTR LO INJ FLOW, are all alarming.
  - All Seal Injection flows indicate 2 gpm each.
  - Charging flow has lowered from 88 gpm to 63 gpm.
  - Charging Pump discharge pressure lowered to 2315 psig.

Which ONE of the following completes the statement below?

1) The abnormal Seal Injection flows are due to a __(1)__.
2) An <u>immediate</u> Reactor Trip __(2)__ required.

A. 1) clogged filter
   2) is not

B. 1) piping break
   2) is not

C. 1) clogged filter
   2) is

D. 1) piping break
   2) is

General Discussion

The RCP Seal Injection line is a tap off the normal Charging Pump discharge header. With a break in the common seal injection piping, Seal injection flows will lower and flow will be robbed from the Charging line. A clogged Seal Injection filter will also lower seal injection flows, but it would result in forcing more flow to the Charging line (i.e. an initial rise in Charging flow)
1-AP-8.00, Loss of Normal Charging Flow, directs transition to 1-E-0 if both Seal Injection AND Thermal Barrier CC are lost. In this scenario, only Seal Injection is lost, so an immediate reactor trip is not required.

Tier 1 Group 1
Objective: ND-88.3-LP-2F

Answer A Discussion

1) is incorrect but plausible because some of the critical parameter changes given would occur if a clogged seal injection filter existed. (Annunciator and seal injection flow). 2) is correct.

Answer B Discussion

CORRECT

Answer C Discussion

1) is incorrect but plausible because some of the critical parameter changes given would occur if a clogged seal injection filter existed. (Annunciator and seal injection flow). 2) is incorrect but plausible if the Candidate does not realize the direction in 1-AP-8.00 to go to 1-E-0 only applies if Thermal Barrier CC is also lost.

Answer D Discussion

1) is correct. 2) is incorrect but plausible if the Candidate does not realize the direction in 1-AP-8.00 to go to 1-E-0 only applies if Thermal Barrier CC is also lost.

Basis for meeting the KA

Must use given changes in critical parameters and determine if a Seal Injection piping break exists (supplied by the Charging line). Also must apply actions in 1-AP-8.00 (Tier 1).

Basis for Hi Cog

Must interpret given critical parameters to determine the cause to be a piping break. Must correctly apply guidance in 1-AP-8.00, based on the loss of only Seal Injection flow.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

1-AP-8.00
Classroom simulator

Student References Provided

APE022 AA2.01 - Loss of Reactor Coolant Makeup
Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup: (CFR 43.5/ 45.13)
Whether charging line leak exists . . . .

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 5

APE025 AA1.10 - Loss of Residual Heat Removal System (RHRS)
Ability to operate and / or monitor the following as they apply to the Loss of Residual Heat Removal System: (CFR 41.7 / 45.5 / 45.6)
LPI pump suction valve and discharge valve indicators ....

Given the following:

- Unit 1 in CSD and making preps for refueling.
- A large Earthquake occurs.
- The RHR system was heavily damaged and is unable to provide cooling.
- The crew is performing actions per 1-AP-27.00, Loss of Decay Heat Removal, and has been directed to establish Forced Feed Cooling per Attachment 6.

Which ONE of the following completes both statements in accordance with 1-AP-27.00, LOSS OF DECAY HEAT REMOVAL, Attachment 6, Forced Feed Cooling.

1) The __(1)__ leg is the preferred injection path.
2) LHSI Pump flow is required to be limited to less than __(2)__ gpm.

A. 1) hot 2) 3000

B. 1) cold 2) 3000

C. 1) cold 2) 440

D. 1) hot 2) 440

General Discussion

Explanation: 1) AP-27.00 Loss of Decay Heat Removal lists the preferred order for Forced Cooling as LHSI to the cold leg, LHSI to hot leg. 2) Caution in Attachment 6 states that LHSI pump flow as indicated on 1-SI-FI-1945 should be limited to less than 3000 gpm during and following transfer to hot leg injection and cold leg injection in order to avoid pump run-out conditions.

Tier 1 Group 1
Objective: ND-88.2-LP-3-B

Answer A Discussion

1) Incorrect because per AP-27.00 the hot leg is used only if the cold leg is not available. Plausible if the operator confuses the preferred path. 2) The max flowrate of 3000 gpm is correct.

Answer B Discussion

Correct.

Answer C Discussion

1) cold leg is correct. 2) 440 gpm is incorrect but plausible if the operator confuses the LHSI flow limit with the HHSI flow limit.

Answer D Discussion

1) Incorrect because per AP-27.00 the hot leg is used only if the cold leg is not available. Plausible if the operator confuses the preferred path. 2) 440 gpm is incorrect but plausible if the operator confuses the LHSI flow limit with the HHSI flow limit.

Basis for meeting the KA

Question requires knowledge of preferred suction and discharge MOVs.

Basis for Hi Cog

Operator must evaluate indications and determine which pump and path to use.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
1-AP-27.00

Student References Provided

APE025 AA1.10 - Loss of Residual Heat Removal System (RHRS)

Ability to operate and / or monitor the following as they apply to the Loss of Residual Heat Removal System: (CFR 41.7 / 45.5 / 45.6)

LPI pump suction valve and discharge valve indicators ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 6

APE027 AK2.03 - Pressurizer Pressure Control System (PZR PCS) Malfunction
Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: (CFR 41.7 / 45.7)
Controllers and positioners ....

Given the following:

- Unit 2 is at 100% power.
- The following Unit 2 annunciators are LIT:
    - 2C-F8, PRZR HI PRESS.
    - 2D-H4, PRZR SFTY VV PWR RELIEF VV OPEN.
- Pressurizer Pressure Control Instrumentation Channels indicate as follows:
    - 2-RC-PI-2444 is 2210 psig and lowering.
    - 2-RC-PI-2445 is 2500 psig and stable.
- Per immediate action steps, the RO takes the control switch for the affected Pressurizer PORV to CLOSE.
- The affected PORV position indicator lights now show GREEN.
- Pressurizer Pressure is now 2185 psig and slowly lowering at 5 psig/minute.

Which ONE of the following correctly states:

1) The next action required to stabilize Pressurizer pressure?
2) The minimum action(s) required to stop the one hour Tech Spec clock for the inoperable PORV?

A. 1) Close the associated Spray Valve Remote Close SOVs.
   2) Close the associated Block MOV only.

B. 1) Close the associated Spray Valve Remote Close SOVs.
   2) Close and de-energize the associated Block MOV.

C. 1) Close the associated Block MOV.
   2) Close the associated Block MOV only.

D. 1) Close the associated Block MOV.
   2) Close and de-energize the associated Block MOV.

General Discussion

Pressurizer Pressure Control channel 2445 inputs to auto operation of Pressurizer PORV 2456. The other Control channel (2444) inputs to the Master Pressure controller, which inputs to PORV 2455C and the Spray valve controllers.
The slowly lowering pressure after PORV closure is indicative of PORV leakby. 0-AP-53.00 Step 2 RNO directs closing the associated block MOV if the affected critical parameter is not stabilized. Failure of the other control channel would require closing both spray valves. A failure of channel 2445 renders the associated PORV inoperable, but capable of being manually cycled. Tech Spec Section 3.1.A. requires entry into a 1 hour LCO until the associated block MOV is closed. If the PORV could NOT be manually cycled, the same Tech Spec section requires closing and de-energizing the associated block MOV.

Tier 1 Group 1.
Objective ND-93.3-LP-5E.

Answer A Discussion

1) is incorrect but plausible if the Candidate confuses which Pressurizer Control channel inputs to the Master Pressure Controller and assumes the lowering pressure is due to open Spray valves. 2) is correct.

Answer B Discussion

1) is incorrect but plausible if the Candidate confuses which Pressurizer Control channel inputs to the Master Pressure Controller and assumes the lowering pressure is due to open Spray valves. 2) is incorrect but plausible if the Candidate confuses the Tech Spec required actions for an inoperable PORV that is INCAPABLE of being manually cycled.

Answer C Discussion

CORRECT

Answer D Discussion

1) is correct. 2) is incorrect but plausible if the Candidate confuses the Tech Spec required actions for an inoperable PORV that is INCAPABLE of being manually cycled.

Basis for meeting the KA

Must interpret given alarms and indications after a PRZR Pressure Control malfunction and relate them to the associated PORV positioner. Requires selection of correct procedure actions to mitigate the event.

Basis for Hi Cog

Must interpret given alarms and indications to determine which controllers/positioners are affected.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
0-AP-53.00. 1-AP-31.00. ND-93.3-LP-5.

Student References Provided

APE027 AK2.03 - Pressurizer Pressure Control System (PZR PCS) Malfunction
Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: (CFR 41.7 / 45.7)
Controllers and positioners ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 7

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 ....

Initial Conditions:

- Unit 1 was operating at 100% when the turbine tripped on low lube oil pressure.
- The Reactor failed to trip automatically or manually.
- The Crew entered 1-FR-S.1, RESPONSE TO NUCLEAR GENERATION ATWS.
- Both Reactor Trip breakers were still closed.
- The Service Building inside watch is **unable** to access the Unit 1 Cable Tray room.

Current Conditions (5 minutes later):

- The MG Set output breakers have been opened.
- Reactor power indication on all PRNIs is 0%.
- Both IRNIs show a negative SUR.
- Safety Injection is not in service.
- Emergency Boration is in progress.

Which ONE of the following choices identifies the required team actions?

A. Remain in current procedure, until emergency boration is complete.

B. Transition to 1-E-0, REACTOR TRIP OR SAFETY INJECTION.

C. Transition to 1-ES-0.1, REACTOR TRIP RESPONSE.

D. Remain in current procedure, until the Reactor Trip breakers are open.

General Discussion

Correct Answer: Transition back to E-0 because continuous action step in FR-S.1 directs returning to Procedure and Step in effect once the reactor is subcritical. The team must return to 1-E-0 because all Immediate Actions have not been performed.

Tier 1 Group 1
Objective: ND-95.3-LP-36-C

Answer A Discussion

Remain in 1-FR-S.1, Response to Nuclear Generation / ATWS, until emergency boration is complete is incorrect because FR-S.1 allows exit, even if emergency boration is not complete. Plausible because emergency boration initiation is required before exiting FR-S.1 and the operator may incorrectly assume that it must be completed prior to procedure exit.

Answer B Discussion

CORRECT.

Answer C Discussion

Transition to ES-0.1 is incorrect because all the immediate actions of E-0 have not been completed. Plausible since first step of E-0 was done and the operator may incorrectly assume returning to E-0 is not required since it has already been entered once. Also plausible because the major actions of E-0 immediate actions; reactor trip, turbine trip, SI not in service are evaluated in FR-S.1 and the operator may conclude that it is not necessary to repeat.

Answer D Discussion

Remain in 1-FR-S.1, until the Reactor Trip breakers are open. Incorrect because FR-S.1 allows exit, even if Reactor Trip breakers are still closed. Plausible becase E-0 requires exit to FR-S.1 if at least one Reactor Trip breaker is not open. Logical because operator may misapply E-0 exit criteria with FR-S.1 exit criteria.

Basis for meeting the KA

Question requires knowledge of Reactor trip breakers as it pertains to a requirement to remain in FR-S.1, ATWS procedure.

Basis for Hi Cog

High cog question because it requires the student to evaluate multiple indications pertaining to reactor trip and determine outcome to a specific scenario.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	Bank Question 1185

Development References

1- FR-S.1.

Student References Provided

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

SPS 2021 NRC EXAM, QUESTION 8.

EPE038 EK1.02 - Steam Generator Tube Rupture (SGTR)

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

Leak rate vs. pressure drop ....

Initial Conditions:

- Unit 1 “A” Steam Generator Tube Rupture (SGTR) occurred.
- The “B” and “C” Reactor Coolant Pumps tripped on Station Service Bus swapover.

Current Conditions:

- The “A” RCP remains in operation.
- The team has completed RCS cooldown and depressurization per 1-E-3, STEAM GENERATOR TUBE RUPTURE.
- The team is performing 1-ES-3.3, POST-SGTR COOLDOWN USING STEAM DUMP.
- RCS has been cooled down to 350°F per 1-ES-3.3.
- RCS pressure and “A” Steam Generator pressures are both 720 psig and stable.
- “A” S/G NR level is 45% and stable.
- The Unit 1 team is attempting to lower “A” S/G pressure by 100 psig, using the MSTV bypass valve.
- The field operator reported they are having difficulty reclosing the MSTV bypass valve.
- 5 minutes later, S/G Pressure has lowered by 200 psig and is continuing to lower.

Which ONE of the following correctly completes the following statements?

1) At this time, the leak rate through the “A” S/G U-tubes is __(1)__ double the rate expected for the planned depressurization.
2) If the “A” MSTV bypass cannot be closed, the first consequence that requires operator action will be __(2)__.

A. 1) less than
   2) pressure below minimum for continued RCP operation

B. 1) less than
   2) pressure drop causing vessel head void formation

C. 1) more than
   2) pressure below minimum for continued RCP operation

D. 1) more than
   2) pressure drop causing vessel head void formation

General Discussion

1) Leak rate is directly proportional to the square root of the pressure drop. In this scenario, a 100 psid across the U-tubes is intended, but an inadvertent 200 psid is created instead. Since the pressure drop is double, the leak rate is the square root of 2, or 1.4141 times the originally expected leak rate (less than double). 2) A NOTE at step 9 of 1-ES-3.3 warns the team that ruptured S/G depressurization may lower to the point where it lowers below the minimum pressure for continued RCP operation. There is also a note at Step 15 that expresses concern for vessel head voiding, but it is only if no RCPs are in operation.

Tier 1 Group 1
Objectives: 193006 ELO 1.2 and ND-95.3-LP-16B

Answer A Discussion

CORRECT.

Answer B Discussion

1) is correct. 2) is incorrect but plausible if the Candidate does not recall the complete note at Step 15 of 1-ES-3.3, where it applies when no RCPs are running. Also plausible if the Candidate incorrectly determines that single RCP operation is not sufficient to prevent vessel head voiding.

Answer C Discussion

1) is incorrect but plausible if the Candidate inverts the equation showing the relationship between delta P and leak rate, or incorrectly recalls it is a square (vice square root) function. 2) is correct.

Answer D Discussion

1) is incorrect but plausible if the Candidate inverts the equation showing the relationship between delta P and leak rate, or incorrectly recalls it is a square (vice square root) function. 2) is incorrect but plausible if the Candidate does not recall the complete note at Step 15 of 1-ES-3.3, where it applies when no RCPs are running. Also plausible if the Candidate incorrectly determines that single RCP operation is not sufficient to prevent vessel head voiding.

Basis for meeting the KA

Must correctly relate SGTR delta P to leak rate, including the implication of a loss of control of this differential pressure. Tier 1 question, as the Candidate must correctly recall the information in 1-ES-3.3 to determine the most limiting consequence of a loss of delta P control.

Basis for Hi Cog

Must use correct calculation to compare two leak rates, based on pressure drop across ruptured S/G U Tubes.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

1-ES-3.3
193006 ELO 1.2
ND-95.3-LP-16B

Student References Provided

EPE038 EK1.02 - Steam Generator Tube Rupture (SGTR)
Knowledge of the operational implications of the following concepts as they apply to the SGTR: (CFR 41.8 / 41.10 / 45.3)
Leak rate vs. pressure drop ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 9.

APE054 AK3.02 - Loss of Main Feedwater (MFW)

Knowledge of the reasons for the following responses as they apply to the Loss of Main Feedwater (MFW): (CFR 41.5,41.10 / 45.6 / 45.13)

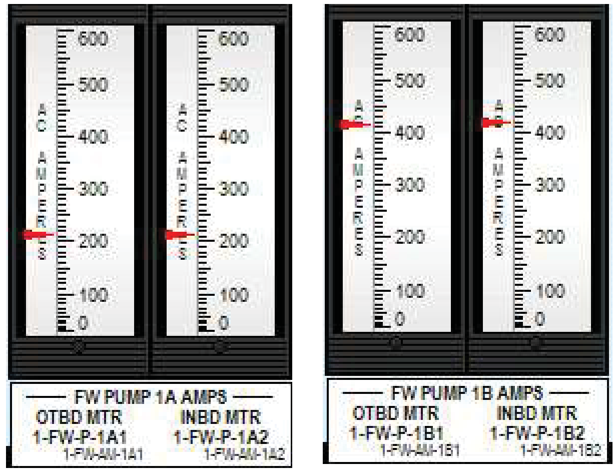
Matching of feedwater and steam flows ....

Given the following:

- Unit 1 is operating at 79% when the following Feed pump indications were noted.

One minute later…

- Annunciators 1H-G5/6/7, STM GEN 1A/1B/1C LVL ERROR are lit.
- SG NR Lvl 32% and lowering in all SGs.
- MFRV demand rising on all MFRVs.



Which ONE of the following actions states <u>all the actions required</u> per the AP to stabilize the plant?

A. Take Main Feed Regulating valves to MANUAL and open to restore SG levels.

B. Start the standby Condensate pump and verify SG level restores to normal.

C. Start the standby Condensate pump and reduce Turbine Load.

D. Trip the Reactor prior to the SG Low level trip, and start AFW pumps.

General Discussion

Explanation: The indications given point to a shaft shear of the 'A' Feed pump. Per 1-AP-21.00, Loss of Main Feedwater Flow. The required immediate actions are to:
1) Check Main Feed pump status and since power is < 80% and there is one Main Feed pump running continue to step 2.
2)Start an additional Condensate pump.
3)Reduce turbine load to match steam flow.
Although just starting a Condensate pump might seem to be enough to stabilize SG levels, it is not. In simulator run (classroom sim); a Feed pump shaft shear followed by just starting an additional condensate pump was not enough to prevent a reactor trip. It will also not be enough to stabilize Feed pump 'B' which will be running at elevated current levels. Therefore, reducing turbine load to match steam flow which is an immediate action is also required.

Tier 1 Group 1
Objective: ND-89.3-LP-3E

Answer A Discussion

Incorrect but plausible because in AP-53.00 this would be a required action if there was a failed instrument. In this case there is no failed instrument. Additionally the Feed Reg Valves will not be able to restore SG level until an additional Condensate pump is started.

Answer B Discussion

Incorrect but plausible if the operator mistakenly believes that only starting a condensate pump will be enough to stabilize the plant. As stated in the explanation, it will not be enough to prevent a reactor trip or stabilize Feed pump 'B' which will be running at elevated current levels. This choice is also plausible because it is an immediate action, if responding to a condensate pump trip with failure of standby condensate pump to auto start.

Answer C Discussion

Correct.

Answer D Discussion

Incorrect but plausible because this would stabilize the plant, however these are not the required actions. It is not required to trip the reactor unless power is > 80% with only one Main feed pump running.

Basis for meeting the KA

Question requires knowledge of reasons for matching steam flow with feed flow. In this case the reason is stated in the question to stabilize the plant and with this scenario that not only includes SG level but also includes Feed pump amps.

Basis for Hi Cog

Question is high cog because it requires the candidate to evaluate Feed pump amps and the other indications and then judge which action is sufficient to stabilize the plant.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
1-AP-21.00

Student References Provided

APE054 AK3.02 - Loss of Main Feedwater (MFW)

Knowledge of the reasons for the following responses as they apply to the Loss of Main Feedwater (MFW): (CFR 41.5,41.10 / 45.6 / 45.13)
Matching of feedwater and steam flows ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 10.

EPE055 2.1.19 - Loss of Offsite and Onsite Power (Station Blackout)
EPE055 GENERIC
Ability to use plant computers to evaluate system or component status. (CFR: 41.10 / 45.12)

Given the following:

- A loss of all AC Emergency Power occurred on Unit 1.
- The team is performing 1-ECA-0.0, LOSS OF ALL AC POWER. .
- The RO is trending DC Bus voltages on the Plant Computer (PCS).

Given the current DC voltages and trends on the attached PCS display, which ONE of the following completes both statements in accordance with 1-ECA-0.0?

1) The soonest time that a complete loss of a DC Bus is expected is __(1)__.
2) Declaration of an Extended Loss of AC Power (ELAP) __(2)__ required.

REFERENCE PROVIDED

A. 1) 20-30 minutes
2) is

B. 1) 1 hour
2) is

C. 1) 20-30 minutes
2) is not

D. 1) 1 hour
2) is not

General Discussion

1) 1-ECA-0.0, Loss Of All AC Power, has a note before Step 24 which informs the team Station battery voltage will begin to lower exponentially once it lowers to 105 VDC. From there, a complete loss could occur within 20 to 30 minutes. In this scenario, the "A" DC Bus has reached 105 VDC in ~ 1 hour. Normally, the Batteries are designed to supply full load for two hours. Based on the Plant Computer trend, the loss of AC power occurred ~ 1 hour ago; the DC Buses would typically supply bus loads for one more hour.
2) 1-ECA-0.0 Step 20 directs declaring an ELAP if at least one Emergency Bus is not reenergized within 45 minutes. Based on the Plant Computer trend, this 45 minutes has passed.

Tier 1 Group 1
Objective: ND-95.3-LP-17B

Answer A Discussion

CORRECT.

Answer B Discussion

1) is incorrect but plausible if the Candidate does not recall the NOTE before Step 24 of 1-ECA-0.0, and misapplies the DC battery rating of supplying full load fo 2 hours (2 hours minus 55 minutes is approximately 1 hour. 2) is correct.

Answer C Discussion

1) is correct. 2) is incorrect because it has been longer than 45 minutes. Plausible of the Candidate incorrectly recalls other (ex: 1 hour) time limits, as applied in many Tech Spec LCOs, TRM actions, etc.

Answer D Discussion

1) is incorrect but plausible if the Candidate does not recall the NOTE before Step 24 of 1-ECA-0.0, and misapplies the DC battery rating of supplying full load fo 2 hours (2 hours minus 55 minutes is approximately 1 hour). 2) is incorrect because it has been longer than 45 minutes. Plausible of the Candidate incorrectly recalls other (ex: 1 hour) time limits, as applied in many Tech Spec LCOs, TRM actions, etc.

Basis for meeting the KA

Use given PCS trend and 1-ECA-0.0 direction (from memory) to determine correct status of "A" DC Bus, as well as requirement for declaring an Exended Loss of AC Power (ELAP).

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
1-ECA-0.0

Student References Provided
PCS trend for DC Bus voltages

EPE055 2.1.19 - Loss of Offsite and Onsite Power (Station Blackout)
EPE055 GENERIC
Ability to use plant computers to evaluate system or component status. (CFR: 41.10 / 45.12)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 11.

D

APE057 AA2.04 - Loss of Vital AC Electrical Instrument Bus

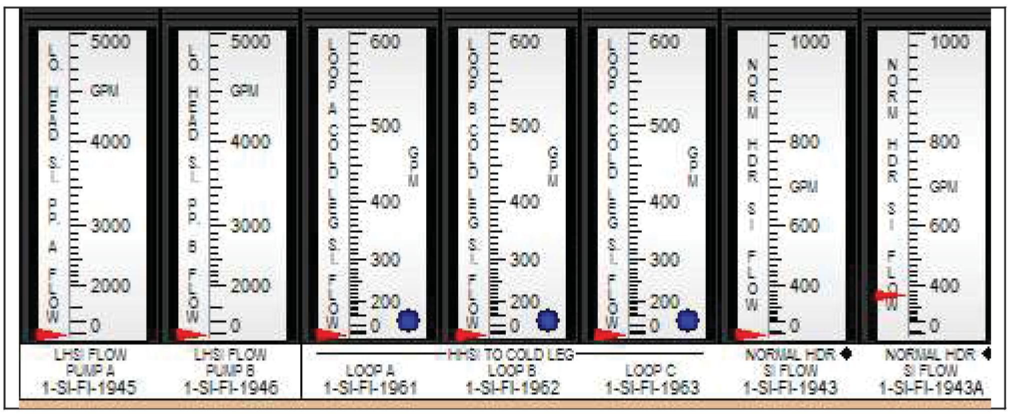
Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: (CFR: 43.5 / 45.13)
ESF system panel alarm annunciators and channel status indicators ....

Initial Conditions:

- Unit 1 was operating at 100% power.
- Multiple annunciators pertaining to Channel III have alarmed.
- The BOP reports a loss of Vital Bus III, crew enters 1-AP-10.03, LOSS OF VITAL BUS III.
- The Team trips the Reactor, and secures the “A” RCP as directed by 1-AP-10.03.

Current Conditions

- The Team has just transitioned to 1-ES-0.1, RESPONSE TO REACTOR TRIP.
- The BOP reports that one of the Steam Dump TCVs, 1-MS-TCV-105A is partially OPEN.
- SI Auto initiates, the team transitions back to 1-E-0, REACTOR TRIP OR SI.
- At step 4 of 1-E-0 the RO reports that he observes the following indications regarding SI.



Based on the conditions given, which ONE of the following correctly completes the statements below?

1) Based on the conditions given there __(1)__ SI flow to the core.
2) The first SI signal actuated by this sequence of events is the __(2)__ SI.

A. 1) is
2) Header to Line

B. 1) is NOT
2) High Steam flow with Low Tave

C. 1) is NOT
2) Header to Line

D. 1) is
2) High Steam flow with Low Tave

D

General Discussion

Explanation: 1) All of the SI flow transmitters that provide HHSI header flow and core flow are powered from Vital Bus III except for 1-SI-FI-1943A. 2) Loss of Vital Bus III will cause channel III instruments to fail low. Channe III High Steam flow is developed for all 3 RCS loops, and the 'C' RCS Loop Tave fails low. When the 'A' RCP is secured flow reversed in the 'A' RCS Loop causing Low Tave. The stuck open TCV will accelerate temp drop. Therefore a High Steam flow with Low Tave would actuate. It is common knowledge that addition of too much AFW to A SG could lead to a header to line SI signal under normal trip conditions. In this case with the stuck open TCV both Header and SG pressures are lowering. The Header idling signal of 585 psig means that SG pressure would have to lower to 465 psig. This corresponds to a Tave of about 463 degrees F before Header to Line SI would occur.

Tier 1 Group 1
Objective: ND-90.3-LP-5-F/G

Answer A Discussion

1) Correct. 2) Incorrect because with the partially stuck open Dump valve Tave will drop faster, and both Header and SG pressures are lowering. Plausible if the operator doesn't correctly diagnose the effects of a stuck open TCV. Under normal conditions the trip of the 'A' RCP would cause reversal of flow in A RCS loop to pressure reduction in A SG, thereby making Header to Line SI more likely.

Answer B Discussion

1) Incorrect but plausible if the operator fails to monitor all SI flow indications, and doesn't realize that most of the SI flow indicators are indicating downscale because of the loss of VB III. 2) Correct.

Answer C Discussion

1) Incorrect but plausible if the operator fails to monitor all SI flow indications, and doesn't realize that most of the SI flow indicators are indicating downscale because of the loss of VB III. 2) Incorrect because with the partially stuck open Dump valve Tave will drop faster, and both Header and SG pressures are lowering. Plausible if the operator doesn't correctly diagnose the effects of a stuck open TCV. Under normal conditions the trip of the 'A' RCP would cause reversal of flow in A RCS loop to pressure reduction in A SG, thereby making Header to Line SI more likely.

Answer D Discussion

Correct.

Basis for meeting the KA

Question requires knowledge of ESF panel alarms and indications related to loss of vital bus III, therefore question meets the K/A.

Basis for Hi Cog

Question requires the operator to analyze multiple indications and alarms to determine correct temperature to maintain and whether SI is flowing or not. Therefore this question is written at the Comprehension level.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

Student References Provided

APE057 AA2.04 - Loss of Vital AC Electrical Instrument Bus

Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: (CFR: 43.5 / 45.13)

ESF system panel alarm annunciators and channel status indicators ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 12

APE058 AK3.01 - Loss of DC Power
Knowledge of the reasons for the following responses as they apply to the Loss of DC Power: (CFR 41.5,41.10 / 45.6 / 45.1)
Use of dc control power by D/Gs ....

Initial Conditions:

- Unit 1 was operating at 100% when a loss of the 1H Emergency Bus occurred.
- The team is performing the following procedures:
  - 1-AP-10.07, LOSS OF UNIT 1 POWER.
  - 0-AP-17.04, EDG 1 Or EDG 2 – EMERGENCY OPERATIONS.
- EDG #1 is running at 900 RPM.
- EMERG BUS 1H VOLTS indicates 0 volts.
- The breaker status lights for 15H3, EMERG SUP, are all NOT lit.

Current Conditions:

- EDG #1 is still running with its AUTO/EXERCISE EMERG GEN 1 switch in AUTO.
- The team is at 0-AP-17.04 step 16, checking the DC Power fuses at breaker 15H3.
- Breaker 15H3 is locally verified OPEN.
- Electricians report no electrical faults were identified, both sets of DC Control power fuses (Closing and Trip power) for breaker 15H3 are blown, and they are ready to replace them.

Based on current conditions, which ONE of the following correctly completes the statements below?

1) 0-AP-17.04 directs placing Breaker 15H3 in __(1)__ prior to replacing the DC fuses.
2) After the 15H3 fuses are replaced, the Auxiliary Trip Relay __(2)__ need to be manually reset.

A. 1) Auto After Stop
   2) will

B. 1) Pull To Lock
   2) will not

C. 1) Auto After Stop
   2) will not

D. 1) Pull To Lock
   2) will

General Discussion

1) Breaker 15H3 DC power is required to load the 1H Bus onto EDG #1 per 0-AP-17.04. Step 16 directs placing the 15H3 control switch in Pull To Lock (PTL) prior to replacing the DC fuses. Breaker 15H8 does not have a PTL function, so it is verified in Auto After Stop if the DC fuses must be replaced. 2) The Auxiliary Trip Relay actuates if either a 15H3 breaker Overcurrent or Differential current condition occur. That is not the case in this scenario.

Tier 1 Group 1
Objective: ND-90.3-LP-1C/D

Answer A Discussion

1) is incorrect but plausible if the Candidate confuses the required actions for replacing fuses in breaker 15H8, NORM SUP to 1H Bus. This breaker does not have a Pull To Lock feature. 2) is incorrect but plausible if the Candidate misinterprets the blown fuses on breaker 15H3 as an overcurrent or differential corrent condition, or confuses the cause-effect relationship between the Aux Trip Relay and Breaker 15H3 operation.

Answer B Discussion

CORRECT.

Answer C Discussion

1) is incorrect but plausible if the Candidate confuses the required actions for replacing fuses in breaker 15H8, NORM SUP to 1H Bus. This breaker does not have a Pull To Lock feature. 2) is correct.

Answer D Discussion

1) is correct. 2) is incorrect but plausible if the Candidate misinterprets the blown fuses on breaker 15H3 as an overcurrent or differential corrent condition, or confuses the cause-effect relationship between the Aux Trip Relay and Breaker 15H3 operation.

Basis for meeting the KA

Must evaluate the impact of a loss of DC power to the EDG output breaker on EDG field, as well as correct procural actions required to restore DC power (Tier 1).

Basis for Hi Cog

Must take given condtions and correctly apply to the associated AOP in order to restore the EDG auto capability.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

0-AP-17.04
ND-90.3-LP-1C/D

Student References Provided

APE058 AK3.01 - Loss of DC Power
Knowledge of the reasons for the following responses as they apply to the Loss of DC Power: (CFR 41.5,41.10 / 45.6 / 45.1)
Use of dc control power by D/Gs ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 13.

APE077 AA2.04 - Generator Voltage and Electric Grid Disturbances

Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: (CFR: 41.5 and 43.5 / 45.5, 45.7, and 45.8)

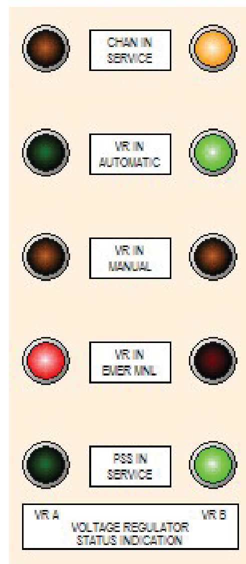
VARs outside the capability curve...

Initial Conditions:

- Unit 1 and Unit 2 are operating at 100%.
- Unit 1 Gen H_2 pressure is lower than normal and is at 60 psig, and stable. Troubleshooting ongoing.
- The plant has been notified by SOC that there are significant grid instabilities.
- The SOC has requested maximum power generation from both units.
- The Operator observes rising MVARS, and is attempting to lower MVARS.

Current Conditions:

- The following Annunciators are alarming:
  - 1J-A8, OVER EXCITATION LIMIT.
  - 1J-B7, VREG CHANNEL A LOCAL.
- The BOP reports the following Unit 1 changes:
  - Gen MWe lowered from 905 to 900 MWe.
  - Gen MVARS rose from + 10 to +350 MVARS.
  - Voltage Regulators have shifted and are as shown.



Which ONE of the following completes the statements below?

1) Based on the information given in the current conditions, the Main Generator limits __(1)__ being exceeded.
2) Per Annunciator 1J-A8, OVER EXCITATION LIMIT the operator should attempt to regain control of Generator Voltage using the __(2)__.

REFERENCE PROVIDED

A. 1) are
   2) Local RAISE/LOWER pushbuttons

B. 1) are NOT
   2) MCR Excitation Level Raise/Lower Switch

C. 1) are
   2) MCR Excitation Level Raise/Lower Switch

D. 1) are NOT
   2) Local RAISE/LOWER pushbuttons

General Discussion

Explanation: 1) Per the Generator Capability curve 350 MVARS and 900 MWe is outside the limits. 2) During this transient the 'A' Voltage Regulator shifted from AUTO/In service to EMERG MAN, and the 'B' Voltage Regulator shifted from AUTO/Out of service to AUTO/In service. This is shown in the diagram. The alarm ARP 1J-A7 was received after the operator first attempted to lower Gen voltage. Per the ARP the operator should first attempt to regain control of Generator Voltage using the MCR Excitation Level Raise/Lower Switch. It should be noted that there is now a new voltage regulator that is in service. If this fails then the ARP directs using the Local RAISE/LOWER pushbuttons at the Generator Voltage Regulator cabinet.

Tier 1 Group 1
Objective: ND-90.1-LP-6-C/D

Answer A Discussion

1) Correct. 2) Incorrect because the ARP first directs using the MCR switch. Plausible because the operator may believe that he already tried using this switch and was not successful therefore he should use the local pushbuttons. But two factors make this incorrect; 1) The ARP was not alarming then, and more importantly 2) The voltage regulator has shifted to the 'B' voltage regulator, therefore he should first attempt using the MCR control.

Answer B Discussion

1) Incorrect but plausible if the operator isn't careful reading the chart. 2) Correct.

Answer C Discussion

Correct.

Answer D Discussion

1) Incorrect but plausible if the operator isn't careful reading the chart. 2) Incorrect because the ARP first directs using the MCR switch. Plausible because the operator may believe that he already tried using this switch and was not successful therefore he should use the local pushbuttons. But two factors make this incorrect; 1) The ARP was not alarming then, and more importantly 2) The voltage regulator has shifted to the 'B' voltage regulator, therefore he should first attempt using the MCR control.

Basis for meeting the KA

The K/A requires a condition whereby VARS are outside the capability curve. This is met by Part 1. The second part of the question is designed to comply with Tier 1 Group 1 criteria by testing procedural knnowledge.

Basis for Hi Cog

High Cog because part 1 requires using a graph. Also, part 2 requires analyzing conditions including Volt Regulator status indicators.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
1J-A8. 1-DRP-003, ATT 52.

Student References Provided
1-DRP-003, ATT 52.

APE077 AA2.04 - Generator Voltage and Electric Grid Disturbances

Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: (CFR: 41.5 and 43.5 / 45.5, 45.7, and 45.8)

VARs outside the capability curve...

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 14.

WE04 EA1.3 - LOCA Outside Containment

Ability to operate and / or monitor the following as they apply to the (LOCA Outside Containment)
(CFR: 41.7 / 45.5 / 45.6)

Desired operating results during abnormal and emergency situations.

Given the following:

- Unit 2 RCS pressure is 990 psig and lowering.
- The team has transitioned to 2-ECA-1.2, LOCA Outside Containment.
- The team is ready to begin attempts to Identify and Isolate the break.

Which of the following answers the questions below?

1) What is the first flow path the crew will attempt to isolate per 2-ECA-1.2, step 2?
2) What parameter will the crew check to determine if the break is isolated?

A. 1) Low Head Safety Injection.
   2) RCS subcooling > 30°F.

B. 1) Charging Line.
   2) RCS subcooling > 30°F.

C. 1) Charging Line.
   2) RCS pressure rising.

D. 1) Low Head Safety Injection.
   2) RCS pressure rising.

General Discussion

Explanation:1) Low Head SI to the Cold Legs (2-SI-MOV-2890C) is the first component that the crew will close in step 2 of 2-ECA-1.2 to attempt to isolate the break. Immediately after closing 2-SI-MOV-2890C the crew will check RCS pressure increasing. 2) If RCS pressure is rising then the break is isolated, and the crew will then place the LHSI pumps in PTL and close the LHSI pump suctions 2-SI-MOV-2862A and B. If that action does not isolate the break, the second isolation attempted is the Charging line flow path. >30°F Subcooling is a common parameter used to determine if SI can be terminated.

Tier 1, Group 1.
Learning Objective:ND-95.3-LP-21, ECA-1.2, Objective B.

Answer A Discussion

Incorrect. 1) Correct. 2) Incorrect. RCS subcooling > 30°F is an indicator typically used to verify that SI flow is not required. This is plausible if the operator confuses equilibrium indications conditions that no longer require SI flow.

Answer B Discussion

Incorrect. 1) Incorrect. 2-SI-MOV-2890C is the component directed to isolate next since this is the MOV closest to the RCS boundary. Charging line is plausible because it is the second flow path isolated in 2-ECA-1.2 if LHSI isolation does not stop the break. 2) Incorrect. RCS subcooling > 30°F is an indicator typically used to verify that SI flow is not required. This is plausible if the operator confuses equilibrium indications conditions that no longer require SI flow.

Answer C Discussion

Incorrect. 1) Incorrect. 2-SI-MOV-2890C is the component directed to isolate next since this is the MOV closest to the RCS boundary. Charging line is plausible because it is the second flow path isolated in 2-ECA-1.2 if LHSI isolation does not stop the break. 2) Correct.

Answer D Discussion

CORRECT

Basis for meeting the KA

Must apply correct sequence of flow paths to isolate in order to isolate a LOCA outside containment. The importance of this is because, for the first attempted flow path isolation, actions are required beforehand (clearing tags and unlocking breakers for the associated MOV breakers). Any delay in these actions needlessly prolongs isolation, risking a total flood of the Safeguards building. This will flood the very isolation MOVs which may be used to isolated the LOCA.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	Bank Question 319

Development References
2-ECA-1.2, LOCA Outside Containment. Rev. 8.

Student References Provided

WE04 EA1.3 - LOCA Outside Containment

Ability to operate and / or monitor the following as they apply to the (LOCA Outside Containment)
(CFR: 41.7 / 45.5 / 45.6)

Desired operating results during abnormal and emergency situations.

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 15.

WE05 2.2.37 - Loss of Secondary Heat Sink
WE05 GENERIC
Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Initial Conditions:

- Unit 1 is at 97% and is currently performing 1-OPT-FW-003, TURBINE DRIVEN AUXILIARY FEEDWATER PUMP 1-FW-P-2.
- Surry is in a normal electrical lineup.
- The SOC notifies Surry that the grid voltage is lower than normal due to several unplanned outages.

Current Conditions:

- The field operator has just depressed the Turbine Manual Push Trip lever per step 6.2.4.
- The SOC notifies Surry that due to cascading failures, a Low Voltage condition exists on the 230 KV system, and it is anticipated that the Emergency Low Limit will be exceeded if a Surry Unit would trip.
- The BOP reports that 230KV voltage is 218 KV.
- The crew enters 0-AP-10.18, RESPONSE TO GRID INSTABILITIES.
- The SRO informs the Shift Manager that 1-OPT-FW-003 should be completed in 60 minutes.

1) Per 0-AP-10.18, the OPT should be __(1)__ and 1-FW-P-2 should be returned to service.
2) The Unit 1 MDAFW pump that would be most adversely affected by the conditions given above would be __(2)__.

A. 1) completed expeditiously
   2) 1-FW-P-3A

B. 1) suspended immediately
   2) 1-FW-P-3B

C. 1) completed expeditiously
   2) 1-FW-P-3A

D. 1) completed expeditiously
   2) 1-FW-P-3B

General Discussion

Explanation: 1) Per 0-AP-10.18, if the Low Voltage limits are received then TS equipment which includes 1-FW-P-2 should be checked to be OPERABLE and if not they should initiate actions to restore the TDAFW pump to operability. Once the operator depresses the manual Turbine trip lever, the pump is inoperable because the steam supplies are closed. This means the OPT should be suspended and 1-FW-P-2 returned to service. 2) A normal electrical lineup means that RSST A & B are powered from bus 5 (500 KV), and RSST C is powered from bus 6 (230 KV). With the problem indicated, only the RSST C is affected. RSST C powers 1H and 2J. With the Low Voltage condition indicated bus 1H and 2J would be declared inoperable. Therefore on Unit 1 only 1-FW-P-3A is affected.

Tier 1 Group 1
Objective: ND-89.3-LP-4E/F

Answer A Discussion

1) Incorrect because 0-AP-10.18 requires that 1-FW-P-2 is checked for operability, and if it’s not operable the RNO states that actions should be initiated to restore equipment to operability. Plausible if the operator believes this test must be completed to confirm operability of 1-FW-P-2. Suspending the test does not make 1-FW-P-2 inoperable. 2) Correct.

Answer B Discussion

1) Correct. 2) Incorrect but plausible if the operator confuses the grid power supplies and believes that bus 1J is the affected bus.

Answer C Discussion

Correct.

Answer D Discussion

1) Incorrect because 0-AP-10.18 requires that 1-FW-P-2 is checked for operability, and if it’s not operable the RNO states that actions should be initiated to restore equipment to operability. Plausible if the operator believes this test must be completed to confirm operability of 1-FW-P-2. Suspending the test does not make 1-FW-P-2 inoperable. 2) Incorrect but plausible if the operator confuses the grid power supplies and believes that bus 1J is the affected bus.

Basis for meeting the KA

This question requires the operator to determine which AFW pumps are required to be checked for operability. Question requires the operator to make a decision regarding performance of the surveillance.

Basis for Hi Cog

Multiple conditions must be evaluated to make a decision reqarding which AFW pumps should be checked for operability, and whether to complete the OPT or suspend it.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References	Student References Provided
0-AP-10.18. 1-OPT-FW-003	

WE05 2.2.37 - Loss of Secondary Heat Sink
WE05 GENERIC
Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 16.

B

WE11 EK1.3 - Loss of Emergency Coolant Recirculation

Knowledge of the operational implications of the following concepts as they apply to the (Loss of Emergency Coolant Recirculation)
(CFR: 41.8 / 41.10 / 45.3)

Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Emergency Coolant Recirculation).

Given the following:

- Unit 2 was operating at 100% when a LBLOCA and Loss of offsite power occurred.
- EDG 3 fails to start automatically, or manually.
- Crew is performing 2-E-1, step 18; "Initiate Evaluation of plant status."

Which one of the following::

1) Requires entry into 2-ECA-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION?
2) Requires securing the Outside Recirc Spray (OSRS) pump, 2-RS-P-2A in accordance with 2-ECA-1.1?

A. 1) Failure of 2-RS-P-2A, OSRS pump to start.
   2) Operating 2-RS-P-2A without 2-CS-P-1A, Containment Spray pump, operating.

B. 1) Failure of 2-RS-P-2A, OSRS pump to start.
   2) Containment sump level < 4.0 feet.

C. 1) Failure of 2-CS-P-1A, Containment Spray pump to start.
   2) Operating 2-RS-P-2A without 2-CS-P-1A, Containment Spray pump, operating.

D. 1) Failure of 2-CS-P-1A, Containment Spray pump to start.
   2) Containment sump level < 4.0 feet.

General Discussion

Explanation:1) E-1 step 18, Initiate Evaluation of Plant status require verification of at least one train of cold leg recirculation and at least 2 RS pumps and associated heat exchangers. With EDG 3 failure there is no power for 'B' train equipment, and If 2-RS-P-2A fails to start then there is only 2-RS-P-1A available. This requires entry into ECA-1.1. 2) If CS-P-1A fails to start then caution prior to step 8 states that operation of an OSRS pump without the associated CS pump could cause cavitation. Caution does not require securing OSRS pump. With Containment sump level < 4.0 feet step 8 does require securing the RS pumps because 4.0 feet is the minimum sump level necessary to prevent cavitation.

Tier 1, Group 1.
Learning Objective: ND-95.3-LP-10, ES-1.3, Objective B.

Answer A Discussion

1) is correct as E-1 step 18 requires at least one train of LHSI and 2 RS pumps and heat exchangers. 2) is incorrect, 2-ECA-1.1 step 8 caution states that operation of an OSRS pump without a CS pump could cause cavitation therefore this does not require securing the OSRS pump. Also ND-95.3-LP-20 trains the operator on the intent of the caution which is to alert the team to stop the affected OSRS pump if cavitation occurs.

Answer B Discussion

CORRECT

Answer C Discussion

1) is incorrect because E-1 does not require a CS pump running in step 18. 2) is incorrect, 2-ECA-1.1 step 8 caution states that operation of an OSRS pump without a CS pump could cause cavitation therefore this does not require securing the OSRS pump. Also ND-95.3-LP-20 trains the operator on the intent of the caution which is to alert the team to stop the affected OSRS pump if cavitation occurs.

Answer D Discussion

1) is incorrect because E-1 does not require a CS pump running in step 18. 2) is correct since < 4.0 feet in the containment sump, ECA-1.1, step 8 does require securing the RS pumps because 4.0 feet is the minimum sump level necessary to prevent cavitation.

Basis for meeting the KA

Must have knowledge of which additional pump failure will place the plant in a Loss of Emergency Coolant Recirculation condition, as well as the threshold for contingency actions.

Basis for Hi Cog

Must relate the conditions of a complex event to EOP entry and the correct critical parameter requiring contingency actions.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	Bank Question 822

Development References

2-E-1, Loss of Reactor or Secondary Coolant

Student References Provided

WE11 EK1.3 - Loss of Emergency Coolant Recirculation

Knowledge of the operational implications of the following concepts as they apply to the (Loss of Emergency Coolant Recirculation)
(CFR: 41.8 / 41.10 / 45.3)

Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Emergency Coolant Recirculation).

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 17..

WE12 EK1.3 - Uncontrolled Depressurization of all Steam Generators

Knowledge of the operational implications of the following concepts as they apply to the (Uncontrolled Depressurization of all Steam Generators)

(CFR: 41.8 / 41.10 / 45.3)

Annunciators and conditions indicating signals, and remedial actions associated with the (Uncontrolled Depressurization of all Steam Generators).

Initial Conditions:

- Both units were operating at 100% power.
- An earthquake caused an automatic reactor trip AND SI on Unit 2.
- All Unit 2 SGs are faulted inside containment.

Current Conditions (15 minutes):

- The team is currently in 2-ECA-2.1, UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS.
- The RO reports the following:
  - RCS cooldown rate is 105°F/hr.
  - All S/G NR levels are 5% and stable.
  - AFW flow is 200 gpm to each S/G.
  - Containment pressure is 20.5 psia.

Per the station EOP network, which ONE of the following states the correct actions to be taken by the team?

A. Throttle each S/G to 60 gpm minimum AFW flow.

B. Throttle each S/G to 100 gpm minimum AFW flow.

C. Raise AFW flow to raise S/G NR levels to >50%.

D. Maintain AFW flow >350 gpm total flow.

General Discussion

Explanation: In 2-ECA-2.1, RCS cooldown rate and S/G NR levels are evaluated. If RCS cooldown rate exceeds 100°F/hr, AFW must be throttled to the point where transition to 2-FR-H.1 will be required (60 gpm, 100 gpm if adverse) . S/G NR levels are to be maintained LESS THAN 50% in 2-ECA-2.1. If RCS cooldown rate and S/G NR levels are both below the stated limits, 2-ECA-2.1 is continued.

Tier 1 Group 1
Objective: ND-95.3-LP-22, ECA-2.1. OBJECTIVE B

Answer A Discussion

Incorrect because containment is adverse. Plausible if the Candidate confuses the AFW min flow requirement for adverse containment with non-adverse containment, which is 60 gpm.

Answer B Discussion

Correct.

Answer C Discussion

Incorrect because S/G NR levels must be maintained below (not above) 50%. Plausible if the Candidate incorrectly applies the 50% limit in 2-ECA-2.1 as a minimum level.

Answer D Discussion

Incorrect because C/D rate is >100°F/hr. Plausible because this would be the required action if the cooldown rate was < 100°F/hr.

Basis for meeting the KA

Must correlate given plant parameters to procedural requirements for safety system component operation in 2-ECA-2.1.

Basis for Hi Cog

Must interpret given indications and relate them to procedural requirements in 2-ECA-2.1.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	Bank question # 1616

Development References
2-ECA-2.1. E-0

Student References Provided

WE12 EK1.3 - Uncontrolled Depressurization of all Steam Generators

Knowledge of the operational implications of the following concepts as they apply to the (Uncontrolled Depressurization of all Steam Generators)
(CFR: 41.8 / 41.10 / 45.3)

Annunciators and conditions indicating signals, and remedial actions associated with the (Uncontrolled Depressurization of all Steam Generators).

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 18.

APE005 AA2.03 - Inoperable/Stuck Control Rod
Ability to determine and interpret the following as they apply to the Inoperable / Stuck Control Rod: (CFR: 43.5 / 45.13)
Required actions if more than one rod is stuck or inoperable ....

Initial Conditions:

- Unit 1 was at 100% power.
- Control Rod C-7 (Shutdown Bank A) partially dropped to 110 steps.

Current Conditions (50 minutes later):

- The team is stabilizing power after a Tech Spec required load reduction.
- Indicated power levels are as follows:
  - PRNI N-41 = 75.5%.
  - PRNI N-42 = 70.5%.
  - PRNI N-43 = 65.0%.
  - PRNI N-44 = 77.2%.
  - A/B/C loop ΔT = 74%.

Which ONE of the following completes the statements below?

1) Based on current conditions, power level __(1)__ satisfy the LCO requirement.
2) If Control Rod K-4 (Control Bank B) drops fully (0 steps), a manual reactor trip __(2)__ required.

A. 1) does
2) is

B. 1) does
2) is not

C. 1) does not
2) is not

D. 1) does not
2) is

General Discussion

1) For either a paritally or fully dropped Control Rod, 0-AP-1.00, Rod Control System Malfunction, is in effect. In this scenario, T.S.3.12 also requires reactor power be lowered less than 75% within one hour, which is directed by 0-AP-1.00. A caution before step 18 states Loop Delta-T is the most accurate measure of Reactor power with a mis-aligned rod, and must be monitored during the ramp and used as the basis for stabilizing power. All loop Delta-T indications below 75% satisfies the T.S.3.12 requirement; the PRNIs are not an accurate indication of power level in this case. 2) A second dropped rod requires re-evaluation of 0-AP-1.00. Step 8 directs tripping the reactor if more than one rod is affected. There is not information in the question that Tave is below 541°F (minimum temperature for critical operation stated in the caution before step 1), but a reactor trip is still required due to operator burden (per T.S.3.12 basis) and per 0-AP-1.00.

Tier 1, Group 2.
Objective: ND-93.3-LP-3D.

Answer A Discussion

CORRECT

Answer B Discussion

1) is correct. 2) is incorrect because 2 dropped rods requires a manual reactor trip per 0-AP-1.00. Plausible if the Candidate incorrectly assumes that it must be more than one fully dropped rod to require a manual reactor trip, or does not recall the requirement in 0-AP-1.00. Also plausible because there is no indication that Tave lowered below 541°F, the minimum temperature for critical operation.

Answer C Discussion

1) is incorrect but plausible if the Candidate incorrectly prioritizes PRNI indications over Loop Delta-T. 2) is incorrect because 2 dropped rods requires a manual reactor trip per 0-AP-1.00. Plausible if the Candidate incorrectly assumes that it must be more than one fully dropped rod to require a manual reactor trip, or does not recall the requirement in 0-AP-1.00. Also plausible because there is no indication that Tave lowered below 541°F, the minimum temperature for critical operation.

Answer D Discussion

1) is incorrect but plausible if the Candidate incorrectly prioritizes PRNI indications over Loop Delta-T. 2) is correct.

Basis for meeting the KA

This question sets up conditions where multiple rods are inopeble or stuck, one at a time. Evaluates the Candidates knowledge of correct instrumentation to use to correctly determine the power level required by Tech Specs. Also evaluates the required actions after a second dropped rod occurs.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
0-AP-1.00 Tech Specs

Student References Provided

APE005 AA2.03 - Inoperable/Stuck Control Rod

Ability to determine and interpret the following as they apply to the Inoperable / Stuck Control Rod: (CFR: 43.5 / 45.13)

Required actions if more than one rod is stuck or inoperable ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 19.

APE028 AK2.03 - Pressurizer (PZR) Level Control Malfunction

Knowledge of the interrelations between the Pressurizer Level Control Malfunctions and the following: (CFR 41.7 / 45.7)

Controllers and positioners ....

Given the following:

- Unit 1 is at 100% power, steady state.
- PRZR LVL CH SEL switch selected to Position 3 (CH3 / CH2).
- PRZR Level Controllers are as shown.

The operator observes a prompt rise of 1-RC-LI-1461, PRZR PROT LEVEL CH 3, indication to 63%.

- The operator announces the failure and enters 0-AP-53.00, LOSS OF VITAL INSTRUMENTATION/CONTROLS.

Which ONE of the following answers the questions below.

1) Based on the conditions given, how will the DEMAND SIGNAL for the PRZR Level controllers respond?
2) Per 0-AP-53.00, which PRZR level controller will need to be Unsaturated?

A. 1) 1-CH-LC-1459G will LOWER, and 1-CH-FC-1122C will RISE.
   2) 1-CH-LC-1459G.

B. 1) 1-CH-LC-1459G will RISE, and 1-CH-FC-1122C will LOWER.
   2) 1-CH-FC-1122C.

C. 1) 1-CH-LC-1459G will LOWER, and 1-CH-FC-1122C will RISE.
   2) 1-CH-FC-1122C.

D. 1) 1-CH-LC-1459G will RISE, and 1-CH-FC-1122C will LOWER.
   2) 1-CH-LC-1459G.

General Discussion

Explanation: With PRZR Ch Sel Switch in position 3, Channel 3 (LT-1461) is the upper channel and inputs directly into the PRZR level controller 1-CH-LC-1459G, and channel 2 (LT-1460) is the lower channel. 1) The upper channel fails from the 100% value (53.7) to 63%. This will cause the PRZR heaters to energize, and an error signal from LC-1459G. LC-1459G compares the actual level (LT-1461) to the programmed level which is generated from Tave. A failure to 63% will cause LC-1459G to lower it's output in an attempt to lower charging flow because actual level is > programmed level. FC-1122C is a reverse acting controller so the signal it receives from LC-1459G will cause it's output to rise. 2) Per 0-AP-53.00, CH-LC-1459G will need to be unsaturated.

Tier 1 Group 1
Objective: ND-93.3-LP-7-F

Answer A Discussion

Correct.

Answer B Discussion

1) Incorrect but plausible if the operator reverses controller response from the normal response. 2) Incorrect but plausible if the operator confuses which controller requires unsaturation per 0-AP-53.00.

Answer C Discussion

1) Correct. 2) Incorrect but plausible if the operator confuses which controller requires unsaturation per 0-AP-53.00.

Answer D Discussion

1) Incorrect but plausible if the operator reverses controller response from the normal response. 2) Correct.

Basis for meeting the KA

K/A requies a question that requires knowledge of how the controller respond to a failure, therefore since the question poses a failure and asks the question, "how do the two controllers respone", this question meets the K/A.

Basis for Hi Cog

Question is written at the comprehension level, because it requires the operator to analyze the conditions given and determine how the controllers will respond.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

0-AP-53.00. ND-93.3-LP-7

Student References Provided

APE028 AK2.03 - Pressurizer (PZR) Level Control Malfunction

Knowledge of the interrelations between the Pressurizer Level Control Malfunctions and the following: (CFR 41.7 / 45.7)

Controllers and positioners ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 20.

APE032 2.2.37 - Loss of Source Range Nuclear Instrumentation
APE032 GENERIC
Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Given the following:

- Unit 2 is in Refueling Shutdown with core on-load in progress.
- Reactor power is 222 cps as indicated on the Audio SR Count Drawer.
- The following alarms and indications occur:
  - 2G-A3, NIS SOURCE RNG LOSS OF DET VOLT, is LIT.
  - Audio SR Count Drawer indication is 0 cps.
  - N-31 benchboard indication is off-scale low.
  - N-32 benchboard indication is approximately 200 cps.
- Audible count rate in Unit 2 Containment has been lost.
- The team has entered 1-AP-4.00, NUCLEAR INSTRUMENTATION MALFUNCTION.

Which ONE of the following completes both statements?

1) Core off-load __(1)__.
2) To restore audible count rate in Unit 2 Containment, the actions in 1-AP-4.00 __(2)__ require I&C support.

A. 1) may continue
   2) will

B. 1) may continue
   2) will not

C. 1) must be stopped
   2) will not

D. 1) must be stopped
   2) will

General Discussion

1) Tech Spec Section 3.10 requires both SRNI channels to be operable whenever core geometry is being changed. Otherwise, refueling operations shall cease. There are other actions required if both SRNI channels are lost, such as PG isolation and racking out control rod drive MG sets. 2) 1-AP-4.00 Step 31 gives direction for restoring audible count rate in Containment if lost. There is a selector switch on the fron of the Audio Count Rate drawer and in the back of the same NI drawer. Although this requries entry into the back of the NI cabinets, this is performed by an RO; I&C support is not required. There are other actions in 1-AP-4.00 that do require I&C support, such as placing certain bistables in trip.

Tier 1, Group 2.
Objective ND-93.2-LP-2E.

Answer A Discussion

1) is incorrect but plausible if the Candidate confuses the requirement for having at least one SR channel operable whenever the reactor vessel head is unbolted, or correctly recalls that requirement and does not recall that both SR detectors must be operable during core loading. 2) is incorrect but plausible if the Candidate confuses other actions in 1-AP-4.00 that do require I&C support (placing certain bistables in trip), or if the Canddate incorrectly assumes the channel must be returned to service.

Answer B Discussion

1) is incorrect but plausible if the Candidate confuses the requirement for having at least one SR channel operable whenever the reactor vessel head is unbolted, or correctly recalls that requirement and does not recall that both SR detectors must be operable during core loading. 2) is correct.

Answer C Discussion

CORRECT

Answer D Discussion

1) is correct. 2) is incorrect but plausible if the Candidate confuses other actions in 1-AP-4.00 that do require I&C support (placing certain bistables in trip), or if the Canddate incorrectly assumes the channel must be returned to service.

Basis for meeting the KA

Must relate a single SRNI channel failure to required actions for Rod Control and Refueling systems components.

Basis for Hi Cog

Must relate given indications to Tech Spec limits. Would be low cog if the question simply asked how many detectors were required for each part.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

Tech Specs Section 3.10
1-AP-4.00, Nuclear Instrumentation Malunction

Student References Provided

APE032 2.2.37 - Loss of Source Range Nuclear Instrumentation
APE032 GENERIC
Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 21.

APE033 AK3.02 - 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)
Guidance contained in EOP for loss of intermediate range instrumentation ....

The following sequence of events occurred on Unit 1:

- Time = 1400, Reactor startup in progress with Source Range at 5×10^{3} cps.
- Time = 1401, IR N-35 has failed. Reactor Operator reports N-35 reading 1×10^{-8} amps. IR N-36 reads 1×10^{-11} amps.
- Time = 1402, The Startup is suspended and Reactor Power is 5×10^{3} cps and stable.

Based on the given sequence of events, which ONE of the following correctly completes the statements below?

1) Per 1-AP-4.00, NUCLEAR INSTRUMENTATION MALFUNCTION, the team is required to (1) .
2) If no operator actions are taken after 1402, the Source Range instruments are (2) .

A. 1) restore N-35 to operable status before power is raised above P-6
2) de-energized

B. 1) insert all rods by tripping the reactor
2) energized

C. 1) restore N-35 to operable status before power is raised above P-6
2) energized

D. 1) insert all rods by tripping the reactor
2) de-energized

C

General Discussion

Explanation: 1) With ONE intermediate range channels failed, and < 11%, AP-4.00 requires restoring the second channel to operability before raising power above P-6. 2) The source ranges require 1 out of 2 Intermediate ranges above P-6 (10 e-10 amps) to allow a manual block. It takes both intermediate ranges below the P-6 reset point (5 x 1- E-11 amps) to automatically reenergize Source Ranges.Therefore source ranges will remain energized.

Tier 1 Group 1
Objective: ND-93.2-LP-2E/F. ND-93.2-LP-3G

Answer A Discussion

1) Correct. 2) Incorrect but plausible if the operator confuses the manual action required to de-energize SR when > P6 with the impact of P-10 (automatically de-energize SR).

Answer B Discussion

1) Incorrect, but plausible if the operator confuses the actions with the loss of both IR channels. 2) Correct.

Answer C Discussion

Correct.

Answer D Discussion

11) Incorrect, but plausible if the operator confuses the actions with the loss of both IR channels. 2) Incorrect but plausible if the operator confuses the manual action required to de-energize SR when > P6 with the impact of P-10 (automatically de-energize SR).

Basis for meeting the KA

Question requires specific knowledge of AP-4.00, Nuclear Instrumentation Malfunction to answer the question.

Basis for Hi Cog

Question requires operator to apply specific knowledge of NI instrumentation to the given scenario.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	Bank question 1301

Development References
1-AP-4.00

Student References Provided

APE033 AK3.02 - 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)

Guidance contained in EOP for loss of intermediate range instrumentation ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 22

APE060 AA2.03 - Accidental Gaseous-Waste Release
Ability to determine and interpret the following as they apply to the Accidental Gaseous Radwaste: (CFR: 43.5 / 45.13)
The steps necessary to isolate a given radioactive-gas leak, using P&IDs ..

Given the following:

- Both units are at 100% power.
- Annunciator 1-RMA-D6, VENT STACK #2 PART ALERT/HI, is alarming.
- The High LED indicator is lit for 1-VG-RI-131B, VENT #2 NORMAL GAS INDICATOR.
- The team is performing 0-AP-5.20, RADIATION MONITOR SYSTEM VENTILATION VENT HIGH ALARM.

Which ONE of the following completes the questions below?

1) In accordance with 0-AP-5.20, what action will the team direct to verify the leak location?
2) If the inlet flange of 1-GW-RV-111A, SAMPLE COMPRESSOR 1-GW-C-4A SUCTION RELIEF VALVE, is verified as the leak location, where must the team send a field operator to isolate the leak?

REFERENCE PROVIDED

A. 1) Have HP sample the area for Iodine and Particulates.
   2) Fuel Building.

B. 1) Align the affected area to Filtered Exhaust.
   2) Fuel Building.

C. 1) Have HP sample the area for Iodine and Particulates.
   2) PG Pump House.

D. 1) Align the affected area to Filtered Exhaust.
   2) PG Pump House.

General Discussion

1-GW-RV-111A is located in the PG Pump House and is shown on P&ID 11448-FM-090A, Sheet 1 of 2. It discharges to the Fuel Building, as shown on P&ID 11448-FM-090A Sheet 2 of 2. A GW system leak will result in a Vent Stack Radiation Monitor alarm; the ARP will direct entry to 0-AP-5.20. This AP directs securing all unfiltered ventilation. One suspected area at a time will be aligned to filtered exhaust and the Vent Stack RM monitored to determine the location of the leak. (HP Iodine and Particulate sampling is directed if there was a failure of the Vent Stack RM in a different AP (0-AP-5.21). Referring to 11448-FM-090A Sheet 1 of 2, it can be determined that the RV suction can be isolated by closing 1-GW-745, which is between the "A" Oxygen Analyzer and the "A" WGDT Sample Compressor. Both components are located in the PG Pump House; the operator would be dispatched to that building to locate and isolate 1-GW-RV-111A.

Tier 1 Group 2
Objective: ND-93.5-LP-3D, ND-92.4-LP-1B

Answer A Discussion

1) is the incorrect action. HP sampling and obtaining results would take approximately 1 hour, significantly delaying isolation of the GW release. Plausible if the Candidate confuses the correct action for a malfunctioning Vent Stack Radiation Monitor in 0-AP-5.21. 2) is the incorrect building. Plausible if the Candidate incorrectly determines the adjacent Gaseous Waste (GW) system components to be located in an area with other GW system components. Also plausible if the Candidate confuses the inlet and outlet sides of the 1-GW-RV-111A on the P&ID, which would require going to the Fuel Building to isolate.

Answer B Discussion

1) is correct. 2) is the incorrect building. Plausible if the Candidate incorrectly determines the adjacent Gaseous Waste (GW) system components to be located in an area with other GW system components. Also plausible if the Candidate confuses the inlet and outlet sides of the 1-GW-RV-111A on the P&ID, which would require going to the Fuel Building to isolate.

Answer C Discussion

1) is the incorrect action. HP sampling and obtaining results would take approximately 1 hour, significantly delaying isolation of the GW release. Plausible if the Candidate confuses the correct action for a malfunctioning Vent Stack Radiation Monitor in 0-AP-5.21. 2) is correct.

Answer D Discussion

CORRECT.

Basis for meeting the KA

Must use P&IDs to determine major system components, to determine location of component for isolating the Waste Gas release. In concert with the P&IDs, must recall the correct abnormal procedure direction to locate the source of the Waste Gas leak.

Basis for Hi Cog

Must evaluate a given P&ID to determine adjacent major system components. Must use that information to interpret the correct location to dispatch a field operator.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
0-AP-5.20.

Student References Provided
Gaseous Waste P&IDs (2): 11448-FM-090A, Sheets 1 and 2

APE060 AA2.03 - Accidental Gaseous-Waste Release

Ability to determine and interpret the following as they apply to the Accidental Gaseous Radwaste: (CFR: 43.5 / 45.13)

The steps necessary to isolate a given radioactive-gas leak, using P&IDs ..

Remarks/Status

SPS 2021 NRC EXAM QUESTION 23

APE061 AK2.01 - Area Radiation Monitoring (ARM) System Alarms
Knowledge of the interrelations between the Area Radiation Monitoring (ARM) System Alarms and the following: (CFR 41.7 / 45.7)
Detectors at each ARM system location ....

Fuel Shuffle is being performed in the Spent Fuel pool when the following occurs:

- The following annunciators alarm simultaneously:
  - 0-RM-C3, FUEL PIT BRDG ALERT/FAILURE.
  - 0-RM-D3, 1-RM-RI-153 HIGH.
- The operator reports that Rad levels have trended to just above the HI alarm setpoint for 1-RM-RI-153 and are stable. No failure indications on the Rad monitor are evident.
- The operators in the fuel building report the following:
  - New Fuel Area Rad Monitor is also trending higher, but is not alarming.
  - Spent fuel pool level is stable at the correct level.
  - No other abnormalities noted.
- The fuel shuffle has been stopped, and the fuel assembly has been lowered to its designated storage location.
- HP has been notified.

Which ONE of the following correctly completes the following statements?

1) Per AP-22.00, FUEL HANDLING ABNORMAL CONDITIONS, <u>immediate</u> evacuation of the Fuel Building __(1)__ required?
2) The type of detector that senses radiation at the Fuel Pit Bridge is a __(2)__.

A. 1) is NOT
   2) Fixed position Ion chamber that monitors gamma radiation in the area

B. 1) is NOT
   2) Beta scintillation detector that monitors particulate activity in sample stream

C. 1) is
   2) Fixed position Ion chamber that monitors gamma radiation in the area

D. 1) is
   2) Beta scintillation detector that monitors particulate activity in sample stream

General Discussion

Explanation: 1) Per ARP 0-RM-C3, and 0-AP-22.00, once the alarm reading has been verified to be due to a high radiation condition and not a failure then the fuel building must be evacuated immediately. If the detector has failed then fuel movement is stopped but the fuel building does not need to be evacuated. 2) The Fuel Pit bridge rad monitor is a fixed ion chamber that monitors for Gamma radiation. A particulate detector uses a beta scintillation detector to count beta radiation. The Containment Radiation monitor uses this type of detector.

Tier 1 Group 1
Objective: ND-92.5-LP-1C.

Answer A Discussion

1) Incorrect but plausible because it is logical for the operator to assume that with only one RM indication alarming that evacuation is not required. Also the operator may (incorrectly) reason that evacuation is not required until another confirmatory indicator is received. 2) Correct.

Answer B Discussion

1) Incorrect but plausible because it is logical for the operator to assume that with only one RM indication alarming that evacuation is not required. Also the operator may (incorrectly) reason that evacuation is not required until another confirmatory indicator is received. 2) Incorrect but plausible because there are some Area Radiation monitors that work on this principle. The Containment rad monitors are Area Rad Monitors that work on this principle.

Answer C Discussion

Correct.

Answer D Discussion

1) Correct. 2) Incorrect but plausible because there are some Area Radiation monitors that work on this principle. The Containment rad monitors are Area Rad Monitors that work on this principle.

Basis for meeting the KA

Question requires knowledge of the type of area rad monitor in this area and actions required for an alarming condition.

Basis for Hi Cog

Question requires analysis of several conditions, both local and remote to determine actions.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

0-RM-C3. NCRODP-46-S.

Student References Provided

APE061 AK2.01 - Area Radiation Monitoring (ARM) System Alarms
Knowledge of the interrelations between the Area Radiation Monitoring (ARM) System Alarms and the following: (CFR 41.7 / 45.7)
Detectors at each ARM system location ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 24

APE067 AA1.09 - 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 fire zone panel (including detector location) ....

The following sequence of events has occurred:

- A Small Break LOCA (SBLOCA) occurred on unit 1 from 100% power.
- Multiple Fire alarms (RED) are in at the Information Management System (IMS Touchscreen) for Unit 1 Containment.
- Unit 1 Containment Fire Detection has been disabled.
- Right after disabling Containment fire detection, the "A" RCP vibration indications made a step increase.
- The team wants Containment Fire Detection re-enabled to monitor for a fire in the "A" RCP Motor Cubicle.

Based on the above conditions, which ONE of the following answers the questions below?

1) At this time, Unit 1 Containment Fire Detection can be manually re-enabled __(1)__ to check for a fire at the "A" RCP cubicle.
2) Once the conditions are clear, the fire alarms __(2)__ manually reset from the Control Room.

A. 1) at any time
   2) are not

B. 1) after 10 minutes
   2) are

C. 1) after 10 minutes
   2) are not

D. 1) at any time
   2) are

General Discussion

1) Due to adverse containment conditions during a LOCA or secondary break, Containment fire detection may be manually disabled for 10 minutes. After this time delay, detection is automatically re-enabled. If monitoring of Containment detection is desired PRIOR to the 10 minutes (ex: monitoring degraded component for fire), it may be manually re-enabled using 0-OP-ZZ-007 Attachment 13. 2) Fire alarms must be manually reset. The Control Room staff is able to do that from the IMS, per 0-OP-ZZ-007 Attachment 12.

Tier 1 Group 2
Objective: ND-92.2-LP-1C

Answer A Discussion

1) is correct. 2) is incorrect but plausible if the Candidate does not recall the guidance in 0-OP-ZZ-007 to reset fire alarms from the Control Room, assuming the local FACPs are the location where fire alarms can be addressed. The alarm can be silenced locally. Also plausible if the Candidate incorrectly determines a local reset is required, as with other station components (ex: S/G Blowdown Trip Valves in Containment after a high flow condition).

Answer B Discussion

1) is incorrect but plausible if the Candidate confuses the function of this time delay with that of others, such as Auto Start Inhibit (i.e. auto start cannot be menually reinstated until AFTER the timer has completed). 2) is correct.

Answer C Discussion

1) is incorrect but plausible if the Candidate confuses the function of this time delay with that of others, such as Auto Start Inhibit (i.e. auto start cannot be menually reinstated until AFTER the timer has completed). 2) is incorrect but plausible if the Candidate does not recall the guidance in 0-OP-ZZ-007 to reset fire alarms from the Control Room, assuming the local FACPs are the location where fire alarms can be addressed. The alarm can be silenced locally. Also plausible if the Candidate incorrectly determines a local reset is required, as with other station components (ex: S/G Blowdown Trip Valves in Containment after a high flow condition).

Answer D Discussion

CORRECT.

Basis for meeting the KA

Evaluates knowledge of functions that can be performed at the Fire Protection IMS in the Control Room, including monitoring of a fire in Containment with detection previously disabled. Misunderstanding of this concept would result in failure to monitor for a plant fire when it is available.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

0-OP-ZZ-007

Student References Provided

APE067 AA1.09 - 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 fire zone panel (including detector location) ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 25

APE076 2.2.12 - High Reactor Coolant Activity
APE076 GENERIC
Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)

Unit 1 is shutting down from 100% power per 1-GOP-2.1, UNIT SHUTDOWN POWER DECREASE FROM ALLOWABLE POWER TO < 30% POWER.

Which ONE of the following answers the questions below?

1) Assume that the ramp continues to HSD. Chemistry is notified once power drops below __(1)__ to sample for Dose Equivalent I-131.
2) Per Tech Specs the specific activity of the primary coolant shall be limited to $\leq$ __(2)__Dose Equivalent I-131.

A. 1) 85%
   2) 1.0 μCi/gm

B. 1) 70%
   2) 0.5 μCi/gm

C. 1) 70%
   2) 1.0 μCi/gm

D. 1) 85%
   2) 0.5 μCi/gm

General Discussion

Explanation: 1) Chemistry must be notified of power escalations or reductions equal to or greater than 15% within one hour. This is standard for any ramp to increase or lower power level. 2) The Tech Spec limit for RCS Activity is < 1.0 μCi/gm.

Tier 1 Group 2
Objective: ND-94.1-SP-1A

Answer A Discussion

Correct.

Answer B Discussion

1) Incorrect but plausible because a common chemistry hold is at 30%. The operator could confuse the 15% within one hour requirement with 30% and 70% chemistry hold points during a startup. 2) Incorrect because this is below the TS limit. Plausible because this is the acceptance criteria for Dose equivalent I-131. Above this value would require increased sampling and would require notificaiton of the MCR.

Answer C Discussion

1) Incorrect but plausible because a common chemistry hold is at 30%. The operator could confuse the 15% within one hour requirement with 30% and 70% chemistry hold points during a startup. 2) Correct.

Answer D Discussion

1) Correct. 2) Incorrect because this is below the TS limit. Plausible because this is the acceptance criteria for Dose equivalent I-131. Above this value would require increased sampling and would require notificaiton of the MCR.

Basis for meeting the KA

The question requires knowledge of the generic requirements regarding Chemistry performing surveillance to sample for RCS activity. This is a generic surveillance requirement because it is required for raising power, lowering power, or rapid ramps.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References	Student References Provided
1-GOP-2.1. TECH SPECS	

APE076 2.2.12 - High Reactor Coolant Activity
APE076 GENERIC
Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 26.

C

WE09 EK1.2 - Natural Circulation Operations
Knowledge of the operational implications of the following concepts as they apply to the (Natural Circulation Operations)
(CFR: 41.8 / 41.10, 45.3)
Normal, abnormal and emergency operating procedures associated with (Natural Circulation Operations).

Initial Conditions:

- Unit 1 experienced a Loss of Offsite Power from 100%.

Current Conditions: (1 hour later)

- The team is performing 1-ES-0.2, NATURAL CIRCULATION COOLDOWN.
- Power is not available to start an RCP.
- Letdown is in service.
- A controlled RCS Cooldown has been commenced.
- Hi Steam Flow Safety Injection has been BLOCKED.
- The team is preparing to depressurize the RCS to 1950 psig.

Which ONE of the following choices is correct regarding the operational restrictions on Unit 1 reaching Cold Shutdown (CSD)?

Depressurization to 1950 psig will be performed using __(1)__, and the remainder of the cooldown to CSD will be at a rate below a maximum of __(2)__.

A. 1) Auxiliary Spray
   2) 25°F/hr

B. 1) One Pressurizer PORV
   2) 10°F/hr

C. 1) Auxiliary Spray
   2) 10°F/hr

D. 1) One Pressurizer PORV
   2) 25°F/hr

General Discussion

A Natural Circ cooldown to Cold Shutdown (CSD) conditions places restrictions on plant operation, due to the increased risk of vessel head voiding. This is due to the aggregate impact of multiple complications, including loss of forced RCS flow and a partial loss of vesel head cooling (i.e. loss of a CRDM fan). 1) With a loss of Normal Spray Flow, 1-ES-0.2 prioritizes Auxiliary Spray over one Pressurizer PORV for RCS depressurization. This is if Letdown is in service. Otherwise, a Pressurizer PORV will be used. 2) Although the initial RCS C/D rate is set at less than 25F/hr, it is further reduced to less than 10F/hr based on having <3 CRDM fans running.

Tier 1 Group 2
Objective: ND-95.3-LP-5B

Answer A Discussion

1) is correct. 2) is incorrect but plausible if the Candidate does not recognize the aggregate impact of the loss of offsite power on components in the station, such as CRDM fans which provide Vessel head cooling.

Answer B Discussion

1) is incorrect but plausible if the Candidate confuses the priority in other EOPs (ex: 1-E-3) for RCS depressurization with Normal Spray flow unavailable. Also plausible if the Candidate does not recognize that Letdown is in service. In Letdown was isolated, then using one PRZR PORV would be the correct answer 2) is correct.

Answer C Discussion

CORRECT.

Answer D Discussion

1) is incorrect but plausible if the Candidate confuses the priority in other EOPs (ex: 1-E-3) for RCS depressurization with Normal Spray flow unavailable. Also plausible if the Candidate does not recognize that Letdown is in service. In Letdown was isolated, then using one PRZR PORV would be the correct answer. 2) is incorrect but plausible if the Candidate does not recognize the aggregate impact of the loss of offsite power on components in the station, such as CRDM fans which provide Vessel head cooling.

Basis for meeting the KA

Must determine the aggregate impact of a loss of offsite power on the plant's ability to reach CSD. Must integrate Natural circulation ops with limitations on RCS C/D rate to prevent Reactor vessel head voiding, and properly prioritizing the method of RCS depressurization. Understanding cooldown and depressurization limitations are an important application for a number of postulated events, meeting Tier 3.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References	Student References Provided
1-ES-0.2	

WE09 EK1.2 - Natural Circulation Operations

Knowledge of the operational implications of the following concepts as they apply to the (Natural Circulation Operations)
(CFR: 41.8 / 41.10, 45.3)

Normal, abnormal and emergency operating procedures associated with (Natural Circulation Operations).

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 27.

SYS003 A2.02 - Reactor Coolant Pump System (RCPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5/ 45.3 / 45/13)

Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP ....

Initial Conditions:

- Unit 1 Reactor startup was in progress following a Forced outage for RCP Corrective maintenance.
- Power was at 10^{-8} amps and holding for Critical Rod data.
- The crew has entered 1-AP-9.00, RCP ABNORMAL CONDITIONS, and has suspended any further power increase.

Current Conditions (10 minutes):

- The RO has plotted the most limiting 1-RC-P-1A parameters over the last 10 minutes and are as follows:

Parameter	Initial Reading	Current Reading (10 min)
Lower Thrust bearing	120 °F	155 °F
RCP Shaft vibration	12 mils	18.5 mils

Which ONE of the following completes the statements below?

1) Based on the trend given above and assuming trend continues at the same rate, the most limiting parameter is __(1)__.
2) Per plant procedures, once the most limiting component reaches its ACTION LEVEL the reactor __(2)__ required to be tripped prior to securing the RCP.

A. 1) Lower Thrust bearing
 2) is

B. 1) Lower Thrust bearing
 2) is NOT

C. 1) RCP Shaft vibration
 2) is NOT

D. 1) RCP Shaft vibration
 2) is

General Discussion

Explanation: 1) Based on the difference between the temperature/vibration rise and the initial temperatures the most limiting parameter is the RCP Shaft vibrations.
- Lower Thrust: 35 °F in 10 minutes; (3.5 °F/min). [(195 - 155) / 3.5 = 11.4 minutes]
- RCP Shaft Vibrations: 6.5 mils in 10 minutes: (.65 mils/min). [(20-18.5) / .65 = 2.3 minutes]
2) The Alert limit will be reached when the RCP shaft alert alarm annunciated at 15 mils. Per the ARP 1C-H5, once the danger limit (20 mils) is reached the reactor must be tripped. This ARP is a stand-alone procedure for this condition. Even though AP-9.00 is entered, it does not provide any explicit direction for hi vibrations. AP-9.00 allows the reactor to be shutdown or tripped per SM direction for many conditions including bearing hi temp conditions.

Tier 1 Group 1
Objective: ND-88.1-ST-6.1-C

Answer A Discussion

1) Incorrect, but plausible if the operator makes a math error or uses another limit such as the alarm setpoint (175 °F is the alarm sp). 2) Correct.

Answer B Discussion

1) Incorrect, but plausible if the operator makes a math error or uses another limit such as the alarm setpoint (175 °F is the alarm sp). 2) Incorrect but plausible because AP-9.00 does not require the reactor to be immediately tripped. The reactor can be shutdown or tripped per SM direction. This would be the correct action if the most limiting component was the Lower Thrust bearing.

Answer C Discussion

1) Correct. 2) Incorrect but plausible because AP-9.00 does not require the reactor to be immediately tripped. The reactor can be shutdown or tripped per SM direction. This would be the correct action if the most limiting component was the Lower Thrust bearing.

Answer D Discussion

Correct.

Basis for meeting the KA

Question meets the K/A because it requires the operator to interpret the indications given, to determine which is the most limiting component and the actions required to mitigate the consequence.

Basis for Hi Cog

Question requires the operator to interpret indications, calculate the rate of temp rise, and determine which component will reach their limit first.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
1-AP-9.00, ARP 1C-H5.

Student References Provided

SYS003 A2.02 - Reactor Coolant Pump System (RCPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5/ 45.3 / 45/13)

Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 28.

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:

- Unit 1 tripped from 100% power, due to an overcurrent trip of "B" RCP.
- The Unit is stabilizing at HSD and the team is in 1-ES-0.1, REACTOR TRIP RESPONSE.
- The team is at Step 1, Check RCS Temperature Control, with the following indications:
  - "A" Loop Tave = 547.8°F.
  - "B" Loop Tave = 536.6°F.
  - "C" Loop Tave = 546.9°F.
  - Steam Dumps are throttled open at 4% demand.

Based on the above conditions, which ONE of the following completes the statements below?

1) Steam dumps __(1)__ expected to be throttled open.
2) At this time, Steam Dump Control is expected to be in __(2)__ mode.

A. 1) are not
   2) Steam Pressure

B. 1) are
   2) T_{AVE}

C. 1) are
   2) Steam Pressure

D. 1) are not
   2) T_{AVE}

General Discussion

1) Automatic Steam Dump operation in Tave mode is based on the Median select Tave. Part of this selctor circuit monitors for a large deviation of one loop Tave from the other two loops (; the circuit "discards" this indication and transfers to auctioneered mode (i.e. the highest of the remaining two loop Tave indications). A loss of a single Reactor Coolant Pump (RCP) at power results in an automatic Reactor trip, with rapid cooling down of the respective loop: Tave will lower significantly below the active loops, causing a deviation large enough to discard its Tave from the other two loops. In this scenario, the auctioneered Tave is 547.8°F (vice the median 546.9°F). With this value above 547°F, there will still be a demand for the Steam Dumps to throttle open. 2) 1-ES-0.1 Step 1 only directs placing Steam Dump Mode Select in STEAM PRESS mode if there is a loss of ALL RCPs. Although a loss of a single RCP affects RCS Temperature control, it is not appropriate to switch operation out of Tave mode, nor is it directed by procedure.

Tier 2 Group 1
Objectives: ND-93.3-LP-2D and ND-93.3-LP-9F

Answer A Discussion

1) is incorrect but plausible if the Candidate does not recognize that the "B" Loop Tave will be removed from the Median Tave selector circuitry. In that case, "C" Loop Tave would be the median (INCORRECT) and Steam Dumps should be closed. If the Candidate assumes Dumps are in Steam Pressure Mode (Part 2), they would incorrectly assume the Dumps are manually throttled 4% open, vice operating automatically controlling Tave correctly. 2) Steam Pressure is incorrect but plausible if the Candidate confuses the actions in 1-ES-0.1 for a loss of ALL RCPs vice only 1 RCP.

Answer B Discussion

CORRECT.

Answer C Discussion

1) is correct. If the Candidate assumes Dumps are in Steam Pressure Mode (Part 2), they would incorrectly assume the Dumps are manually throttled 4% open (i.e. proper manual control), vice operating automatically controlling Tave correctly. 2) Steam Pressure is incorrect but plausible if the Candidate confuses the actions in 1-ES-0.1 for a loss of ALL RCPs vice only 1 RCP.

Answer D Discussion

1) is incorrect but plausible if the Candidate does not recognize that the "B" Loop Tave will be removed from the Median Tave selector circuitry. In that case, "C" Loop Tave would be the median (INCORRECT) and Steam Dumps would be closed. 2) is correct.

Basis for meeting the KA

Ties response ot Tave response in an idle loop to its impact on RCS Temperature control (i.e. Steam Dumps), as well as the requirements for Steam Dump mode of operation with a loss of a single RCP. This is required to prevent further complicating RCS Temperature control with one idle loop. Must understand the K/A requirement that "B" Loop Tave is unstable because it is a shutdown loop and that system design takes that into account by discarding the deviating Loop Tave from the median select circuit.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References	Student References Provided
1-ES-0.1 ND-93.3-LP-2D ND-93.3-LP-9F	

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

SPS 2021 NRC EXAM, QUESTION 29.

SYS004 K4.16 - Chemical and Volume Control System

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

Temperature at which the temperature control valve automatically diverts flow from the demineralizer to the VCT; reason for this diversion.

Unit 1 was operating at 100% operation when a failure occurred causing Letdown temperature to rise.

Which of the following describes:

1) At what temperature will the Letdown divert valve, 1-CH-TCV-1143 divert to the VCT?
2) What is the reason for this action?

A. 1) 145 °F.
   2) Protect Ion Exchanger resin from damage due to high Letdown line temp.

B. 1) 145 °F.
   2) Mitigate negative reactivity caused by boron release from Demins.

C. 1) 130 °F.
   2) Protect Ion Exchanger resin from damage due to high Letdown line temp.

D. 1) 130 °F.
   2) Mitigate negative reactivity caused by boron release from Demins.

General Discussion

Explanation: Letdown Line temperatures and VCT temperatures are rising slowly. Once Letdown line temperature reaches 145 °F, 1-CH-TCV-1143 will divert to the VCT which bypasses the Demins. The reason for this is to protect the Ion exchangers from high temperatures. 130 °F is the high temperature alarm setpoint for the VCT.

Tier 2 Group 1.
ND-88.3-LP-5D

Answer A Discussion

Correct.

Answer B Discussion

1) 145 deg. F. Correct. 2) Mitigate negative reactivity caused by boron release from Demins. Incorrect, TCV 1143 provides protection for excessive temperature which could cause resin decomposition. Plausible because letdown temperature increase will cause a change to boron. In this case Letdown temperatures are rising which will release boron adding negative reactivity.

Answer C Discussion

1) 130 deg. F. Incorrect, because the divert valve diverts at 145 deg. F. Plausible because this is the setpoint for ARP 1D-F1, VCT Hi temp, therefore this choice could be selected if candidate confused between VCT hi temp and Letdown Hi temp/divert setpoint. 2) Protect Ion Exchanger resin from damage due to high Letdown line temp. This is correct.

Answer D Discussion

1) 130 deg. F. Incorrect, because the divert valve diverts at 145 deg. F. Plausible because this is the setpoint for ARP 1D-F1, VCT Hi temp, therefore this choice could be selected if candidate confused between VCT hi temp and Letdown Hi temp/divert setpoint. 2) Mitigate negative reactivity caused by boron release from Demins. Incorrect, TCV 1143 provides protection for excessive temperature which could cause resin decomposition. Plausible because letdown temperature increase will cause a change to boron. In this case Letdown temperatures are rising which will release boron adding negative reactivity.

Basis for meeting the KA

Question requires knowledge of CVCS design feature that provides protection against hi letdown temperatures.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	Bank # 351

Development References

1D-G5, ND-88.3-LP-5

Student References Provided

SYS004 K4.16 - Chemical and Volume Control System

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

Temperature at which the temperature control valve automatically diverts flow from the demineralizer to the VCT; reason for this diversion.

Remarks/Status

SPS 2021 NRC EXAM QUESTION 30.

SYS005 A1.05 - Residual Heat Removal System (RHRS)

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

Detection of and response to presence of water in RHR emergency sump .

Initial Conditions:

- Unit 1 is at Cold Shutdown (CSD) in Mid-Loop operations.
- "A" RHR Pump is in service.

The following sequence of events occurred:

- Annunciator 1B-A3, CTMT SUMP HI LVL, is locked in.
- RCS temperature is 102°F and stable.
- "A" RHR Pump amps are beginning to oscillate between 23 and 26 amps.
- The STA reports RCS Level is now in the UNACCEPTABLE region, based on RCS Standpipe level indication.

Which ONE of the following choices is correct regarding the response to this event?

Based on the current conditions, the team will enter __(1)__, which will direct __(2)__ RHR system flow.

A. 1) 1-AP-16.01, SHUTDOWN LOCA
   2) lowering

B. 1) 1-AP-27.00, LOSS OF DECAY HEAT REMOVAL CAPABILITY
   2) raising

C. 1) 1-AP-16.01, SHUTDOWN LOCA
   2) raising

D. 1) 1-AP-27.00, LOSS OF DECAY HEAT REMOVAL CAPABILITY
   2) lowering

General Discussion

A loss of coolant event below 200°F meets the entry conditions for 1-AP-27.00, Loss of Decay Heat Removal Capability. Although 1-AP-16.01, Shutdown LOCA, has similar entry conditions, it is only applicable with RCS temperature >200°F. With an unacceptably low RCS level and RHR pump amps beginning to oscillate, RHR system flow must be lowered in order to stop RHR pump vortexing. Otherwise, the RHR pump must be secured, resulting in a loss of ALL decay heat removal until after RCS level is restored. Although raising RHR system flow will prevent an RCS heatup, this is a lower priority in 1-AP-27.00.

Tier 2 Group 1
Objective: ND-88.2-LP-3B

Answer A Discussion

1) is incorrect because 1-AP-16.01 is only applicable >200°F RCS temperature. Plausible because Containment Sump level indication is one of the entry conditions. Also plausible because of the titles of each AOP could cause the candidate to believe it is the correct procedure. 2) is correct.

Answer B Discussion

1) is correct. 2) is incorrect because it would result in RHR pump cavitation. Plausible if the Candidate does not understand that preventing pump cavitation is the priority over RCS heatup and that a heatup may be expected, as is reinforced in a CAUTION before step 15 of 1-AP-27.00. Also plausible if the Candidate confuses what must be done with MAKEUP flow to the RCS vice RHR system flow.

Answer C Discussion

1) is incorrect because 1-AP-16.01 is only applicable >200°F RCS temperature. Plausible because Containment Sump level indication is one of the entry conditions. Also plausible because of the titles of each AOP could cause the candidate to believe it is the correct procedure. 2) is incorrect because it would result in RHR pump cavitation. Plausible if the Candidate does not understand that preventing pump cavitation is the priority over RCS heatup and that a heatup may be expected, as is reinforced in a CAUTION before step 15 of 1-AP-27.00. Also plausible if the Candidate confuses what must be done with MAKEUP flow to the RCS vice RHR system flow.

Answer D Discussion

CORRECT.

Basis for meeting the KA

For loss of coolant into the Containment Sump, must determine the correct AOP to use, as well as the critical parameter of highest priority. Failure to do this would result in delayed response to a loss of coolant in a condition of little margin with regards to fuel cooling. Also, prioritizing a stable RCS temperature will result in RHR pump cavitation and subsequent loss, causing a loss of all decay heat removal.

Basis for Hi Cog

Must take given plant conditions and determine the correct AOP to use, as well as prioritize the most important critical parameter to stabilize.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
1-AP-27.00 1-AP-16.01

Student References Provided

SYS005 A1.05 - Residual Heat Removal System (RHRS)

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

Detection of and response to presence of water in RHR emergency sump .

Remarks/Status
SPS 2021 NRC EXAM QUESTION 31.

D

SYS006 K5.02 - Emergency Core Cooling System (ECCS)
Knowledge of the operational implications of the following concepts as they apply to ECCS: (CFR: 41.5 / 45.7)
Relationship between accumulator volume and pressure ....

ECA-0.0, LOSS OF ALL AC POWER, Step 24, directs the operator to:

"Depressurize all Intact SGs to 300 psig"

Which ONE of the following describes the reason for stopping the pressure reduction at 300 psig?

A. Prevent losing pressurizer level.

B. Minimize inventory loss out of RCP seals.

C. Prevent voiding in the Reactor Vessel upper head.

D. Prevent SI Accumulator Nitrogen injection to the RCS.

General Discussion

Explanation: SG depressurization is stopped at 300 psig to prevent N2 injection from SI accumulators. Injecting Nitrogen into the RCS could interfere with Natural Circulation which is providing decay heat removal. The step's purpose is to utilize the SI Accumalator inventory to provide a makeup to the RCS due to assumed leakage from RCP seals. This provides time to pursue restoration of power before core uncovery occurs.

Tier 2 Group 1
Objective: ND-95.3-LP-17B

Answer A Discussion

Incorrect, but plausible if candidate confuses reason for stopping with other Notes. Notes prior to referenced Step of ECA-0.0 lists loss of PRZR level as an expected occurrence, stopping of depressurization is not required.

Answer B Discussion

Incorrect, but plausible if the candidate confuses this note with other notes in ECA-0.0. SGs are depressurized at max rate to minimize inventory loss from RCP seals is true but isn't the reason for the 300 psig limit..

Answer C Discussion

.Incorrect, Note prior to Step lists upper head voiding as a condition that could be expected and not secured because of the voiding. Plausible since the Candidate may apply concept of other EOP steps in this Plant condition.

Answer D Discussion

Correct.

Basis for meeting the KA

Question requires knowledge of SI Accumulator volume and pressure, and the operational implication of reducing pressure to the point where SI Accumulator injects nitrogen into the RCS.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	Bank Question 386

Development References
1-ECA-0.0.

Student References Provided

SYS006 K5.02 - Emergency Core Cooling System (ECCS)

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

Relationship between accumulator volume and pressure ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 32.

SYS007 A1.03 - Pressurizer Relief Tank/Quench Tank System (PRTS)

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

Monitoring quench tank temperature ....

The following sequence of events have just occurred:

- Unit 1 was stable at 100% power.
- Annunciator 1C-F7, PRZR RELIEF TK HI PRESS, has just come in.
- Pressurizer Pressure is 2210 psig and lowering.
- The RO is monitoring PRZR PORV and SV tailpipe temperatures.

Which ONE of the following correctly completes the below statements?

A PORV or SV should be suspected of gross leakby if its tailpipe temperature indicates approximately __(1)__. With no operator action, the affected tailpipe temperature trend will __(2)__.

A. 1) 193°F
2) slowly rise

B. 1) 228°F
2) slowly rise then lower rapidly

C. 1) 228°F
2) slowly rise

D. 1) 193°F
2) slowly rise then lower rapidly

General Discussion

1) Annunciator 1C-F7, PRZR RELIEF TK HI PRESS, alarms at 10 psig (or 20 psia, with Containment Pressure at approximately 10 psia). Enthalpy in the PRZR vapor space is approximately 1117 BTU/lbm. With the isenthalpic process through the suspected SV, that will result in SV tailpipe temperature being at saturation for downstream pressure (i.e. PRT pressure); this is 288°F. Saturation temperature for 10 psia (failing to take Containment Pressure in to account) is 193°F. 2) There is a rupture disk on the PRT that is designed to fail at 100 psig (or 110 psia); this equates to a saturation temperature of 335°F. Once this is reached and the PRT rupture disk fails, PRT pressure will lower rapidly and, in turn, so will SV tailpipe temperature.

Answer A Discussion

1) is incorrect but plausible if the Candidate doesn't take reference pressure (CTMT press) into account when using the steam tables to determine the correct Tsat. 2) is incorrect but plausible because it is partially correct, and the Candidate fails to take the PRT rupture disk into account. The significance is that they may misinterpret the lowering tailpipe temperature as the SV reseating.

Answer B Discussion

CORRECT

Answer C Discussion

1) is correct. 2) is incorrect but plausible because it is partially correct, and the Candidate fails to take the PRT rupture disk into account. The significance is that they may misinterpret the lowering tailpipe temperature as the SV reseating.

Answer D Discussion

1) is incorrect but plausible if the Candidate doesn't take reference pressure (CTMT press) into account when using the steam tables to determine the correct Tsat. 2) is correct.

Basis for meeting the KA

Requires predicting expected temperature trend, based on expected PRT pressure trend, including knowledge of the PRT rupture disk design.

Basis for Hi Cog

Must interpret a given alarm, including reference Containment pressure, and use steam tables to determine the correct temperature. Must also determine the correct trend; the consequence is mis-diagnosing the rapidly lowering temperature after PRT disk rupture as a reseated PRZR safety valve.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

ARP 1C-F7
Steam Tables

Student References Provided

SYS007 A1.03 - Pressurizer Relief Tank/Quench Tank System (PRTS)

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

Monitoring quench tank temperature ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 33.

D

SYS008 2.4.6 - Component Cooling Water System (CCWS)
SYS008 GENERIC
Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)

The following sequence of events have just occurred:

- Unit 1 was at Cold Shutdown, Unit 2 was at 100% power.
- The teams are responding to a large leak in the Component Cooling (CC) system.
- Efforts are continuing to stop the lowering CC Surge Tank level.
- Unit 2 has tripped the reactor and is at Hot Shutdown.
- The Unit 1 team is evaluating the priority of the following APs:
  - 1-AP-15.00, LOSS OF COMPONENT COOLING.
  - 1-AP-27.00, LOSS OF DECAY HEAT REMOVAL CAPABILITY.

Which ONE of the following explains the highest priority AP to be implemented by the Unit 1 team?

A. 1-AP-15.00 is prioritized because it addresses the common cause of the loss of CC and decay heat removal capability.

B. 1-AP-15.00 is prioritized because 1-AP-27.00 does not provide guidance to isolate the leak and restore CC.

C. 1-AP-27.00 is prioritized because Unit 2 is prioritizing the Loss of CC.

D. 1-AP-27.00 is prioritized to establish alternate methods of decay heat removal.

General Discussion

A loss of CC while on RHR creates a challenge to Decay Heat removal. Restoration of Decayeat removal is a higher priority than restoration of CC itself, as is stated in a CAUTION in 1-AP-15; this directs prioritization of 1-AP-27 in this instance. A loss of CC at power creates a challenge to cooling many key station components, such as RCPs, Non-regen Heat Exchanger, etc. 1-AP-15 will address the appropriate mitigation strategy for the various challenges to plant operation.

Tier 2, Group 1.
Objective ND-88.2-LP-2C

Answer A Discussion

1-AP-15 is incorrect because 1-AP-15 prioritizes 1-AP-27 if the unit is on RHR. Plausible because the loss of CC is the common cause of the loss of CC and decat heat removal.

Answer B Discussion

1-AP-15 is incorrect because 1-AP-15 prioritizes 1-AP-27 if the unit is on RHR. Plausible because part of the distractor is correct: 1-AP-27 does NOT provide guidance on isolating the break in the CC system and restoring level.

Answer C Discussion

Incorrect but plausible because 1-AP-27 is the correct procedure. Also incorrect because 1-AP-27 would be prioritized whether or not Unit 1 was addressing the loss of CC.

Answer D Discussion

CORRECT

Basis for meeting the KA

Must determine which procedure has the appropriate mitigation strategy for a loss of CC on RHR.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
1-AP-15.00. 1-AP-27.00

Student References Provided

SYS008 2.4.6 - Component Cooling Water System (CCWS)
SYS008 GENERIC
Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
SPS 2021 NRC EXAM QUESTION 34.

SYS010 K5.01 - Pressurizer Pressure Control System (PZR PCS)

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

Determination of condition of fluid in PZR, using steam tables ....

Initial Conditions:

- Unit 1 experienced a spurious Safety Injection from 100% power.

Current Conditions:

- The team has terminated SI and is currently in 1-ES-1.1, SI Termination.
- An evaluation is being made for drawing a bubble in the Pressurizer at this time.
- The following indications exist for the Pressurizer:
  - All PRZR LEVEL PROTECT channels are 100%.
  - PRZR Temperatures is 633°F.
  - The Pressurizer has been filled solid, and pressure is at 2270 psig and stable.
- Pressurizer heater switches are as follows:
  - "B" and "C" Banks are ON (energized).
  - "A", "D", and "E" banks are in AUTO (de-energized).

Based on these indications which ONE of the following completes both statements?

1) Based on Current Conditions, what is the correct action to take with the Pressurizer Heaters?
2) If the team lowers Charging flow below Letdown flow, what is the first response of the Pressurizer?

A. 1) Place "B" and "C" Banks in AUTO
   2) A bubble will form.

B. 1) Place "B" and "C" Banks in AUTO
   2) Pressure will lower.

C. 1) Place "A", "D" and "E" Banks in ON
   2) Pressure will lower.

D. 1) Place "A", "D" and "E" Banks in ON
   2) A bubble will form.

General Discussion

After a Safety Injection (SI) with no leak path in the RCS, Pressurizer level rises rapidly and solid plant conditions are reached by the time SI termination is accomplished. 1) Energizing all heaters in a subcooled Pressurizer will not raise pressure, but only adds sensible heat to raise temperature. This is desired to aid in drawing a bubble in the Pressurizer to minimize the time of solid plant pressure control. If the Pressurizer were saturated, then turning off heaters would be the correct action with RCS pressure above normal operating pressure (2235 psig). 2) When drawing a bubble, the PZR temperature and pressure must be at saturation conditions for a bubble to be drawn. Otherwise, the subcooled PZR pressure will lower based on the mass imbalance, as will regular solid plant operations. In this scenario, PZR temperature is below saturation conditions and pressure will lower.

Tier 2 Group 1
Objective: ND-94-SP-2C

Answer A Discussion

1) is incorrect but plausible if the Candidate incorrectly focuses on the high Pressurizer Pressure and assumes securing heaters will lower pressure. In this scenario, The Pressurizer is subcooled, so it will only add sensible heat (i.e. PRZR Temperature) vice latent heat (i.e. Pressure rise). Turning off heaters will also needlessly delay drawing a bubble in the Pressurizer and etending the time of Solid Plant pressure control.
2) is incorrect but plausible if the Candidate does not account for the lowered Pressurizer temperature after filling solid, and does not utilize the Steam Tables.

Answer B Discussion

1) is incorrect but plausible if the Candidate incorrectly focuses on the high Pressurizer Pressure and assumes securing heaters will lower pressure. In this scenario, The Pressurizer is subcooled, so it will only add sensible heat (i.e. PRZR Temperature) vice latent heat (i.e. Pressure rise). Turning off heaters will also needlessly delay drawing a bubble in the Pressurizer and etending the time of Solid Plant pressure control.
2) is correct.

Answer C Discussion

CORRECT.

Answer D Discussion

1) is correct. 2) is incorrect but plausible if the Candidate does not account for the lowered Pressurizer temperature after filling solid, and does not utilize the Steam Tables.

Basis for meeting the KA

Requires use of Steam Tables to evaluate the possible implications of drawing a bubble in the Pressurizer based on given critcal parameters. Failure to apply this would result in loss of Pressurizer Pressure control; the Candidate would prove unable to determine if they would cause an undesired plant response.

Basis for Hi Cog

Must evaluate given critical parameters and use steam tables to determine the correct outcome.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

1-ES-1.1, SI Termination
Steam Tables
1-GOP-1.1

Student References Provided

SYS010 K5.01 - Pressurizer Pressure Control System (PZR PCS)
Knowledge of the operational implications of the following concepts as the apply to the PZR PCS: (CFR: 41.5 / 45.7)
Determination of condition of fluid in PZR, using steam tables ....

Remarks/Status

SPS 2021 NRC EXAM QUESTION 35.

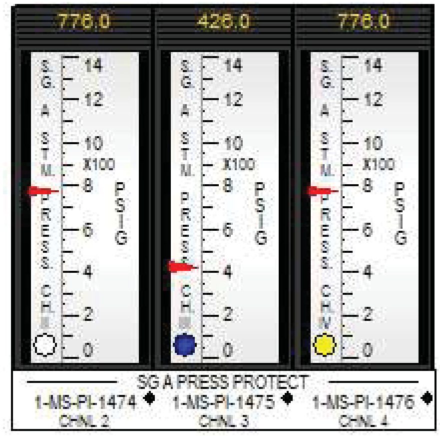
SYS012 A2.03 - Reactor Protection System (RPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

Incorrect channel bypassing ....

Initial Conditions:

- Unit 1 is operating at 100%.
- All Steam Flow and Feed Flow instruments are set to BLUE.
- Steam `pressure channel 1-MS-PI-1475 Fails as indicated.
- The operator takes manual control of 'A' Feed Reg Valve and performs 0-AP-53.00, LOSS OF VITAL INSTRUMENTATION/CONTROLS.
- "A" SG level is restored to normal.



Current Conditions:

- A technician troubleshooting the failed channel inadvertently de-energized the power for 1-MS-PI-1476 pressure channel IV.
- The technician attempted to re-energize the channel but is unable to do so.
- The reactor does NOT trip.

Assuming no operator actions which ONE of the following identifies what has happened, and what actions must be taken?

A. An ATWS has occurred since the reactor should have tripped from the SI signal generated. Trip the reactor and enter E-0 Rx Trip or SI.

B. No Reactor trip is expected for this condition. Place the second channel to trip and operation of Unit 1 may continue.

C. An ATWS has occurred since the reactor should have tripped from the SG LO Level signal. Trip the reactor and enter E-0 Rx Trip or SI.

D. No Reactor trip is expected for this condition. Unit 1 must be ramped off-line and taken to Cold Shutdown.

General Discussion

Explanation: The failure of 1-MS-PI-1475 will cause a perturbation of SG level because the low Steam pressure will cause Steam flow to lower, which in turn will cause SG level to lower. AP-53.00 actions were taken, and SG level restored to normal. Also part of AP-53.00 is to swap over to channel 4. So it can be assumed that 1-MS-PI-1476 is now supplying channel 4 steam flow. When I&C de-energized the wrong channel (channel 4) all bistables associated with Steam pressure would trip. This will result in an immediate Header to Line SI which in turn should have tripped the reactor. Header to line SI is caused by 2 of 3 MS Header pressures > 120 psi higher than 2 of 3 line pressures on 1/3 steam lines.

Tier 2 Group 1
Objective: ND-91-LP2 E/F

Answer A Discussion

Correct.

Answer B Discussion

Incorrect but plausible if the operator confuses the header to line SI logic with the HI Steam Flow SI logic. The Hi SF logic requires multiple steam lines to cause the Hi SF SI. If the operator believes it takes multiple lines to actuate SI then he may believe that there shouldn't have been a trip. If the operator does not understand the logic then he may (mistakenly believe we can have multiple steam pressure channels in trip.

Answer C Discussion

Incorrect because the header to line SI will actuate immediately. Plausible because with no operator actions, this would be correct if this was the only fault. Steam pressure failing low will cause Steam flow and subsequently SG level to lower and eventually trip.

Answer D Discussion

D.Incorrect because an ATWS did occur. Plausible because Tech specs does not allow the placing of two steam pressures to trip and the plant will need to be taken to Cold Shtdown. Placing one steam line to trip is allowed, but placing two channels to trip would constitute an 3.01 condition which would require 6 and 36 hours to Cold Shutdown.

Basis for meeting the KA

The question matches the K/A because the scenario posed is one that has an incorrect channel bypassing event regarding a Steam pressure channel. This is one of the functions (Header to Line) that would result in a reactor trip.

Basis for Hi Cog

Question requires the operator to apply knowledge in a scenario to determine the correct outcome. This requires more mental effort than simply recalling knowledge.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
ND-91-LP-5. ND-91-LP-2

Student References Provided

SYS012 A2.03 - Reactor Protection System (RPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

Incorrect channel bypassing ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 36.

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

Initial Conditions:

- Unit 1 tripped from 100% due to a loss of “A” DC Bus.
- The 1A and 1-1 DC breaker panel loads have been stripped.

Current Conditions:

- The cause for the loss of the Unit 1 “A” DC Bus has been corrected.
- The DC Bus is now being energized from the Battery Chargers.

Which ONE of the following states a reason that a specific sequence is recommended by 1-AP-10.06, LOSS OF DC POWER, when restoring power following a loss of a DC Bus?

A. To prevent actuation of safety injection.

B. To prevent overloading the associated DC Buses.

C. To prioritize restoration of letdown.

D. To prioritize Pressurizer PORV-1455C restoration.

General Discussion

When restoring a DC bus following a loss of power, 1-AP-10.06 is in effect. All circuit breakers are opened, the DC Bus re-energized, and then the breakers are closed in a sequence. Hi CLS is re-energized PRIOR to re-energizing the SI relays, since HI CLS is a de-energize to function circuit amd SI is an energize to function circuit. HI CLS is reset to clear the SI signal, then the SI circuit is powered. Performing this out of sequence results in an inadvertent SI initiation.

Tier 2 Group 1
Learning Objective:ND-90.3-LP-6D

Answer A Discussion

CORRECT

Answer B Discussion

Incorrect. Overloading the DC bus is not a concern due to limited current drawn by relays and circuits powered from the bus. Plausible if the Candidate confuses the primary concern with re-energizing AC buses.

Answer C Discussion

Incorrect. Power to individual valves is restored in the last step of the procedure (Step 20); restoration of protection circuit power has a higher priority. Plausible because this is a function that is restored, but is not the reason for the sequence.

Answer D Discussion

Incorrect. This step is permitted to be performed early out of step sequence, but is not critical in sequence. Plausible if the Candidate misapplies the OE from the TMI-2 event (loss of light indication with operable PORV), and does not recognize that PORV-1456 is still available.

Basis for meeting the KA

Must relate the DC Bus power restoration to its impact on Safety Injection circuitry. Specific to this is understanding the power supply arrangement to CLS and SI relays, whether they are energize or de-energize to function. Failure to apply this may result in inadvertent SI initiation.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	Bank Question 766

Development References

1-AP-10.06
ND-90.3-LP-6D

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

SPS 2021 NRC EXAM, QUESTION 36. (Modified from 2014 SPS NRC Exam, Q 17)

SYS022 A2.01 - Containment Cooling System (CCS)

Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; 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)

Fan motor over-current ....

Given the following:

- Unit 1 is at 100% power operation.
- The following indications occur simultaneously:
  - Annunciator 1K-E4, 480V BKR AUTO TRIP alarms.
  - The RO reports that green and amber lights for CARF 1-VS-F-1B is Lit, and CARF 1-VS-F-1A, and 1-VS-F-1C remain operating.
- The crew enters 1-AP-25.00, Loss of Containment Air cooling.

Based on these indications which ONE of the following completes both statements?

1) Following the loss of CARF 1-VS-F-1B, 1-CC-TV-110B, CARF B CLR CC RETURN TV, __(1)__ automatically CLOSE.
2) Per 1-AP-25.00, Loss of Containment Air cooling, Containment hydrogen samples __(2)__ required.

A. 1) will NOT
   2) are

B. 1) will
   2) are NOT

C. 1) will
   2) are

D. 1) will NOT
   2) are NOT

General Discussion

Explanation: 1) There is no interrel;ation between a CARF's breaker position and its associated containment isolation valve (1-CC-TV-110A/B/C); the OC trip of the CARF in this scenario will not result in auto closure of its associated TV. Other Ctmt equipment such as the Containment Sump pumps do have such an interrelationship whereby the discharge MOV is interlocked with the pump.. 2) Per 1-AP-25.00, Loss of Containment Air cooling HP is to be contacted if less than two CARFs are running to obtain local Containment H2 samples and initiate analyses. In this scenario, this is not required (two CARFs are still running).

Tier 2 Group 1
Objective: ND-88.4-LP-6D

Answer A Discussion

1) is correct. 2) Incorrect but plausible if the operator confuses the actions for at least two CARFs. In this case, two CARFs are still running, therefore H2 sampling is NOT required.

Answer B Discussion

1) Incorrect but plausible if the operator confuses this with other CTMT equipment such as the Containment Sump pumps, One of the discharge MOVs will auto close if the CTMT sump pump is secured. The candidate could also confuse this with other equipment such as the Blowdown Trip valves which close upon AFW start. 2) is correct.

Answer C Discussion

1) Incorrect but plausible if the operator confuses this with other CTMT equipment such as the Containment Sump pumps, One of the discharge MOVs will auto close if the CTMT sump pump is secured. The candidate could also confuse this with other equipment such as the Blowdown Trip valves which close upon AFW start. 2) Incorrect but plausible if the operator confuses the actions for at least two CARFs. In this case, two CARFs are still running, therefore H2 sampling is NOT required.

Answer D Discussion

Correct.

Basis for meeting the KA

This K/A is a 2-part K/A. In part 1 the K/A requires the operator to correctly determine the impact of a CARF breaker overcurrent trip on its associated support equipment (Containment Trip Valve). This matches the Tier 2 category. Part 2 of the K/A requires the operator to know the actions to correct, control or mitigate the fan trip. Part 2 of the question directly tests this by asking the operator which actions are required per 1-AP-25.00.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References	Student References Provided
1-AP-25.00. ND-88.4-LP-6D. ND-88.4-LP-5B.	

SYS022 A2.01 - Containment Cooling System (CCS)

Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; 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)

Fan motor over-current ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 38

SYS022 K2.01 - Containment Cooling System (CCS)
Knowledge of power supplies to the following: (CFR: 41.7)
Containment cooling fans ....

Unit 1 is at 100% power.

Which ONE of the following completes the following statements about the Unit 1 Containment Air Recirc Fans (CARFs)?

1) The Power supply breaker for the “A” CARF is __(1)__.
2) If a Large Break LOCA occurs, the __(2)__ CARF will remain running.

A. 1) 1-EP-BKR-14H-8
   2) “B”

B. 1) 1-EP-BKR-14H-8
   2) “C”

C. 1) 1-EP-BKR-15H8
   2) “B”

D. 1) 1-EP-BKR-15H8
   2) “C”

General Discussion

1) The Containment Air Recirc Fans are powered by the following 480v buses:
"A" CARF - 1H Bus
"B" CARF - 1J Bus
"C" CARF - 1C Bus

2) In the event of a Hi-Hi CLS (would occur after a LBLOCA), the emergency Bus powered fans will trip, leaving only the "C" CARF running. The control switches for the CARFs in the Control Room are ordered A/C/B (not A/B/C).

Tier 1 Group 1
Objective: ND-88.4-LP-6B

Answer A Discussion

1) is correct. 2) is incorrect but plausible if the Candidate confuses the power supplies for the "B" and "C" CARFs. This is plausible because the Control Room switches are arrnged in the following order: A/C/B.

Answer B Discussion

CORRECT.

Answer C Discussion

1) is incorrect but plausible if the Candidate confuses the CARF motor voltage (480v) with that of other large motors (4160v). 2) is incorrect but plausible if the Candidate confuses the power supplies for the "B" and "C" CARFs. This is plausible because the Control Room switches are arrnged in the following order: A/C/B.

Answer D Discussion

1) is incorrect but plausible if the Candidate confuses the CARF motor voltage (480v) with that of other large motors (4160v). 2) is correct.

Basis for meeting the KA

Must know correct power supplies and supply voltage of the Containment Air Recirc Fan. Must also know which power supplies strip the CARF load after a LOCA.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
ND-88.4-LP-6, Containment Ventilation

Student References Provided

SYS022 K2.01 - Containment Cooling System (CCS)
Knowledge of power supplies to the following: (CFR: 41.7)
Containment cooling fans ....

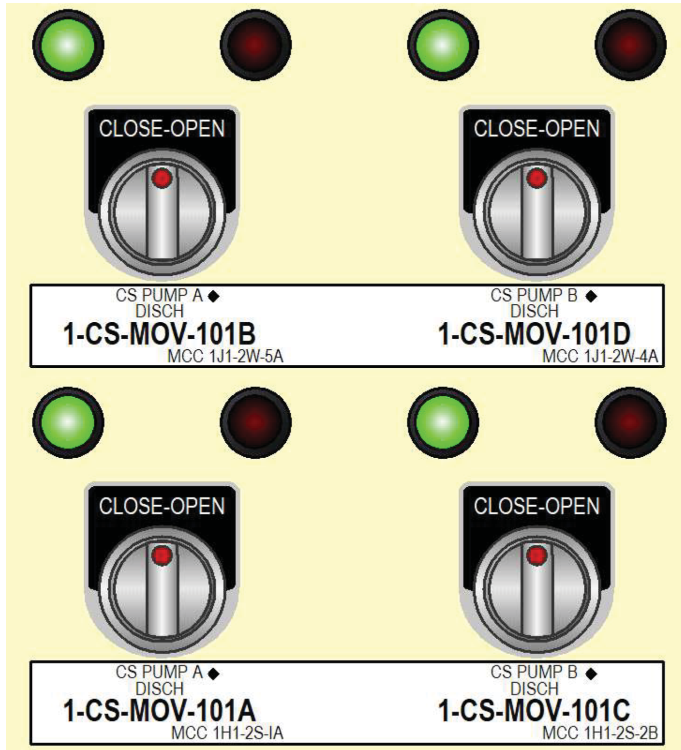
Remarks/Status
SPS 2021 NRC EXAM, QUESTION 39.

B

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

Which ONE of the following answers both questions?

1) Which Discharge MOVs have an interlock with the supply breaker <u>position</u> for 1-CS-P-1A (i.e. DISCONNECT, TEST, CONNECT)?
2) When is this interlock in effect?



A. 1) 1-CS-MOV-101A and B
   2) At all times

B. 1) 1-CS-MOV-101A and C
   2) At all times

C. 1) 1-CS-MOV-101A and C
   2) With Hi Hi CLS actuated

D. 1) 1-CS-MOV-101A and B
   2) With Hi Hi CLS actuated

General Discussion

Explanation: 1) A contact in the "close" circuit is used to ensure that the affected CS pump breaker is racked in or to "test" to allow the Bus-specific MOVs to close. The "H" Bus MOVs are interlocked with the "H" Bus CS pumps breaker, in that it cannot be closed unless respective CS pump breaker is open, racked to test or connect, and CLS is reset. 2) Although Hi Hi CLS is part of the interlock between the CS Pump discharge MOVs, the interlock with the Pump breaker position exists whether or not Hi Hi CLS is locked in.

Tier 2 Group 1
Objective: ND-91-LP-5D

Answer A Discussion

1) is incorrect because 1-CS-MOV-101B is powered by the "J" Bus. Plausible if the Condidate confuses the CS interlock, believing it is between each CS Pump and its respective discharge MOVs. 2) is correct.

Answer B Discussion

Correct.

Answer C Discussion

1) is correct. 2) is incorrect because the interlock between the CS Pump and affected MOVs exists at all times. Plausible because the discharge MOVs are also interlocked with Hi Hi CLS, in that they cannot be closed with Hi Hi CLS locked in.

Answer D Discussion

1) is incorrect because 1-CS-MOV-101B is powered by the "J" Bus. Plausible if the Condidate confuses the CS interlock, believing it is between each CS Pump and its respective discharge MOVs. 2) is incorrect because the interlock between the CS Pump and affected MOVs exists at all times. Plausible because the discharge MOVs are also interlocked with Hi Hi CLS, in that they cannot be closed with Hi Hi CLS locked in.

Basis for meeting the KA

K/A: Candidate must determine if CS valves can be manually operated based on CS pump breaker position.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
ND-91-LP-5

Student References Provided

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

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 40

SYS039 K1.02 - Main and Reheat Steam System (MRSS)

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

Atmospheric relief dump valves ....

Given the following:

- Unit 1 was manually tripped from 100% due to a non-recoverable low vacuum condition.
- Condenser Vacuum is currently 24 inches Hg and is lowering at 0.2 inches Hg/minute.
- The crew has just entered 1-ES-0.1, REACTOR TRIP RESPONSE.

Which ONE of the following answers the questions below.

1) What temperature will Tave stabilize at with NO operator action, and assuming NO change in present conditions?
2) IF a SG PORV was open and couldn't be closed from the MCR, where could the SG PORV be manually isolated?

A. 1) 547°F.
   2) Unit 1 Cable Vault room.

B. 1) 551°.F
   2) Unit 1 Aux Shutdown panel.

C. 1) 547°F.
   2) Unit 1 Aux Shutdown panel.

D. 1) 551°F.
   2) Unit 1 Cable Vault room.

General Discussion

Explanation: When condenser vacuum is < 25 inches Hg, the steam dumps are no longer in operation, therefore the SG PORVs will respond automatically to control pressure. The SG PORVs are set at 1035 psig, therefore Tave will stabilize at saturation temperature for 1035 psig which is 551°F. The SG PORVs have an emergency CLOSE keyswitch located in the Unit 1 Cable Vault room. The Pressurizer PORVs can be emergency closed from the Aux Shutdown panel.

Tier 2 Group 1
Objective: ND-93.3-LP-9E

Answer A Discussion

1) Incorrect because the steam dumps will be prevented from operation. Plausible because 547 °F is the temperature Tave normally stabilizes at and if the operator confuses Steam dump operation with SG PORV operation or believes the Steam dumps can operate at 24 inches (forgets or confuses setpoint with another ESF like Main steam trip valves). 2) Correct.

Answer B Discussion

1) Correct. 2) Incorrect, but plausible if the operator confuses the SG Porv emerg close with the Pressurizer emerg close switch which is located on aux shutdown panel.

Answer C Discussion

1) Incorrect because the steam dumps will be prevented from operation. Plausible because 547 °F is the temperature Tave normally stabilizes at and if the operator confuses Steam dump operation with SG PORV operation or believes the Steam dumps can operate at 24 inches (forgets or confuses setpoint with another ESF like Main steam trip valves). 2) Incorrect, but plausible if the operator confuses the SG Porv emerg close with the Pressurizer emerg close switch which is located on aux shutdown panel.

Answer D Discussion

Correct.

Basis for meeting the KA

SG PORVs are atmospheric dump valves that are part of the Main Steam system. Part 1 test the cause effect relationship with Tave and Steam dumps/SG PORVs. Part 2 test the physical connection (location) of the emerg CLOSE switch.

Basis for Hi Cog

Question requires use of steam tables to determine T sat for 1035 psig, therefore this is hi cog.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References	Student References Provided
ND-93.3-LP-9. 0-FCA-1.00. 1-FCA-4.00	Steam Tables

SYS039 K1.02 - Main and Reheat Steam System (MRSS)

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

Atmospheric relief dump valves ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 41.

SYS059 2.1.32 - Main Feedwater (MFW) System
SYS059 GENERIC
Ability to explain and apply system limits and precautions. (CFR: 41.10 / 43.2 / 45.12)

Given the following:

- Unit 1 is shutting down per 1-GOP-2.1, UNIT SHUTDOWN, FROM ALLOWABLE POWER TO LESS THAN 30%.
- The crew is at the step to shutdown the first Main Feed Pump, 1-FW-P-1A.
- FW PP RECIRC FCV, 1-FW-FCV-150A is CLOSED and in AUTO.

Which ONE of the following answers the questions below?

1) Per 1-GOP-2.1, what action should be taken with respect to 1-FW-FCV-150A, Feed Pump Recirc FCV immediately prior to closing the Feed Pump Discharge MOVs?
2) What is the reason for the action in Part 1?

A. 1) Check FW PP RECIRC FCV in AUTO.
   2) Prevent MFP overpressurization.

B. 1) Place FW PP RECIRC FCV in OPEN.
   2) Prevent MFP overpressurization.

C. 1) Place FW PP RECIRC FCV in OPEN.
   2) Prevent MFP overheating.

D. 1) Check FW PP RECIRC FCV in AUTO.
   2) Prevent MFP overheating.

General Discussion

Explanation: 1) Per 1-GOP-2.1 the sequence of operations for securing a Main Feed Pump are as follows:
Check or place the FW PP RECIRC VV for the selected Feed pump in OPEN.
Close the discharge MOV for the selected Main Feed pump.
Place FW PP RECIRC VV in AUTO.
Stop the OTBD, then the INBD Main Feed Pump motors.
The reason for this sequence and the reason for the Main feed pump Recirc CV is to protect the MFP from overheating during low flow conditions and allow pump coastdown when stopping the MFP.

Tier 2 Group 1
Objective: ND-89.3-LP-3E

Answer A Discussion

1) Incorrect because the procedure explicitly states that the Recirc Cv should be opened or checked open. Plausible because the FW PP RECIRC CV is designed to open on a low flow condition with CS in AUTO. Logical for the operator to assume that procedure would merely ensure the CS is in AUTO. 2) Incorrect but plausible because prior to securing the MFP the Discharge MOV is closed. Logical for the operator to believe that the reason and purpose for the Recirc CV is to prevent overpressurization.

Answer B Discussion

1) Correct. 2) Incorrect but plausible because prior to securing the MFP the Discharge MOV is closed. Logical for the operator to believe that the reason and purpose for the Recirc CV is to prevent overpressurization.

Answer C Discussion

Correct.

Answer D Discussion

1) Incorrect because the procedure explicitly states that the Recirc Cv should be opened or checked open. Plausible because the FW PP RECIRC CV is designed to open on a low flow condition with CS in AUTO. Logical for the operator to assume that procedure would merely ensure the CS is in AUTO. 2) Correct.

Basis for meeting the KA

Question relates to proper operation of the MFP Recirc CV and the reason for this operation.

Basis for Hi Cog

Question requires the operator to use knowledge of the procedure and the component design to determine correct action. Question also requires an understanding as to why a particular action is required. This also makes the question a hi cog question.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
1-GOP-2.1. ND-89.3-LP-3.

Student References Provided

SYS059 2.1.32 - Main Feedwater (MFW) System
SYS059 GENERIC
Ability to explain and apply system limits and precautions. (CFR: 41.10 / 43.2 / 45.12)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 42

SYS059 2.4.1 - Main Feedwater (MFW) System
SYS059 GENERIC
Knowledge of EOP entry conditions and immediate action steps. (CFR: 41.10 / 43.5 / 45.13)

Which Main Feedwater system event will require performing the immediate actions of 1-E-0, REACTOR TRIP OR SAFETY INJECTION?

A. Recirc valve 1-FW-FCV-150A fails open at 100% power.

B. Overcurrent fault at the 1A MFW pump inboard motor at 83% power.

C. Sensing line separates at the 1B MFW Lube Oil Pressure switches at 75% power.

D. Discharge MOV 1-FW-MOV-150A fails closed at 70% power.

General Discussion

1-AP-21.00 addresses a loss of Main Feedwater (MFW) flow and contains immediate action steps. Above 80% power, if only 1 MFW pump is running, then transition is required to 1-E-0. Each MFW pump is driven by two motors. An Overcurrent fault on only one breaker will cause the other MFW motor breaker to automatically open, resulting in a complete loss of the MFW pump. At 90% power, 1-AP-21.00 immediate actions will direct transition to 1-E-0. MFW pump recirc valve failure does not constitute a loss of a MFW pump, and any loss of a single MFW pump below 80% power will not require transition to 1-E-0.

Tier 2 Group 1
Objective: ND-89.3-LP-3E

Answer A Discussion

Incorrect because two main feedwater pumps are running with power >80%. 1-AP-21.00 will not direct transition to 1-E-0; starting an additional CN pump is required. Plausible if the Candidate misdiagnosis the failed FCV as an effective loss of the MFW pump, or confuses the MFP trip associated with the Recirc FCV not opening as designed on low flow.

Answer B Discussion

CORRECT.

Answer C Discussion

Incorrect because loss of one MFP from 75% power will not reqire transition from 1-AP-21.00 to 1-E-0. Plausible if the Candidate recalls the incorrect threshold for reactor power that requires transition to 1-E-0, or incorrectly assumes it was the only running MFP. At 70% power, both MFPs will be running per station procedures.

Answer D Discussion

Incorrect because power is below the threshold for transition from 1-AP-21.00 to 1-E-0. Plausible if the Candidate does not recall the correct power level required to transition to 1-E-0 with a loss of a single MFP, or incorrectly assumes it was the only running MFP. At 70% power, both MFPs will be running per station procedures.

Basis for meeting the KA

Evaluates proper assessment of various events and relates them to the immediate actions for a Loss of Main Feedwater (1-AP-21.00). Specifically, which event will require transition to 1-E-0, Reactor Trip or Safety Injection. Determines the generic ability of the Candidate to recognize when a reactor trip is required for various sets of conditions. Candidate must also discern the difference in the power level requirement for a loss of a single MFW pump with that for a loss of HP drain pump to choose the correct answer.

Basis for Hi Cog

Must relate given indications to the required AOP actions. From there, must determine the applicability of EOP entry.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References	Student References Provided
1-AP-21.00 ND-89.3-LP-3E	

SYS059 2.4.1 - Main Feedwater (MFW) System
SYS059 GENERIC
Knowledge of EOP entry conditions and immediate action steps. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 43

SYS061 A1.02 - Auxiliary / Emergency Feedwater (AFW) System

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

S/G pressure ....

Unit 1 is currently at HSD and is continuing to shutdown and cooldown the plant per 1-GOP-2.4, UNIT COOLDOWN, HSD TO 351°F.

As the plant is cooling down and depressurizing which ONE of the following must be done to prevent a loss of Auxiliary Feedwater due to inadequate NPSH?

A. The auto-open signal for one AFW MOV on two SGs must be defeated before S/G pressure lowers below 600 psig.

B. The auto-open signal for the AFW MOVs on one SG must be defeated before S/G pressure lowers below 600 psig.

C. The auto-open signal for the AFW MOVs on one SG must be defeated before RCS Tave lowers below 535°F.

D. The auto-open signal for one AFW MOV on two SGs must be defeated before RCS Tave lowers below 535°F.

General Discussion

Explanation: A potential exists for a loss of all AFW pumps between 350°F and HSD if only one MDAFW pump is operating and the SG pressure is too low for operation of the TDAFW pump. With one MDAFW pump supplying all SGs through six MOVs, a high flow condition could render the operating pump inoperable due to inadequate NPSH. 600 psig is the required SG pressure for the TDAFW pump to operate at full capacity.

Tier 2 Group 1
Objective:

Answer A Discussion

Incorrect because the specified parameter is 535 deg. F vice 600 psig. 600 psig is the pressure required for full TDAFW pump operation. Plausible because this is partially correct. Also incorrect for defeating the auto open signal for one AFW MOV on 2 SGs. Both AFW MOVs are in parallel and are both 100% full flow capacity. Plausible that the operator may confuse two MOVs on one SG with one MOV on two SGs.

Answer B Discussion

Incorrect because the specified parameter is 535 deg. F vice 600 psig. 600 psig is the pressure required for full TDAFW pump operation. Plausible because this is partially correct. Also plausible because this is partially correct in that both AFW MOVs for one SG must be defeated.

Answer C Discussion

Correct.

Answer D Discussion

.Incorrect because the requirement is to defeat both AFW MOVs on one SG. Both AFW MOVs are in parallel and are both 100% full flow capacity. Plausible that the operator may confuse two MOVs on one SG with one MOV on two SGs. Also this is plausible because the specified parameter for defeating the AFW MOVs is correct.

Basis for meeting the KA

Question requires knowledge of parameters to monitor for securing two MOVs to prevent inadequate NPSH at lower SG pressures.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
1-GOP-2.4. ND-89.3-LP-4

Student References Provided

SYS061 A1.02 - Auxiliary / Emergency Feedwater (AFW) System

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

S/G pressure ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 44

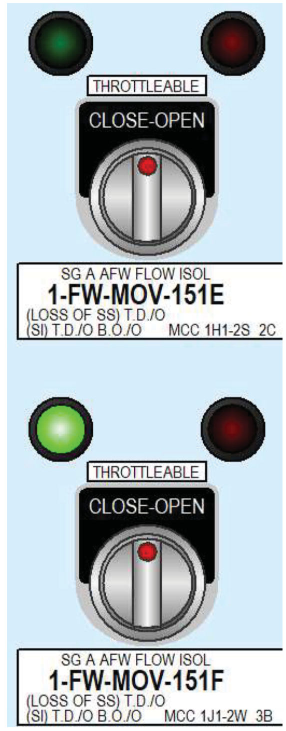
SYS061 K6.01 - Auxiliary / Emergency Feedwater (AFW) System

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

Controllers and positioners ....

Given the following:

- Unit 1 reactor just tripped from 100% power.
- The team is performing Attachment 5 of 1-ES-0.1, REACTOR TRIP RESPONSE, to establish Transient AFW Flow Control.
- As soon as the RO turned the control switch for 1-FW-MOV-151E to CLOSE, its light indication extinguished (as shown).
- 1-FW-MOV-151F was operated and indicates as shown:



Which ONE of the following answers the questions below?

1) At this time, what is the approximate Aux Feedwater Flow Indication to the “A” S/G?
2) What is the minimum number of manual valves in accordance with 1-ES-0.1, “Reactor Trip Response” that must be operated to isolate flow through 1-FW-MOV-151E?

A. 1) 350 gpm.
   2) Three.

B. 1) 175 gpm.
   2) Three.

C. 1) 175 gpm.
   2) One.

D. 1) 350 gpm.
   2) One.

General Discussion

1) Aux Feedwater (AFW) MOVs are designed that each header can provide full flow to each S/G. Both MOVs must be throttled or closed to significantly impact AFW flow to the respective S/G. Each AFW Pump has two discharge flow paths: each flows to a respective H and J Emergency Bus header (this is based on the power supplies to each set of MOVs). If an emergency bus is deenergized, three manual valves must be closed to isolate the entire header (this is directed in multiple AOPs and EOPs). If only ONE AFW MOV cannot be closed, the exact same action is required, based on the piping configuration.

Tier 2 Group 1
Objective: ND-89.3-LP-4B

Answer A Discussion

CORRECT.

Answer B Discussion

1) is incorrect but plausible if the Candidate does not recall the impact of isolating one of the two MOVs in parallel to a single S/G, assuming they are not sized to each provide full flow. 2) is correct.

Answer C Discussion

1) is incorrect but plausible if the Candidate does not recall the impact of isolating one of the two MOVs in parallel to a single S/G, assuming they are not sized to each provide full flow. 2) is incorrect but plausible if the Candidate misinterprets the steps in 1-ES-0.1 Attachment 5, incorrectly relating a single manual valve with each AFW MOV.

Answer D Discussion

1) is correct. 2) is incorrect but plausible if the Candidate misinterprets the steps in 1-ES-0.1 Attachment 5, incorrectly relating a single manual valve with each AFW MOV.

Basis for meeting the KA

Must know the impact of a single AFW MOV that will not close. Specifically, its impact on flow to the respective S/G and what is required to provide full isolation of that MOV. Failure to correctly apply this concept would result in overcooling the RCS and creating an unnecessary Header-to-Line Safety Injection.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

ND-89.3-LP-4, Auxiliary Feed System
1-ES-0.1, Reactor Trip Response

Student References Provided

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

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

Controllers and positioners ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 45

SYS062 K3.01 - AC Electrical Distribution System
Knowledge of the effect that a loss or malfunction of the ac distribution system will have on the following: (CFR: 41.7 / 45.6)
Major system loads ....

Given the following:

- Unit 1 and Unit 2 is operating at 100% power.
- A severe electrical storm is in progress.
- Both units have the "B" and "C" Condensate pumps running.
- Unit 2 experiences a spurious SI.
- Station Service Bus 1A NORM SUP BKR 15A2 spuriously trips (no Over Current trip).
  .

After 45 seconds has elapsed, which ONE of the following completes the statements below?

1) IF the operator takes 1-CN-P-1A Condensate pump handswitch to START, the pump __(1)__ start.

2) IF the operator takes 2-CN-P-1A Condensate pump handswitch to START, the pump __(2)__ start.

	Unit 1, 1-CN-P-1A	Unit 2, 2-CN-P-1A
A.	will not	will not
B.	will	will
C.	will not	will
D.	will	will not

General Discussion

Explanation: With Unit 2 experiencing a spurious SI, the station service busses on U2 will swapover to the RSSTs (25A1, B1, C1 will close). The Auto Start Inhibit (ASI) will be active for U2 components. The ASI prevents auto start of certain components for a pre-determined amount of time, BUT does not prevent manual start. 2-CN-P-1A will start once its HS is taken to START. With 15A2 spuriously tripping, swapover will occur for just that bus, and the 15A1 will close. With 15A1 and 25A1 closed the D transfer bus will Load Shed. This will prevent 1-CN-P-1A from starting until the LS is reset.

Tier 2 Group 1
Objective: ND-90.2-LP-2E

Answer A Discussion

1) 1-CN-P-1A will NOT start is correct. 2) 2-CN-P-1A will not start is Incorrect but plausible if operator believes Unit 2 Cond pump is a LOAD SHED component. This is plausible if the operator confuses the U2 Condensate pump that is load shed (2-CN-P-1C) with the Unit 1 pump that is load shed (1-CN-P-1A).

Answer B Discussion

1) 1-CN-P-1A will start is Incorrect but plausible if the operator confuses which U1 components are Load shed since the U2 Condensate pump 2-CN-P-.1A does not load shed. 2-CN-P-1C would load shed if it's station service bus was powered by the RSST. Incorrect but plausible if operator believes Unit 2 Cond pump is a LOAD SHED component. 2) 2-CN-P-1A will start is Correct.

Answer C Discussion

Correct.

Answer D Discussion

1) 1-CN-P-1A will start is Incorrect but plausible if the operator confuses which U1 components are Load shed since the U2 Condensate pump 2-CN-P-.1A does not load shed. 2-CN-P-1C would load shed if it's station service bus was powered by the RSST. Incorrect but plausible if operator believes Unit 2 Cond pump is a LOAD SHED component. 2) 2-CN-P-1A will not start is Incorrect but plausible if operator believes Unit 2 Cond pump is a LOAD SHED component. This is plausible if the operator confuses the U2 Condensate pump that is load shed (2-CN-P-1C) with the Unit 1 pump that is load shed (1-CN-P-1A).

Basis for meeting the KA

This questions tests the operator's knowledge of how the failure of the 15-A2 breaker (loss or failure of the AC distribution system) will affect the Condensate pumps on both units(effect on major system loads). Specifically this tests the operators ability to use system design of Load Shed and Auto Start Inhibit to answer the question.

Basis for Hi Cog

Question is high cog because it requires the operator to utilize their knowledge of auto start inhibit and load shed to determine the outcome.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	Bank Q # 1297

Development References	Student References Provided
ND-90.2-LP-2.	

SYS062 K3.01 - AC Electrical Distribution System
Knowledge of the effect that a loss or malfunction of the ac distribution system will have on the following: (CFR: 41.7 / 45.6)
Major system loads ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 46

SYS063 A4.01 - DC Electrical Distribution System

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

Major breakers and control power fuses ....

Given the following:

- Unit 1 was at 100%.
- A Loss of Unit 1 B DC Bus occurred.
- The team is performing the immediate actions of 1-E-0, REACTOR TRIP OR SAFETY INJECTION.

Based on the event, which ONE of the following completes both statements?

1) The Main Generator Output breakers __(1)__ automatically open.
2) After the Generator Output breakers are open, __(2)__ Reactor Coolant Pump(s) will be lost.

A. 1) will
   2) both 1B and 1C

B. 1) will not
   2) only 1B

C. 1) will not
   2) both 1B and 1C

D. 1) will
   2) only 1B

C

General Discussion

DC power is provided to 4160 VAC breakers to provide both control and trip power. 1) A loss of "B" DC Bus removes control and trip power from the "B" and "C" Station Service Buses, as well as the control and protection power that enables automatic opening of the Main Generator Output Breakers. Loss of the "A" DC Bus would do the same for the "A" Station Service Bus, but does not impact automatic operation of the Generator Output Breakers. 2) Based on the information give in Part 1), once the Main Generator Output breakers are open and excitation secured, the "B" and "C" Station Service Buses will lose power. This is due to the loss of control power to close the respective supply breakers from offsite power. As a result, the "B" and "C" RCPs will be deenergized.

Tier 2 Group 1
Objective: ND-90.3-LP-6D

Answer A Discussion

1) is incorrect but plausible if the Candidate confuses which DC bus affects auto operation of the Main Generator Output breakers. 2) is correct.

Answer B Discussion

1) is correct. 2) is incorrect but plausible if the Candidate confuses which buses are impacted by a loss of each DC bus.

Answer C Discussion

CORRECT.

Answer D Discussion

1) is incorrect but plausible if the Candidate confuses which DC bus affects auto operation of the Main Generator Output breakers. 2) is incorrect but plausible if the Candidate confuses which buses are impacted by a loss of each DC bus.

Basis for meeting the KA

Requires knowledge of the impact each DC bus has on major system breakers, such as Station Service supplies ans Generator Output breakers.. Failure to understand this concept would cause misdiagnosis and delayed implementation of corrective action in the event of a DC Bus loss.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
ND-90.3-LP-6D

Student References Provided

SYS063 A4.01 - DC Electrical Distribution System
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
Major breakers and control power fuses ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 47

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:

- 1-FW-P-3A, AFW pump 'A' is operating during a plant cooldown.
- The white breaker available light above 1-FW-P-3A extinguishes.
- An Operator is sent to investigate conditions at the breaker and he reports that both sets of Control power fuses (Closing and Trip) were checked; and only the Closing circuit control power fuse set is blown.

Which ONE of the following complete the statements below:

1) Main Control Board red/green running indication will be __(1)__.
2) If 1-FW-P-3A breaker sensed a fault condition (overcurrent) the pump __(2)__ trip.

A. 1) lost 2) would

B. 1) available 2) would not

C. 1) available 2) would

D. 2) lost 2) would not

General Discussion

Explanation: Control power provides the ability to electrically operate this 4160 V breaker and provides red/green indication. The white light above the red light for each MDAFW pump monitors breaker closing control voltage and that the breaker is racked in the "connected" position. 1) When the CLOSE ckt control power fuse blows, the ability to operate the pump from the MCR is lost. The red/green indication, pump running indication is NOT lost because those indications are provided through the trip power fuses. 2) The Trip/Ind fuses provide red/green indication and provides the power to actuate the trip coil if there is a fault condition. Therefore the pump would trip on fault.

Tier 2 Group 1
Objective: ND-89.3-LP-4D

Answer A Discussion

1) Incorrect but plausible if the operator confuses the closing power control power with a total loss of control power. Or plausible if the operator confuses what breaker component is powered by each fuse. 2) Correct.

Answer B Discussion

1) Correct. 2) Incorrect but plausible if the operator confuses the operation of a 4160 V pump with a 480 v pump which still would trip on fault condition.

Answer C Discussion

Correct.

Answer D Discussion

1) Incorrect but plausible if the operator confuses the closing power control power with a total loss of control power. Or plausible if the operator confuses what breaker component is powered by each fuse. 2) Incorrect but plausible if the operator confuses the operation of a 4160 V pump with a 480 v pump which still would trip on fault condition.

Basis for meeting the KA

Question requires the operator to have detailed understanding as to how the AFW pump operates with a partial loss of its control power.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	Bank Question # 1546

Development References

ND-89.3-LP-4

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

SPS 2021 NRC EXAM, QUESTION 48.

SYS064 K6.07 - Emergency Diesel Generator (ED/G) System
Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: (CFR: 41.7 / 45.7)
Air receivers ....

Given the following:

- Unit 1 is at 100%.
- Annunciator 1C-F6, EDG 1 TRBL, is LIT.
- The field operator just reported the following from the #1 EDG Room:
  - The LOW AIR PRESSURE light is LIT at the local control panel.
  - Bank 1 Air pressure is 190 psig and stable.
  - Bank 2 Air pressure is 160 psig and slowly lowering.
  - The supply breaker for the #2 Air Compressor motor for EDG #1 is tripped.

Based on the event, which ONE of the following completes both statements?

1) Bank 1 starting air __(1)__ sufficient to start EDG #1 if an auto start signal occurred.
2) To <u>immediately</u> restore Bank 2 starting air, the field operator must __(2)__.

A. 1) is
   2) open a cross connect valve between air banks

B. 1) is not
   2) start the Lister diesel for the #2 Air Compressor

C. 1) is not
   2) open a cross connect valve between air banks

D. 1) is
   2) start the Lister diesel for the #2 Air Compressor

General Discussion

Two independent banks for starting air are used on each EDG to engage pinions and operate starting air motors, cranking the EDG in its starting sequence. Each bank is tested on even/odd months to ensure only one bank is sufficient to start the EDG. For times where one starting air compressor is out of service, a cross connect valve exists between starting air banks (1-EG-15 for EDG #1). This valve can be operated using 1-OP-EG-003.

Tier 2 Group 1
Objective ND-90.3-LP-1B

Answer A Discussion

CORRECT.

Answer B Discussion

1) is incorrect but plausible if the Condidate confuses the reason both starting air banks engage for an EDG auto start, or does not recall the fact that only one starting air bank is used during periodic testing to crank the EDG and verify starting air system operability. 2) is incorrect because belts must be swapped from the #2 Starting Air compressor electric motor to the diesel before it can be used to restore air pressure. Plausible because the Lister Diesel is installed as a backup prime mover in the event of a loss of power to the Starting Air motors, and the Candidate does not realize other actions are required in order for the Lister diesel to be used. Also plausible if the Candidate does not recall there is the ability to cross tie starting air banks.

Answer C Discussion

1) is incorrect but plausible if the Condidate confuses the reason both starting air banks engage for an EDG auto start, or does not recall the fact that only one starting air bank is used during periodic testing to crank the EDG and verify starting air system operability. 2) is correct.

Answer D Discussion

1) is correct. 2) is incorrect because belts must be swapped from the #2 Starting Air compressor electric motor to the diesel before it can be used to restore air pressure. Plausible because the Lister Diesel is installed as a backup prime mover in the event of a loss of power to the Starting Air motors, and the Candidate does not realize other actions are required in order for the Lister diesel to be used. Also plausible if the Candidate does not recall there is the ability to cross tie starting air banks.

Basis for meeting the KA

Must determine the impact of a loss of one bank of starting air pressure on EDG auto start capability. Must also know system design to determine which mitigating action will correct the starting air malfunction.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

ND-90.3-LP-1B
0-AP-17.04

Student References Provided

SYS064 K6.07 - Emergency Diesel Generator (ED/G) System
Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: (CFR: 41.7 / 45.7)
Air receivers ....

Remarks/Status

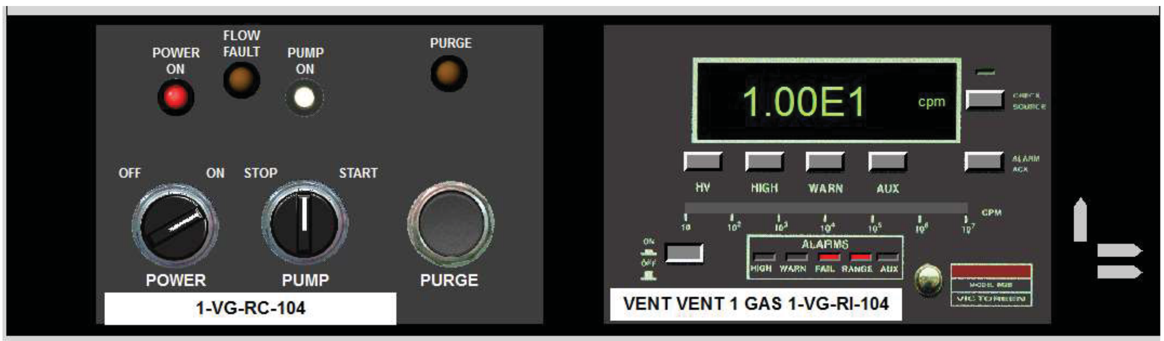
SPS 2021 NRC EXAM, QUESTION 49.

D

SYS073 K4.01 - Process Radiation Monitoring (PRM) System
Knowledge of PRM system design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Release termination when radiation exceeds setpoint ....

Given the following:

- Both Units are operating at 100%.
- Normal Ventilation lineup.
- Annunciator 0-RM-L4, VENT VENT 1 GAS ALERT/FAILURE has just alarmed.
- Indications for 1-VG-RI-104 are as shown below.



Which ONE of the following describes:

1) The effluent release path that is monitored by this radiation monitor __(1)__ be automatically isolated.
2) What type of detector failure could cause the indications shown?

A. 1) will
   2) No pulses provided by the detector for five minutes.

B. 1) will
   2) Large rise in pulses causing detector saturation.

C. 1) will not
   2) Large rise in pulses causing detector saturation.

D. 1) will not
   2) No pulses provided by the detector for five minutes.

General Discussion

1) 1-VG-RI-104 is the Vent Stack 1 Radiation Monitor. With the indications shown; alarm, and radiation monitor the student must conclude that the Rad monitor 1-VG-RI-104 has failed. There is no automatic effluent release isolation. All actions required to isolate this release path are manual actions.
2) When a fail condition occurs, other than power failure, the red fail light will be lit. There are four conditions that can cause ratemeter failure; power failure, no count failure, MPU failure, and Anti jam failure. If no pulses are received by the ratemeter for five minutes, a no count failure is detected. A no count alarm usually indicates a failure in the detector or high voltage supply. When the radiation field is too low to be measured, the indicator will read 0.00 (or downsacale value), the bargraph wil go out and range alarm light will be lit.

Tier 2 Group 1.
Objective ND-90.3-LP-1B

Answer A Discussion

1) Incorrect, but plausible to believe there are automatic isolations associated with this effluent release because other effluent releases such as the Process Vent Stack (1-GW-RI-130A, B, C) does have an automatic isolation such as WGDT Isolation. The student could confuse this Ventilation Rad Monitor with other Ventilation Radiation monitors. 2) Correct.

Answer B Discussion

1) Incorrect, but plausible to believe there are automatic isolations associated with this effluent release because other effluent releases such as the Process Vent Stack (1-GW-RI-130A, B, C) does have an automatic isolation such as WGDT Isolation. The student could confuse this Ventilation Rad Monitor with other Ventilation Radiation monitors. 2) Incorrect but plausible because large increase would cause saturation and would cause the fail light and the range light to be lit, but would provide different indications. The presence of a radiation field too high to measure would cause the detector to go into saturation (conduct continuously). The indicator would read EEEEEEE, the range alarm would be lit. Also 0-RM-M4, 1-VG-RI-104 would be alarming.

Answer C Discussion

1) Correct. 2) Incorrect but plausible because large increase would cause saturation and would cause the fail light and the range light to be lit, but would provide different indications. The presence of a radiation field too high to measure would cause the detector to go into saturation (conduct continuously). The indicator would read EEEEEEE, the range alarm would be lit. Also 0-RM-M4, 1-VG-RI-104 would be alarming.

Answer D Discussion

Correct.

Basis for meeting the KA

Question requires an understanding of Rad monitor failed indications, exactly what Effluent release path is serviced by the failed rad monitor, and knowledge of radiation monitor fault indications.

Basis for Hi Cog

Question requires the operator to analyze the indications given to determine outcome vice a simple recall question.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	Bank Question 1649

Development References

0-RM-L4, Vent Vent 1 Gas Alert/Failure. 0-AP-5.21, Radiation Monitor System Ventilation Vent Monitor Malfunction.

Student References Provided

SYS073 K4.01 - Process Radiation Monitoring (PRM) System
Knowledge of PRM system design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
Release termination when radiation exceeds setpoint ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 50

SYS073 K1.01 - Process Radiation Monitoring (PRM) System

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

Those systems served by PRMs ....

Given the following:

- A Large Break LOCA occurred on Unit 1 from 100% power.
- CLS Hi Hi Train A and B have just initiated.
- RWST Level is 96.5% and lowering.

Which ONE of the following choices is correct regarding the Unit 1 Recirc Spray Service Water Radiation Monitoring subsystem?

1) The time delay for auto-starting the associated Rad Monitor Pumps begins __(1)__.
2) The Rad Monitor pumps will pump the sample streams through <u>Process Rad Monitors</u> located in __(2)__ Safeguards basement.

A. 1) when RWST level reaches 60%
   2) Unit 2

B. 1) Immediately after CLS HI HI
   2) Unit 1

C. 1) when RWST level reaches 60%
   2) Unit 1

D. 1) immediately after CLS HI HI
   2) Unit 2

General Discussion

1) Recirc Spray Service Water Rad Monitor (RSSW RM) pumps auto-start one minute after CLS HI Hi initiation, to sample RSSW flow immediately after it is established. The Recirc Spray Pumps no not auto-start until RWST level lowers to 60% during a CLS Hi Hi. 2) The Unit 1 RSSW RM flowpath is as follows: From the Unit 1 RSSW outlet piping, to the RSSW RM pumps (in Unit Safeguards), to the RSSW Rad Monitor (in Unit 2 Safeguards), and out the Unit 2 CW discharge tunel. The Rad Monitors are located at the opposite unit to minimize false indication by the "shine" effect from Unit 1 Containment after a LBLOCA.

Tier 2, Group 1.
Objective: ND-91-LP-6C

Answer A Discussion

1) is incorrect but plausible if the Candidate confuses the auto start logic for RS pumps with RSSW pumps. Also plausible because CLS Hi Hi is part of the logic for RSSW pump start (partially correct). 2) is correct.

Answer B Discussion

1) is correct. 2) is incorrect but plausible if the Candidate does not recall which unit's concrete bunker in each Safeguards basement houses the Unit 1 RSSW RMs. Also plausible if the Candidate has a misconception about the concrete bunker; that it is suffient enough to provide shielding from Unit 1 Containment, or that it is desired to keep dose rates on the operating unit as low as possible.

Answer C Discussion

1) is incorrect but plausible if the Candidate confuses the auto start logic for RS pumps with RSSW pumps. Also plausible because CLS Hi Hi is part of the logic for RSSW pump start (partially correct). 2) is incorrect but plausible if the Candidate does not recall which unit's concrete bunker in each Safeguards basement houses the Unit 1 RSSW RMs. Also plausible if the Candidate has a misconception about the concrete bunker; that it is suffient enough to provide shielding from Unit 1 Containment, or that it is desired to keep dose rates on the operating unit as low as possible.

Answer D Discussion

CORRECT.

Basis for meeting the KA

Must know the flow path for Recirc Spray Service Water Process Rad Monitoring, must also know when RSSW sampling commences. Otherwise, if the RSSW RM pumps did not start as designed, manual actions would not be taken promptly, leading to a possible unmonitored release if a RSHX Tube leak occurred during the LBLOCA.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References	Student References Provided
ND-91-LP-6. NCRODP-13	

SYS073 K1.01 - Process Radiation Monitoring (PRM) System

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

Those systems served by PRMs ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 51.

SYS076 A3.02 - Service Water System (SWS)
Ability to monitor automatic operation of the SWS, including: (CFR: 41.7 / 45.5)
Emergency heat loads ....

Given the following:

- Unit 1 has experienced a large break LOCA from 100% power.
- Containment pressure peaked at 44.5 psia.

Which ONE of the following components will have their supporting Service Water equipment immediately reposition from the equipment's original position, as a result of the LOCA?

A. Recirculation Spray heat exchangers.

B. Component Cooling Water heat exchangers.

C. Bearing Cooling Water heat exchangers.

D. Charging Pump oil coolers.

General Discussion

Explanation: Upon receipt of a HI-HI CLS signal, the service water Recirculation cooler inlet isolation valves; MOV-SW-103A, B, C, and D open and admit SW to each cooler. MOV-SW-104/5 A, B, C, and D are normally closed and automatically open to provide SW flowpath through the RS heat exchangers. The Bearing Cooling and Component Cooling SW MOVs are normally OPEN and close on a Hi-Hi CLS in coincidence with a blackout (LOOP) signal.

Tier 2 Group 1
Objective: ND-89.5-LP-2B

Answer A Discussion

Correct.

Answer B Discussion

Incorrect. Plausible because the inlet and outlet SW valves on the CC heat exchanger close on Hi-Hi CLS signal, but only in coincidence with a blackout signal.

Answer C Discussion

Incorrect. Plausible because the inlet and outlet SW valves on the CC heat exchanger close on Hi-Hi CLS signal, but only in coincidence with a blackout signal.

Answer D Discussion

Incorrect because the Charging Pump oil cooler TCV does not receive an automatic opening signal due a LOCA. Plausible because Charging Pump Service water Pumps do receive an automatic start signal, but it is based on low SW discharge pressure only. Also plausible because each Charging Pump Service Water TCV will receive a signal to modulate open based on temperature, which will eventually occur after a LOCA due to all Charging (HHSI) Pumps auto starting on Safety Injection.

Basis for meeting the KA

The operator is required to recognize the systems that will automatically realign as a result of a Hi-Hi Containment pressure condition.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2010 SPS EXAM Q # 53

Development References
ND-89.5-LP-2

Student References Provided

SYS076 A3.02 - Service Water System (SWS)
Ability to monitor automatic operation of the SWS, including: (CFR: 41.7 / 45.5)
Emergency heat loads ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 52.

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

Given the following:

- Both units were at 100% power.
- A complete loss of offsite power to both units occurred.
- The team is evaluating the power availability of the Recirc Spray Service Water (RSSW) MOVs 1-SW-MOV-103A/B/C/D.

Which ONE of the following completes the statements below?

1) The 1H Bus supplies power to __(1)__.
2) If 1J Bus is not reenergized, a 480v J Bus ABT __(2)__ energize the remaining MOVs.

A. 1) 1-SW-MOV-103A and B
   2) will not

B. 1) 1-SW-MOV-103A and D
   2) will not

C. 1) 1-SW-MOV-103A and D
   2) will

D. 1) 1-SW-MOV-103A and B
   2) will

B

General Discussion

1) There are two Recirc Spray Service Water (RSSW) headers that supply the heat exchangers in Containment: 1-SW-MOV-103A and B supply one header, and -103C and D the other. The power supplies are arranged such that, each Emergency bus will power one MOV for EACH RSSW supply header. 1-SW-MOV-103A and D are powered by 1H Emergency bus, for example. 2) There is an ABT that can be supplied by either 1J or 2J 480v Emergency power. The purpose of this ABT is to maximize power availability for Circ Water MOV isolation is necessary. SW MOVs are not supplied by this ABT, but directly from the respective unit's 480v Emergency Bus.

Tier 2 Group 1
Opbjectives: ND-89.5-LP-2C and ND-89.5-LP-1C

Answer A Discussion

1) is incorrect but plausible if the Candidate confuses the power supply arrangement for the RSSW header MOVs. Both mark numbers for the choices ("B" and "D") are normally Train B or J Bus components. 2) is correct.

Answer B Discussion

CORRECT.

Answer C Discussion

1) is correct. 2) is incorrect but plausible if the Candidate confuses the purpose of the J Bus 480v ABT powering other MOVs in the Turbine Buildings (CW MOVs).

Answer D Discussion

1) is incorrect but plausible if the Candidate confuses the power supply arrangement for the RSSW header MOVs. Both mark numbers for the choices ("B" and "D") are normally Train B or J Bus components. 2) is incorrect but plausible if the Candidate confuses the purpose of the J Bus 480v ABT powering other MOVs in the Turbine Buildings (CW MOVs).

Basis for meeting the KA

Must know power supply arrangement to Service Water system components, including alternate power availability for J Bus components. The consequence of misunderstanding this concept will lead to misunderstanding of safety related service water availability if a design basis accident occurs.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
ND-89.5-LP-2C ND-89.5-LP-1C

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

SPS 2021 NRC EXAM, QUESTION 53.

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 ....

Unit 1 is starting up following a refueling outage, Unit 2 is at 100%.

Initial Conditions:

- Unit 1 RCS Heatup in accordance with 1-GOP-1.7, UNIT STARTUP, RCS HEATUP FROM AMBIENT TO HSD.
- 'A' S/G PORV is operating in AUTO to control RCS temperature at HSD.
- A sustained loss of the Semi-Vital Bus occurs.

Current Conditions:

- Indications lost in the Control Room include the following:
  - All RCP CC flow and temperature indications.
  - PI-IA-100, Instrument Air Rcvr Disch Press.
  - PI-IA-101, Containment Instrument Air Rcvr Disch Press.
  - PI-SA-100, Service Air Rcvr Disch Press.
- The crew has entered 1-AP-10.05, Loss of Semi-Vital Bus.

Which ONE of the following describes:

1) S/G PORV capability to control S/G pressure immediately following the Loss of the Semi-Vital Bus?
2) Alternate indication(s) available to monitor Service Air parameters?

A. 1) S/G PORVs will not control in AUTO, operator will need to operate PORVs locally.
   2) Plant Computer System (PCS).

B. 1) S/G PORVs will not control in AUTO, operator will need to operate PORVs locally.
   2) Unit 2 and local indicators.

C. 1) S/G PORVs will continue to control in AUTO for approximately 30 minutes.
   2) Plant Computer System (PCS).

D. 1) S/G PORVs will continue to control in AUTO for approximately 30 minutes.
   2) Unit 2 and local indicators.

General Discussion

Explanation: 1) S/G PORVs will remain energized by a UPS in MB-8 are powered from the Semi Vital Bus (MB-8) and will remain energized for 30 minutes. The PORVs will continue to control in automatic at the last setpoint set on the MCR Manual/Auto station. 2) 1-AP-10.05, step 17 specifies alternate indications available as Unit 2 and Local gauges.

Tier 2 Group 1
Objective: ND-92.1-LP-1B

Answer A Discussion

1) Incorrect. S/G PORVs will remain energized by a UPS in MB-8 for approximately 30 minutes. This is plausible because Attachment 4 provides steps for locally operating a S/G PORV. 2) PCS indicators (incorrect) do not provide any air pressure indications. Plausible because PCS does provide indication of many plant support systems.

Answer B Discussion

1) Incorrect. S/G PORVs will remain energized by a UPS in MB-8 for approximately 30 minutes. This is plausible because Attachment 4 provides steps for locally operating a S/G PORV. 2) Unit 2 and local indications (correct). Alternate indication for Air pressures are as listed in 1-AP-10.05 table Step 17, Page 8 of 11.

Answer C Discussion

1) Correct. 2) PCS indicators (incorrect) do not provide any air pressure indications. Plausible because PCS does provide indication of many plant support systems.

Answer D Discussion

Correct.

Basis for meeting the KA

Question specifically requires knowledge of alternate indications for Air pressure, therefore this meets the K/A.

Basis for Hi Cog

Question requires the operator to analyze the scenario to determine the correct method for controlling SG Porvs.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	Bank question # 804

Development References

1-AP-10.05, ND-92.1-LP-1.

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

SPS 2021 NRC EXAM, QUESTION 54.

SYS103 A3.01 - Containment System

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

Containment isolation ....

Initial Conditions:

- Unit 1 was operating at 100% power.
- The RO reported Pressurizer level was 45% and lowering rapidly.
- The RO completed Immediate Actions of 1-AP-16.00, Excessive RCS Leakage.
- The Crew subsequently tripped the reactor and initiated safety injection.

Current Conditions:

- RCS pressure is 1320 psig and lowering.
- Containment pressure is 20.5 psia and slowly rising.
- The BOP is performing E-0, Attachment 1, System Alignment Verification, and has identified the following valves in the OPEN position:
  - 1-SV-TV-102, AE DISCH TO CTMT TB TV.
  - 1-IA-TV-100, CTMT COMP DISCH TV.
  - 1-CC-TV-140A, RCP THERM BARR CC RTN I/S TV.
  - 1-IA-TV-101B, IA COMPR CTMT SUCT O/S TV.

Which ONE of the following sets of Containment Isolation valves should currently be CLOSED?

A. 1-IA-TV-100 and 1-IA-TV-101B.

B. 1-SV-TV-102 and 1-CC-TV-140A.

C. 1-SV-TV-102 and 1-IA-TV-101B.

D. 1-IA-TV-100 and 1-CC-TV-140A.

General Discussion

A Hi CLS (Phase 2) occurs when Containment pressure exceeds 17.7 psia. 1-SV-TV-102 and 1-IA-TV-101B automatically close on Phase 2 Containment isolation. In contrast, 1-IA-TV-100 and 1-CC-TV-140A automatically close on Phase 3 Containment isolation. This would occur at 23.0 psia (20 psia is only a threshold for using different setpoints in the EOPs for Averse Containment Conditions).

Learning Objective:ND-91-LP-3, SI Sys Operations, Objective D,

Answer A Discussion

1-IA-TV-100 is incorrect but plausible if the Candidate confuses which phase of Containment isolation affect each Containment IA valve. Also plausible if the Candidate confuses the setpoint for Phase 3 isolation with that for adverse Containment conditions. Also plausible because the answer is partially correct (1-IA-TV-101B closes on Phase 2 isolation).

Answer B Discussion

1-CC-TV-140A is incorrect but plausible if the Candidate confuses which phase of Containment isolation affect each Containment IA valve. Also plausible if the Candidate confuses the setpoint for Phase 3 isolation with that for adverse Containment conditions. Also plausible because the answer is partially correct (1-SV-TV-102 closes on Phase 2 isolation).

Answer C Discussion

CORRECT .

Answer D Discussion

1-IA-TV-100 is incorrect but plausible if the Candidate confuses which phase of Containment isolation affect each Containment IA valve. Also plausible if the Candidate confuses the setpoint for Phase 3 isolation with that for adverse Containment conditions. The same analysis applies to 1-CC-TV-140A. The reason for this choice having both incorrect valves is to provide even distribution of the valves in the question choices.

Basis for meeting the KA

Question meets the K/A because the operator has to demonstrate knowledge of Containment isolations that occur for a set of given conditions.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
E-0, Reactor Trip and Safety Injection, Att. 1 and Att.4

Student References Provided

SYS103 A3.01 - Containment System

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

Containment isolation ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 55.

SYS001 A1.08 - Control Rod Drive System

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

Verification that CRDS temperatures are within limits before starting ....

A Reactor startup is in progress on Unit 1.

- Critical Rod height data is in progress.
- CRDM Fan 1-VS-F-60A has tripped.
- The crew enters 1-AP-25.00, LOSS OF CONTAINMENT COOLING.
- Rod motion limits are being imposed until a standby CRDM Fan can be started.
- An operator has been dispatched to check the local breaker for 1-VS-F-60A.

Which ONE of the following answers the questions below?

1) Where is the Standby Fan started from?
2) Why are Rod motion limits imposed?

A. 1) Main Control Room.
   2) Erratic CERPI indication may occur.

B. 1) Locally at the breaker.
   2) Erratic Rod movement may occur.

C. 1) Locally at the breaker.
   2) Erratic CERPI indication may occur.

D. 1) Main Control Room.
   2) Erratic Rod movement may occur.

2021 NRC SPS SRO NRC Examination **QUESTION 56** **A**

General Discussion

Explanation: CRDM fans are normally operated so that there is one CRDM fan operating per Duct. When the RCS temperature is > 175 °F. One fan of each pair is normally operated to produce the required heat removal capability. 1) Start/Stop pushbuttons on the MCC for the respective fan are disabled and cannot be utilized to operate the fan. From the Control room the respective fans are paired together on the same switch/fan unit. 2) In addition to impacting containment envelope operability, loss of the containment ventilation system can impact the operability of the Rod Position indication (CERPI) subsystem. Loss of CRDM fans has caused erratic CERPI indication due to elevated temperature.

Tier 2 Group 1
Objective: ND-88.4-LP-6E

Answer A Discussion

Correct.

Answer B Discussion

1) Incorrect but plausible because there are Start/Stop pushbuttons on the MCC breaker but they are disabled. 2) Incorrect but plausible because Containment ventilation temperatures will be going up, and CRDM stepping mechanism is located in the area where temperatures will be rising.

Answer C Discussion

1) Incorrect but plausible because there are Start/Stop pushbuttons on the MCC breaker but they are disabled. 2) Correct.

Answer D Discussion

1) Correct. 2) Incorrect but plausible because Containment ventilation temperatures will be going up, and CRDM stepping mechanism is located in the area where temperatures will be rising.

Basis for meeting the KA

Question poses a scenario where temperatures are rising in the vicinity of the CRDS. Procedurally and during systems training operators are instructed as to the limiting components per design for this condition (CERPI). During rod withdrawal limitations are imposed based on elevated temperature. Therefore the question matches the intent of the K/A... What are limitations associated with operating CRDS controls.

Basis for Hi Cog

The operator must not only understand the location of controls, but also the reason for imposing rod motion limitations. Therefore this question is written at the Comprehension level.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
1-AP-25.00. ND-88.4-LP-6

Student References Provided

SYS001 A1.08 - Control Rod Drive System

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

Verification that CRDS temperatures are within limits before starting ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 56.

SYS002 K4.10 - Reactor Coolant System (RCS)
Knowledge of RCS design feature(s) and/or interlock(s) which provide for the following : (CFR: 41.7)
Overpressure protection ....

Given the following:

- Unit 1 is at Cold Shutdown (CSD).
- The Overpressure Mitigating System (OPMS) is in service.
- 1-RC-PI-1403, RC PRESS NARROW RANGE, just failed to 800 psig.

Which ONE of the following answers both questions?

1) Which Pressurizer PORV will be open?
2) What action will close the affected PORV?

A. 1) 1-RC-PCV-1455C.
2) Place PORV control switch to CLOSE.

B. 1) 1-RC-PCV-1456.
2) Place the OPMS keyswitch in DISABLE.

C. 1) 1-RC-PCV-1456.
2) Place PORV control switch to CLOSE.

D. 1) 1-RC-PCV-1455C.
2) Place the OPMS keyswitch in DISABLE.

General Discussion

1) When OPMS is in service, two separate RCS Narrow Range Pressure Transmitters provide input to the two Pressurizer PORVs: 1-RC-PT-1403 inputs to 1-RC-PCV-1455C, while 1-RC-PT-1458 inputs to 1-RC-PCV-1456. 2) OPMS is designed to actuate and prevent a Cold Overpressurization of the RCS. Part of the design is that OPMS defeats the PORV control switches' ability to manually close the respective PORV if OPMS actuation is occurring. Normally, the PORV control switches will manually close their respective PORV, even if an auto actuation is occurring. With OPMS in service, the only way to close a failed open PORV is to disable OPMS using the associated keyswitch.

Tier 2 Group 2
Objectives: ND-93.3-LP-6D and F

Answer A Discussion

1) is correct. 2) is incorrect, because OPMS is designed to protect agailnst Cold Overpressure, even defeating manual operator action. Plausible if the Candidate incorrectly assumes the PORV control switch will work the same as in any other plant condition when OPMS is not enabled.

Answer B Discussion

1) is incorrect but plausible if the Candidate which RCS Narrow Range Pressure Transmitter provides input to 1-RC-PCV-1455C when OPMS is in service. 2) is correct.

Answer C Discussion

1) is incorrect but plausible if the Candidate which RCS Narrow Range Pressure Transmitter provides input to 1-RC-PCV-1455C when OPMS is in service. 2) is incorrect, because OPMS is designed to protect agailnst Cold Overpressure, even defeating manual operator action. Plausible if the Candidate incorrectly assumes the PORV control switch will work the same as in any other plant condition when OPMS is not enabled.

Answer D Discussion

CORRECT.

Basis for meeting the KA

Evaluates knowledge of RCS Cold Overpressure protection scheme, regarding instrumentation inputs and the function of defeating the ability of manual operator action to inadvertently close a PORV after OPMS actuation.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References	Student References Provided
ND-93.3-LP-6D and F	

SYS002 K4.10 - Reactor Coolant System (RCS)
Knowledge of RCS design feature(s) and/or interlock(s) which provide for the following : (CFR: 41.7)
Overpressure protection ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 57.

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

Which ONE (1) of the following identifies (in the order presented) the normal power (480V) supplies for the following Pressurizer Heater Groups?

Group A (Backup) _____, Group B (Backup) _____, Group C (Proportional) _____.

	Group A (BU)	Group B (BU)	Group C (Prop)
A.	1H1	1A1	1B1
B.	1J1	1B1	1A1
C.	1H1	1B1	1A1
D.	1J1	1A1	1B1

General Discussion

Explanation: Group A and E are the Backup heater groups that are powered from the Emergency 480 V busses; Group A from 1J1, and Group E from 1H1. Backup heater groups B is powered from 480 V non-essential bus 1B1. The proportional heaters are powered from 480V bus 1C1.

Tier 2, Group 1
Learning Objective:ND-93.3-LP-5C

Answer A Discussion

Incorrect but plausible if the operator confuses the emergency and non-emergency bus power supplies. 480V bus 1H1 powers the 'E' group which is the other emergency powered backup heater group. Groups B and C are also the incorrect power supplies.

Answer B Discussion

Correct.

Answer C Discussion

Incorrect but plausible if the operator confuses the emergency and non-emergency bus power supplies. 480V bus 1H1 powers the 'E' group which is the other emergency powered backup heater group. The power supplies for Groups B and C are correct.

Answer D Discussion

Incorrect but plausible because the power supply for Group A is correct. The power supplies for Group B and Group C are 1B1 and 1A1 respectively.

Basis for meeting the KA

Question exactly matches the K/A because asks the operator for the normal bus power supplies to 3 of the 5 groups.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	2011 Robinson Q 57

Development References
ND-93.3-LP-5, PZR PRESS CONT.

Student References Provided

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

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 58.

SYS017 A2.02 - In-Core Temperature Monitor (ITM) System

Ability to (a) predict the impacts of the following malfunctions or operations on the ITM system; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

Core damage ....

Initial Conditions:

- Unit 1 tripped from 100%.
- The unit was stabilized at Hot Shutdown (HSD).
- The team was performing Step 2 of 1-ES-0.1, REACTOR TRIP RESPONSE.

Current Conditions:

- A Small Break Loss Of Coolant Accident (SBLOCA) occurred on Unit 1.
- The team transitioned back to 1-E-0, REACTOR TRIP OR SAFETY INJECTION.
- Multiple failures in the High Head Safety Injection (HHSI) system are resulting in a constant rise in Core Exit Thermocouple (CETC) indication.
- All RCPs have been secured.
- The Assistant RO is performing Attachment 2 of 1-E-0, REACTOR TRIP OR SAFETY INJECTION, to correct the degraded HHSI flow.

Which ONE of the following completes both statements?

1) Immediately after CETCs reach __(1)__, an ORANGE path Status Tree will be MET for 1-FR-C.2, RESPONSE TO DEGRADED CORE COOLING.
2) If 1-FR-C.2 is entered, the team will __(2)__ performing Attachment 2 of 1-E-0.

A. 1) 1200°F 2) suspend

B. 1) 700°F 2) continue

C. 1) 700°F 2) suspend

D. 1) 1200°F 2) continue

General Discussion

1) Per 0-F-2, CORE COOLING STATUS TREE, an ORANGE path is met when RCPs are secured and CETC temperature reaches 700°F. The next threshold for CETC Temperature is 1200°F. 2) Per OP-AP-104, when an ORANGE or RED path CSFST is met, all recovery procedures are suspended during performance of the applicable FR. This includes 1-E-0 attachments.

Tier 2 Group 2
Objective ND-95.3-LP-26E

Answer A Discussion

1) is incorrect but plausible because it IS a threshold CETC temperaure for Core Cooling FR entry; it is a RED path value and higher than the ORANGE path value. 2) is correct.

Answer B Discussion

1) is correct. 2) is incorrect because all recovery procedures are suspended per OP-AP-104 when an ORANGE path FR is met. Plausible if the Candidate confuses the allowance to continue 1-E-0 Attachments after transition is made to another RECOVERY procedure, not an FR.

Answer C Discussion

CORRECT.

Answer D Discussion

1) is incorrect but plausible because it IS a threshold CETC temperaure for Core Cooling FR entry; it is a RED path value and higher than the ORANGE path value. 2) is incorrect because all recovery procedures are suspended per OP-AP-104 when an ORANGE path FR is met. Plausible if the Candidate confuses the allowance to continue 1-E-0 Attachments after transition is made to another RECOVERY procedure, not an FR.

Basis for meeting the KA

Must relate Core Exit Thermocouple indication to the appropriate Core Cooling Function Restoraion transition requirement. Must also understand the overall EOP strategy to restore the Core Cooling function, to mitigate core damage.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
0-F-2 OP-AP-104 ND-95.3-LP-26E

Student References Provided

SYS017 A2.02 - In-Core Temperature Monitor (ITM) System

Ability to (a) predict the impacts of the following malfunctions or operations on the ITM system; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

Core damage ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 59.

SYS041 K6.03 - Steam Dump System (SDS)/Turbine Bypass Control
Knowledge of the effect of a loss or malfunction on the following will have on the SDS: (CFR: 41.7 / 45.7)
Controller and positioners, including ICS, S/G, CRDS ....

Initial Conditions:

- Unit 1 is operating at 100%.
- Tave and Tref are at 573 °F.
- Ch3 (P1446) is selected for Pimp.
- Pimp Ch 3 (P1446) Fails low to 40%.
- The Crew enters 0-AP-53.00, LOSS OF VITAL INSTRUMENTATION/CONTROLS.

Current Conditions:

- The crew has completed actions per 0-AP-53.00. Pimp Ch 4 is now selected.
- Power is at 100%.
- Tave and Tref are at 573 °F.
- A Turbine control malfunction causes the turbine and reactor to trip.

Which ONE of the following completes both statements?

1) Immediately after Pimp Ch 3 failed to 40% Steam Dump Demand Indicator on the Vertical Board was reading __(1)__.
2) Following the reactor and turbine trip the Steam dumps will modulate to control Tave at __(2)__.

A. 1) 0% 2) 557 °F

B. 1) 100% 2) 547 °F

C. 1) 100% 2) 557 °F

D. 1) 0% 2) 547 °F

General Discussion

Explanation: The Steam Dump Demand signal is generated by comparing actual Tavg signal to a Tref signal that is generated from PT-446 (Ch 3 Pimp). The Tref signal is linear from 547 to 573 °F. The error signal from the demand computer is developed in proportion to the difference between median Tavg and Tref. Initially with Pimp Ch 3 failing to 40%, Tref would be 557.4 °F (rounded to 557 °F). Tavg is 573 °F therefore the error is 16 degrees. The Steam Demand meter would indicate 100% with a 13 degree mismatch, therefore the initial Demand meter indicator would be 100%. The other Pimp channel does not input into the Demand computer. 2) On a load reject the dump demand signal is developed with a 5 °F deadband because rod control is designed to control this amount of error. The turbine trip mode is similar to the Load reject mode except the turbine trip is the arming mechanism, and in Turbine trip median Tave is compated to no load Tavg of 547 °F therefore P446 failure is out of the picture.

Tier 2 Group 1
Objective: ND-93.3-LP-9F

Answer A Discussion

1) Incorrect, but plausible if the operator confuses how the Steam Demand indication is generated. If the operator believes P-447 which provides arming signal must also be present to cause an indication on Steam Demand meter then this is plausible. This is logical because for any one Steam impulse pressure (1446 failing) there will be no Steam dump actuation. 2) Incorrect but plausible if the operator uses the Load reject mode and bases Tref on the failure of P446 because Tref = (.4) (26) + 547 °F which equals 557.4 °F (rounded to 557 °F).

Answer B Discussion

CORRECT.

Answer C Discussion

1) Correct. 2) Incorrect but plausible if the operator uses the Load reject mode and bases Tref on the failure of P446 because Tref=(.4) (26) + 547 °F which equals 557.4 °F (rounded to 557 °F).

Answer D Discussion

1) Incorrect, but plausible if the operator confuses how the Steam Demand indication is generated. If the operator believes P-447 which provides arming signal must also be present to cause an indication on Steam Demand meter then this is plausible. This is logical because for any one Steam impulse pressure (1446 failing) there will be no Steam dump actuation. 2) Correct.

Basis for meeting the KA

Matches the K/A because this question poses a fault in one of the Pimp channels that is used to generate Tref. Question requires the operator to fully understand the difference between Load Reject and Turbine trip modes with a failure that affects Steam Dump operation.

Basis for Hi Cog

Operator must analyze the failure and determine outcome, this includes effects on Stm Dump Demand Meter, and Steam Dump System.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
ND-93.3-LP-9. 0-AP-53.00

Student References Provided

SYS041 K6.03 - Steam Dump System (SDS)/Turbine Bypass Control
Knowledge of the effect of a loss or malfunction on the following will have on the SDS: (CFR: 41.7 / 45.7)
Controller and positioners, including ICS, S/G, CRDS ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 60.

SYS045 A4.01 - Main Turbine Generator (MT/G) System
Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8)
Turbine valve indicators (throttle, governor, control, stop, intercept), alarms, and annunciators ....

Given the following:

- Unit 1 is performing a Main Turbine startup per 1-OP-TM-001, TURBINE – GENERATOR STARTUP TO 20% - 25% TURBINE POWER.
- The team has just commenced latching the Main Turbine.
- The LATCH pushbutton has been depressed.
- The LATCH pushbutton is now backlit.
- Annunciator 1G-A5, VAC TRIP LATCH ACTUATED, is LIT.

Which ONE of the following completes both statements?

1) When the Turbine is latched, the __(1)__ are expected to remain closed.
2) After the LATCH pushbutton is released, Annunciator 1G-A5 will be __(2)__.

A. 1) Governor valves ONLY
   2) NOT LIT

B. 1) Governor AND Intercept valves
   2) NOT LIT

C. 1) Governor valves ONLY
   2) LIT

D. 1) Governor AND Intercept valves
   2) LIT

General Discussion

1) 1-OP-TM-001 is the procedure used to latch the Main Turbine. It outlines the expected response of the Turbine Control System after the turbine is successfully latched. Latching the turbine opens all Turbine control valves except for the Governor valves. Although the Intercept valves are on the same EH fluid header as the governor valves, they will be allowed to open as well during latching. 2) When the LATCH pushbutton is released, it is expected that annunciator 1G-A5 clears and the LATCH pushbutton remains lit. If 1G-A5 does not clear, it is indicative of a stuck 33/RO switch, which is defeating turbine trip SOVs in order to raise EH pressure to latch the turbine.

Tier 2 Group 2
Objective: ND-93.2-LP-2C

Answer A Discussion

CORRECT.

Answer B Discussion

1) is incorrect but plausible if the Candidate confuses the effect of a signal that depressurizes the EH Governor Valve header (OPC); this is not the case in this scenario. 2) is correct.

Answer C Discussion

1) is correct. 2) is incorrect but plausible if the Candidate confuses the impact of Latching the Turbine on the LATCH pushbutton vice the Latch Actuated annuunciator.

Answer D Discussion

1) is incorrect but plausible if the Candidate confuses the effect of a signal that depressurizes the EH Governor Valve header (OPC); this is not the case in this scenario. 2) is incorrect but plausible if the Candidate confuses the impact of Latching the Turbine on the LATCH pushbutton vice the Latch Actuated annuunciator.

Basis for meeting the KA

Directly related to expected Control Room indications and alarms when latching the Main Turbine. There have been various Turbine control valve failures (most recent January 25, 2021 on Unit 2), so it is important to verify proper control valve operation. Also important based on Surry OE with a stuck 33RO snap switch (used to reset Turbine Trip SOVs). Identifying the failure of the annunciator to reset directed the team to correct the 3RO switch issue, preventing operating the turbine with turbine trip SOVs defeated.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

1-OP-TM-001
ND-92.3-LP-2C
ND-89.2-LP-6B

Student References Provided

SYS045 A4.01 - Main Turbine Generator (MT/G) System

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

Turbine valve indicators (throttle, governor, control, stop, intercept), alarms, and annunciators ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 61.

SYS055 2.2.44 - Condenser Air Removal System (CARS)
SYS055 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)

Initial Conditions:

- Unit 1 is at 100% power.
- The following indications are observed:
- Condenser vacuum is 27.3 in Hg and worsening.
  - All waterbox outlet temperatures are 86°F and stable.
  - Gen MW is 890.6 and lowering.
- Both Turbine Building operators are investigating

Curent Conditions (7 minutes later):

- The team is performing 1-AP-14.00, LOSS OF MAIN CONDENSER VACUUM.
- BOP reports:
  - Condenser Vacuum is now 26.5 in Hg, and slowly lowering.
  - Water box temperatures remain at 86°F and stable.
  - No alarms are lit.

Which ONE of the following statements are correct regarding operator actions per 1-AP-14.00, Loss of Main Condenser Vacuum?

1) The Condenser Hoggers __(1)__ be placed in service.
2) Per 1-AP-14.00, if Condenser vacuum lowers to __(2)__ the Turbine must be immediately tripped.

A. 1) should not
2) 25 in Hg

B. 1) should
2) 25 in Hg

C. 1) should not
2) 22.5 in Hg

D. 1) should
2) 22.5 in Hg

General Discussion

Explanation: 1) AP-14.00 directs the Hoggers to be placed in service if Condenser is greater than 25 in Hg. Hoggers should be effective for this scenario (air in leakage). If the loss of vacuum is due to inadequate heat sink then hoggers will be ineffective. There are no indications given that would indicate the heat sink (Condenser water boxes) are inadequate. 2) AP-14.00 states that the Turbine must be tripped if vacuum lowers to 22.5 in Hg.

Tier 2 Group 2
Objective: NP-89.3-LP-2E

Answer A Discussion

1) Incorrect but plausible if the operator confuses when the hoggers will be effective. AP-14.00 states that the hoggers will be ineffective if the cause of the vacuum loss in inadequate heat sink. There are no indications given that would indicate the heat sink (Condenser water boxes) are inadequate . 2) AP-14.00 states that the turbine must be tripped if vacuum lowers to 22.5 in Hg. 25 in Hg is plausible because that is when the low condenser vacuum alarms, and that is also when Steam dumps will be automatically disabled.

Answer B Discussion

1) Correct. 2) AP-14.00 states that the turbine must be tripped if vacuum lowers to 22.5 in Hg. 25 in Hg is plausible because that is when the low condenser vacuum alarms, and that is also when Steam dumps will be automatically disabled.

Answer C Discussion

1) Incorrect but plausible if the operator confuses when the hoggers will be effective. AP-14.00 states that the hoggers will be ineffective if the cause of the vacuum loss in inadequate heat sink. There are no indications given that would indicate the heat sink (Condenser water boxes) are inadequate. 2) Correct.

Answer D Discussion

Correct.

Basis for meeting the KA

Question requires the operator to interpret the indications given and determine if hoggers should be started or not.

Basis for Hi Cog

Question requires the operator to interpret the indications given and determine if hoggers should be started or not.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
1-AP-14.00

Student References Provided

SYS055 2.2.44 - Condenser Air Removal System (CARS)

SYS055 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
SPS 2021 NRC EXAM, QUESTION 62.

SYS056 K1.03 - Condensate System

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

MFW . ...

Given the following:

- Unit 1 is at 100% power.
- CALCALC Shift Average Power and Instantaneous Power are 99.91% and stable.
- CALCALC is based on the Ultrasonic detectors (UFM)
- The Condensate Polishing Building operator has just been briefed to place a Unit 1 Polisher vessel in Extended Service Rinse.

Which ONE of the following answers both statements to verify the correct evolution was performed on Unit 1?

1) Unit 1 Main Feedwater Pump Suction Pressure will __(1)__.
2) Unit 1 CALCALC Instantaneous Power will initially __(2)__.

A. 1) lower
   2) rise

B. 1) rise
   2) lower

C. 1) rise
   2) rise

D. 1) lower
   2) lower

General Discussion

There are 7 Condensate Polishing (CP) Demineralizers in parallel that are part of the Main Condensate flow path. At 100% power, there are normally 6 of the 7 CP demins in service. Each demin is periodically removed from service, regenerated, and returned to service. Part of the return to service is plaing the Demin in a service rinse, which recirculates flow through the vessel, back to the Main Condenser (CN Pump suction), in order to restore chemistry to within specifications before forward flow to the S/Gs. When a Demin is placed in Service Rinse, the recirc flow causes a drop in CN header pressure, and subsequently a drop in FW Pump suction pressure. This will cause a temporary drop in Feed flow through the UFM detectors and an initial drop in the CALCALC 10 minute average power level.

Tier 2 Group 2
Objective: ND-89.4-LP-1D

Answer A Discussion

LOWER;RISE is incorrect but plausible if the Candidate confuses the parameter changes that would result from a different event on the secondary plant (ex: Failure that would cause a Main Feedwater Regulating Valve to modulate open).

Answer B Discussion

LOWER;RISE is incorrect but plausible if the Candidate confuses the parameter changes that would result from a different event on the secondary plant (ex: Failure that would cause a Main Feedwater Regulating Valve to modulate closed).

Answer C Discussion

RISE;RISE is incorrect but plausible because these would be indications if Polisher were removed from service.

Answer D Discussion

CORRECT.

Basis for meeting the KA

Must relate a Condensate System evolotion to its impact on the Main Feedwater System parameters, including Feedwater based Calorimetric power. This is important, because evolutions occur simultaneously on both units in the Condensate Polishing building. The Candidate must be able to use critical parameter changes to ensure the correct evolution is being performed on their unit.

Basis for Hi Cog

Must predict critical parameter response from different Condensate evolutions to determine the correct set of parameter changes.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

NCRODP-61B
ND-89.4-LP-1D

Student References Provided

SYS056 K1.03 - Condensate System
Knowledge of the physical connections and/or cause-effect relationships between the Condensate System and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)
MFW . ...

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 63.

SYS068 K5.04 - Liquid Radwaste System (LRS)

Knowledge of the operational implication of the following concepts as they apply to the Liquid Radwaste System: (CFR: 41.5 / 45.7)
Biological hazards of radiation and the resulting goal of ALARA ....

A High Integrity Container (HIC) filled with Liquid resin is enroute to the Surry Radwaste Facility (SRF) for final processing.

- During the transfer the HIC is dropped causing spillage of approximately 50 gallons of radioactive liquid waste resin in the decon building.
- HP reports there is airborne contamination in the vicinity and asks that the use of SCBAs be evaluated.
- HP reports dose rates on contact with the spill as **7000 mRem/hour** external Beta/Gamma.
- HP has stated that if respirators are **NOT** worn, the **internal dose rate is 6000 mRem/hr** while performing cleanup operations; this dose rate is in addition to the radiation field of **7000 mRem/hr** in the vicinity of the liquid waste.
- All dose received by the operators has been from Surry.
- The time to perform the cleanup has been estimated as:
    - One person with a SCBA – 16 minutes.
    - Two people without SCBAs – 5 minutes.

Which one of the following completes the statements below:

1) The method that will result in the lowest total dose for the task is __(1)__.
2) Per VPAP-2101,RADIATION PROTECTION PROGRAM; IF an operator's annual dose exceeds __(2)__ mRem the worker will be denied RCA access until an upgrade is approved.

A. 1) two people without SCBAs
   2) 2550

B. 1) two people without SCBAs
   2) 1700

C. 1) one person wearing an SCBA
   2) 1700

D. 1) one person wearing an SCBA
   2) 2550

C

General Discussion

Explanation: 1) Total dose for one operator wearing an SCBA: (7000mrem/hr) (16 min) (1hr/60 min) = 1866 mRem. Two operators without SCBAs: (7000 + 6000 mRem/hr) (5 min) (2 operators) (1hr/60min) = 2166 mrem. Therefore the lowest total dose will occur with one operator wearing an SCBA. 2) Per VPAP-2101 the station administrative annual dose limit is 2000 mrem. If a workers annual dose exceeds 85% of an administrative limit (.85 x 2000 = 1700 mrem), the worker will be denied RCA access until an upgrade is approved.

Tier 3
Objective:SROU-02B

Answer A Discussion

1) Incorrect because the total dose for two people without SCBAs is 2166 mRem. Plausible if the operator performs a math error or doesn't take into account that two people are performing the task and picks this choice because the per-operator dose would be smaller. 2) Incorrect because VPAP-2101 requires an upgrade once 85% of the limit is reached. Plausible if the operator applies the 85% to the multi-site limit (3.0 rem).

Answer B Discussion

B.1) Incorrect because the total dose for two people without SCBAs is 2166 mRem. Plausible if the operator performs a math error or doesn't take into account that two people are performing the task and picks this choice because the per-operator dose would be smaller. 2) Correct.

Answer C Discussion

Correct.

Answer D Discussion

D.1) Correct. 2) Incorrect because VPAP-2101 requires an upgrade once 85% of the limit is reached. Plausible if the operator applies the 85% to the multi-site limit (3.0 rem).

Basis for meeting the KA

Question requires the operator to calculate total dose and to take into account internal and external dose received. Therefore this question requires knowledge of bio hazards and one of the goals of ALARA which is to have the lowest total dose.

Basis for Hi Cog

Question written at the application level. Question requires calculations to determine which method will result in lowest dose.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
VPAP-2101

Student References Provided

SYS068 K5.04 - Liquid Radwaste System (LRS)

Knowledge of the operational implication of the following concepts as they apply to the Liquid Radwaste System: (CFR: 41.5 / 45.7)

Biological hazards of radiation and the resulting goal of ALARA ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 64.

D

SYS072 A3.01 - Area Radiation Monitoring (ARM) System
Ability to monitor automatic operation of the ARM system, including: (CFR: 41.7 / 45.5)
Changes in ventilation alignment ....

Given the following:

- Unit 1 is in a Refueling shutdown with Fuel offload in progress.
- Containment purge is in operation with Containment Purge Supply fans and 1-VS-F-58A Filtered Exhaust fan is running.
- A Containment Instrument Air compressor is in operation on its normal suction flow path.
- Annunciator 1-RM-K8, 1-RM-RI-162 HIGH, alarms.
- The BOP confirms that the 1-RM-RI-162 is above the HIGH setpoint.

Assuming all automatic actions occur as designed, which ONE of the following completes the statements below?

1) The Containment Purge fans, 1-VS-F-4A and 4B are tripped directly as a result of __(1)__.

2) The actions the operator will take for the Containment instrument air compressor is to verify IA COMPR CTMT suction valves, 1-IA-TV-101A and B are CLOSED, and __(2)__ CTMT OUTSIDE suction valve, 1-IA-AOV-103.

A. 1) low suction pressure
   2) manually OPENS

B. 1) RM-RI-162 HIGH radiation
   2) manually OPENS

C. 1) low suction pressure
   2) checks OPEN

D. 1) RM-RI-162 HIGH radiation
   2) checks OPEN

General Discussion

Explanation: The manipulator crane radiation monitor is an area radiation monitor that has several automatic operations that occur on hi radiation. They are: 1) Trip of Containment Purge supply fans, 1-VS-F-4A and 4B. 2) Shuts VS-MOV-100A, B, C, and D. 3) Shuts suction valves for containment instrument air compressor, 1-IA-TV-101A/B which will then OPEN the outside suction valve 1-IA-AOV-103.

Tier 2 Group 2
Objective: ND-93.5-LP-1D

Answer A Discussion

1) Incorrect but plausible if the operator confuses the trips for the Ctmt purge supply fan with the trips associated with 1-VS-F-58A which is the exhaust fan in this question. 2) Incorrect but plausible because other rad monitor auto actions have manual actions afterwards as a result of the auto action. Logical for the operator to believe he needs to realign the suction valve following this auto isolation.

Answer B Discussion

1) Correct. 2) Incorrect but plausible because other rad monitor auto actions have manual actions afterwards as a result of the auto action. Logical for the operator to believe he needs to realign the suction valve following this auto isolation.

Answer C Discussion

1) Incorrect but plausible if the operator confuses the trips for the Ctmt purge supply fan with the trips associated with 1-VS-F-58A which is the exhaust fan in this question. 2) Correct.

Answer D Discussion

Correct.

Basis for meeting the KA

K/A specifies an area rad monitor that has auto actions that result in ventilation lineup. The manipulator crane Hi rad does change Ctmt ventilation lineup and is an area rad monitor therefore this question matches the K/A.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References	Student References Provided
ND-93.5-LP-1. ND-92.3-LP-4. 1-RM-K8	

SYS072 A3.01 - Area Radiation Monitoring (ARM) System
Ability to monitor automatic operation of the ARM system, including: (CFR: 41.7 / 45.5)
Changes in ventilation alignment ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 65.

GEN2.1 2.1.14 - GENERIC - Conduct of Operations

Conduct of Operations

Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc. (CFR: 41.10 / 43.5 / 45.12)

Preparations are in progress for radiography of 1-SW-P-10B, CHARGING PUMP SERVICE WATER PUMP discharge piping.

- The pump needs to be run for 10 minutes to heatup piping.
- All affected areas in the Aux Building have been posted.
- All affected areas in the Aux Building have been verified clear of all personnel.
- The area of piping that needs to be radiographed has been prepped.

Which of the following is correct regarding plant wide announcements using the Gaitronics system?

1) A plant announcement for starting 1-SW-P-10B, __(2)__ required.
2) A plant announcement for Radiography of the affected area (exposing the source) __(1)__ required.

A. (1) is (2) is not

B. (1) is not (2) is not

C. (1) is (2) is

D. (1) is not (2) is

General Discussion

Explanation: 1) Per Dominion Nuclear Operations Standards (OP-AA-100) a plant wide announcement will be made when starting or stopping plant equipment that constitutes large 480 volt or larger. It is not expected that changes in running status be announced for minor loads such as sump pumps or Turbine Bldg. vent fans be announced. The basis for this is personnel protection in the event of a catastrophic breaker failure. Large 480 Volt loads would be any load center breaker; SI pump, Containment Spray pump. Charging pumps SW pump would be a small 480 volt load (similar to a sump pump) that is operated off of an MCC therefore a plant wide announcement is not required for starting this pump. 2) When ongoing activities have the potential to create changing radiological conditions, operations personnel will announce the planned activity with direction that personnel stand clear of impacted areas. Therefore a plant wide announcement would be made for commencement of radiography.

Tier 3 Group 0
Objective: RO/SRO-SDS-02 A

Answer A Discussion

1) Incorrect but plausible if the operator believes that large loads are any 480 volt load. Ch pump SW pumps are 480 volt pumps, but are considered similar to sump pumps with respect to their size. 2) Incorrect but plausible if the operator believes that preparations that were made; posting and verification that areas are clear are sufficient.

Answer B Discussion

1) Correct. 2) Incorrect but plausible if the operator believes that preparations that were made; posting and verification that areas are clear are sufficient.

Answer C Discussion

1) Incorrect but plausible if the operator believes that large loads are any 480 volt load. Ch pump SW pumps are 480 volt pumps, but are considered similar to sump pumps with respect to their size. 2) Correct.

Answer D Discussion

Correct.

Basis for meeting the KA

Question requires specific knowledge of plant wide announcement criteria therefore K/A is met.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
OP-AA-100

Student References Provided

GEN2.1 2.1.14 - GENERIC - Conduct of Operations

Conduct of Operations

Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc. (CFR: 41.10 / 43.5 / 45.12)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 66.

GEN2.1 2.1.20 - GENERIC - Conduct of Operations
Conduct of Operations
Ability to interpret and execute procedure steps. (CFR: 41.10 / 43.5 / 45.12)

Given the following:

- Unit 1 is preparing to perform SI Accumulator recirculation and sampling per 1-OP-SI-002, SAFETY INJECTION ACCUMULATORS.
- Administrative control will be required for two manual valves, both located in the Auxiliary Building.

Which ONE of the following completes the following statements?

1) One operator __(1)__ permitted to have admin control of both manual valves.
2) Per SUADM-O-26, ADMINISTRTATIVE CONTROL OF OPERATIONAL COMPONENTS, and 1-OP-SI-002, an operator assigned to the Fire Team __(2)__ permitted to maintain Fire Team responsibility while having admin control.

A. 1) is NOT
   2) is NOT

B. 1) is NOT
   2) is

C. 1) is
   2) is NOT

D. 1) is
   2) is

General Discussion

1) SUADM-O-26, Administrative Control of Operational Components, states an operator with Admin Control is limited to only one control action. In 1-OP-SI-002, this is limited to one valve per control action. 2) 1-OP-SI-002, Safety Injection Accumulators, provides allowance for an operator with Admin Control to have a concurrent responsibility (i.e. Fire Team) that is not considered a Control Action. This is provided that contingencies are in place in the event a fire occurs.

Tier 3 Group 0
Objective: SROU-02A

Answer A Discussion

1) is correct. 2) is incorrect because 1-OP-SI-002 4.10 specifically states a Fire Team member may have an admin control function, provided contingencies are in place if the Fire Team response is necessary. Although maintaining both positions by the same operator is "not desired" it is permitted.

Answer B Discussion

CORRECT.

Answer C Discussion

1) is incorrect but plausible if the Candidates does not recall the requirement in SUADM-O-26 for Administrative Control. Also plausible because one of the valves in this procedure has a much longer Admin control requirement (10 minutes vs. immediately) and the Candidate may incorrectly determine one operator is sufficient to operator both valves in order of priority. 2) is incorrect because 1-OP-SI-002 4.10 specifically states a Fire Team member may have an admin control function, provided contingencies are in place if the Fire Team response is necessary. Although maintaining both positions by the same operator is "not desired" it is permitted.

Answer D Discussion

1) is incorrect but plausible if the Candidates does not recall the requirement in SUADM-O-26 for Administrative Control. Also plausible because one of the valves in this procedure has a much longer Admin control requirement (10 minutes vs. immediately) and the Candidate may incorrectly determine one operator is sufficient to operator both valves in order of priority. 2) is correct.

Basis for meeting the KA

Requires correct interpretation of SUADM-O-26 and correctly apply to a frequent evolution requiring multiple components to have admin control. Also requires knowledge of which personnel on shift are permitted to establish admin control with other concurrent responsibilities.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References
1-OP-SI-002 SUADM-O-26 SROU-02A

Student References Provided

GEN2.1 2.1.20 - GENERIC - Conduct of Operations

Conduct of Operations

Ability to interpret and execute procedure steps. (CFR: 41.10 / 43.5 / 45.12)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 67.

GEN2.2 2.2.18 - GENERIC - Equipment Control

Equipment Control

Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.
(CFR: 41.10 / 43.5 / 45.13)

Given the following:

- Unit 1 is starting up following a refueling outage.
- The plant has just exited Cold Shutdown mode and is heating up.
- MDAFW pump 1-FW-P-3A was overhauled during the outage.
- The only remaining PMT for 1-FW-P-3A is the Recirc flow test of 1-FW-P-3A.

Which ONE of the following completes the statements below regarding PMT?

1) 1-FW-P-3A can be returned to operable __(1)__ completing the final PMT.
2) The Recirc flow test of 1-FW-P-3A shall be performed __(2)__ entering the Tech Spec mode of applicability for AFW.

A. 1) only after
   2) prior to

B. 1) prior to
   2) after

C. 1) only after
   2) after

D. 1) prior to
   2) prior to

General Discussion

Explanation: 1) All PMT must be completed before returning equipment to service. PMT is performed following maintenance and proves that the equipment is operable as designed. 2) All PMT must be completed before entering the Tech Spec mode of applicability. If PMT is not performed satisfactorily then entering the mode of applicability would also mean entering a TS clock. The only exception for this is Terry Turbine maintenance performed during a RFO. For this case it is allowable to enter the TS mode of applicability (350 °F/450 psig) prior to completing all PMT. Tech Specs provides a specific exception (7 days) to allow Terry Turbine run at NOP/NOT before it is considered operable.

Tier 3
Objective: RO/SRO-SDS-02 A

Answer A Discussion

Correct.

Answer B Discussion

1) Incorrect, but plausible if the operator confuses "return to service" (fully operable) with the equipment being "available" which means that maintenance completed and equipment can be operated. 2) Incorrect but plausible if the operator confuses the MDAFW with the Turbine driven aux feed pump. With the TDAFW pump this is exactly what is done; mode of applicability entered then 7 days to complete

Answer C Discussion

1) Correct. 2) Incorrect but plausible if the operator confuses the MDAFW with the Turbine driven aux feed pump. With the TDAFW pump this is exactly what is done; mode of applicability entered then 7 days to complete.

Answer D Discussion

1) Incorrect, but plausible if the operator confuses "return to service" (fully operable) with the equipment being "available" which means that maintenance completed and equipment can be operated. 2) Correct.

Basis for meeting the KA

Question meets the K/A because the question tests the operator's understanding of Post Maintenance testing, what it means and when it has to be done. In this case a specific example (MDAFW) is used to test the generic concept of PMT.

Basis for Hi Cog

Question written at the application level. The operator must use data given in the stem of the question to determine when PMT must be completed.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References
WM-AA-100. TECH SPECS

Student References Provided

GEN2.2 2.2.18 - GENERIC - Equipment Control
Equipment Control
Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 68.

GEN2.2 2.2.44 - GENERIC - Equipment Control

Equipment Control

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:

- Unit 1 is at 32% power and shutting down per 1-GOP-2.1, UNIT SHUTDOWN to LESS THAN 30%, for refueling outage.
- The BOP is preparing to transfer station Electrical Service from Normal to Reserve in accordance with Attachment 6, “Transferring to RSS Supply”.
- No other licensed operators in the MCR are readily available for a peer check.

Which ONE of the following completes both statements?

1) With the Given conditions it __(1)__ permissible to perform the station bus transfer with no peer checks provided the BOP uses Overt Supervisory oversight with Shift Manager’s permission.
2) If the operator incorrectly transfers Bus 1C; by opening Station Service Norm Sup Bkr 15C2 prior to closing Reserve Sup Bkr 15C1 the reactor __(2)__ required to be manually tripped.

A. 1) is NOT
   2) is NOT

B. 1) is
   2) is

C. 1) is
   2) is NOT

D. 1) is NOT
   2) is

General Discussion

Explanation: 1) Per OP-AA-100, Conduct of Operations, peer check all manipulations in the control room during normal or routine operations activities. If a peer check cannot be made, apply overt supervisory oversight with Shift Managers permission. Peer checks during AOP and EOP response is appropriate as long as it doesn't delay implementation of the AOP or EOP network. In this case the plant is NOT in an emergency AOP or EOP situation, therefore peer checks are required. 2) In this situation the 15-C2 breaker opening will result in a loss of the C RCP. Because the reactor is < 35% the P8 bypass is in effect, meaning there will be NO automatic reactor trip. However procedures (GOPs, ARPs) require the reactor to be tripped if there is a loss of any RCP.

Tier 3 / Group 0
Objective: SROU-O2A

Answer A Discussion

1) "is not" is incorrect but plausible if the operator believes that peer checks cannot be waived during normal evolutions which is the "Norm". OP-AA-100 does allow for relaxation of peer checks but only with SM's approval. In this case the supervisor would provid peer checks. 2) "is NOT" is incorrect but plausible because at this power level the reactor trip form low loop flow is bypassed. Candidate may conclude that if there is no failed auto RPS trip then, there is no failure to trip and therefore no requirement to trip the reactor.

Answer B Discussion

Correct.

Answer C Discussion

1) Correct. 2) "is NOT" is incorrect but plausible because at this power level the reactor trip form low loop flow is bypassed. Candidate may conclude that if there is no failed auto RPS trip then, there is no failure to trip and therefore no requirement to trip the reactor

Answer D Discussion

1) "is not" is incorrect but plausible if the operator believes that peer checks cannot be waived during normal evolutions which is the "Norm". OP-AA-100 does allow for relaxation of peer checks but only with SM's approval. In this case the supervisor would provid peer checks. 2) "is" is correct.

Basis for meeting the KA

Meets K/A based on plant wide requirements for performing peer checks. Question requires the operator candidate to interpret given conditions, which is also part of the K/A. Part 1 evaluates the general concept of a Conduct Of Ops requirement; conditions that allow waiving Peer Check/Supervisory oversight requirements. Part 2 evaluates correct Tech Spec directions that can apply to any situation that requires conservative decision making.

Basis for Hi Cog

HI Cog: Yes the question is written at the comprehension level because the operator must assess plant conditions given to determine the outcome.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References	Student References Provided
1-GOP-2.1, Rev 51 OP-AA-100 Rev 43	

GEN2.2 2.2.44 - GENERIC - Equipment Control

Equipment Control

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

SPS 2021 NRC EXAM, QUESTION 69.

GEN2.3 2.3.11 - GENERIC - Radiation Control
Radiation Control
Ability to control radiation releases. (CFR: 41.11 / 43.4 / 45.10)

Given the following:

- “A” WGDT is in service (lined up).
- “B” WGDT release is in progress in accordance with OP-23.2.4, RELEASE OF WASTE GAS DECAY TANK 1B.
- Initial Hydrogen concentration in “B” WGDT is 8.1%.

Which ONE of the following completes the statements below:

1) The maximum release rate from “B” WGDT is based on the __(1)__.
2) The maximum curie content in each gas storage tank is limited to a maximum of __(2)__ in order to limit the total body exposure to an individual at the exclusion boundary.

A. 1) the release permit
   2) 24,600 curies

B. 1) the Hydrogen concentration
   2) 24,600 curies

C. 1) the release permit
   2) 12,300 curies

D. 1) the Hydrogen concentration
   2) 12,300 curies

General Discussion

Explanation:1) Per OP-23.2.4 the release rate is maintained within the limit stated on the release perfmit. OR if tank is greater than 80% Hydrogen, the limit specified on attachment 4. In this case Hydrogen is < 80% therefore the release permit provides the release rate limit. This is generically true for all releases to the environment of any tank or area that has high radioactivity. 2) The maximum curie content for each gas storage tank is limited to 24,600 curies.

Tier 3 Group 0
Learning Objective:ND-93.5-LP-3B.

Answer A Discussion

CORRECT

Answer B Discussion

1) Incorrect but plausible if the operator believes the hydrogen concentration is above the release limit. OP-23.2.4 P&L 4.2 states that when WGDT Hydrogen > 4% Oxygen must not be greater than 2%. Therefore the operator could confuse this P&L and mistakenly believe we must limit the release rate. 2) Correct.

Answer C Discussion

1) Correct. 2) Incorrect but plausible if the operator believes the Tech Spec value is based on both (or total) of 24,600 which would make each tank limit to be 12,300 curies.

Answer D Discussion

1) Incorrect but plausible if the operator believes the hydrogen concentration is above the release limit. OP-23.2.4 P&L 4.2 states that when WGDT Hydrogen > 4% Oxygen must not be greater than 2%. Therefore the operator could confuse this P&L and mistakenly believe we must limit the release rate. 2) Incorrect but plausible if the operator believes the Tech Spec value is based on both (or total) of 24,600 which would make each tank limit to be 12,300 curies.

Basis for meeting the KA

Question requires procedural and Tech spec knowledge that relates to controlling radiation release. Both the maximum curie content of each WGDT and limiting release rate based on the release permit control radiation release in this scenario.

Basis for Hi Cog

Operator must analyze data to determine how release rate is limited therefore this question is written at the comprehension level.

Basis for SRO only

Assessing plant condition and selecting a procedure to mitigate, recover or which to proceed.

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	MODIFIED	Bank Question 444

Development References
OP-23.2.4. Tech Specs.

Student References Provided

GEN2.3 2.3.11 - GENERIC - Radiation Control
Radiation Control
Ability to control radiation releases. (CFR: 41.11 / 43.4 / 45.10)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 70.

GEN2.3 2.3.5 - GENERIC - Radiation Control

Radiation Control

Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.11 / 41.12 / 43.4 / 45.9)

Given the following:

- Unit 1 is at 10^{-8} Amps, taking critical rod height data.
- Tave is being maintained using Steam Dumps.
- The following Critical Parameters were just observed:
  - Pressurizer level is 20.4% and lowering.
  - Containment Sump level is 42% and stable.
  - There are NO annunciators lit related to Sumps outside Containment.
- The team has dispatched Health Physics (HP) to locally survey Rad Levels by the affected Rad Monitors (RMs).

Which ONE of the following completes the statements below?

1) At this time, the team will use the __(1)__ RMs to evaluate for a primary to secondary leak.
2) Health Physics will be dispatched to Unit 1 __(2)__ to survey near these RM detectors.

A. 1) N-16
   2) Mechanical Equipment Room

B. 1) Main Steam
   2) Mechanical Equipment Room

C. 1) N-16
   2) Safeguards

D. 1) Main Steam
   2) Safeguards

General Discussion

1) Below 25% reactor Power, the PRNIs provide a cutoff for N-16 RMs. This is because, at low power levels, the RM indication is not accurate. In this scenario, Only the MS RMs will provide accurate indication to determine the presence of a Primary to Secondary Leak. 2) The MS RM detectors are located in the respective Unit's Safeguards, at the MS riser piping. The N-16 RM detectors are located in the respective Unit's Mechanical Equipment Ropm (MER).

Answer A Discussion

1) is incorrect because power level is below the cutoffofor Operation of the N-16 RMs. Plausible because at normal 100% power, this would be the first means of detecting a primary to secondary leak. 2) is the incorrect location, but plausible if the Canddiate confuses the locations with that of the N-16 RM detectors.

Answer B Discussion

1) is correct. 2) is the incorrect location, but plausible if the Canddiate confuses the locations with that of the N-16 RM detectors.

Answer C Discussion

1) is incorrect because power level is below the cutoffofor Operation of the N-16 RMs. Plausible because at normal 100% power, this would be the first means of detecting a primary to secondary leak. 2) is correct.

Answer D Discussion

CORRECT.

Basis for meeting the KA

Must determine, from a selection of available RMs, which one is appropriate for a given power level. This knowledge is required for a number of scenarios at various power levels. Must also have knowledge of various RM detector locations to validate MCR indications with local surveys using a portable frisker at the correct location.

Basis for Hi Cog

Must interpret given plant conditions and discern which equipment is correct to use for the event.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	NEW	

Development References

ND-93.5-LP-3A/D
1-AP-24.00

Student References Provided

GEN2.3 2.3.5 - GENERIC - Radiation Control

Radiation Control

Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.11 / 41.12 / 43.4 / 45.9)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 71.

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)

While taking LOGS in the auxiliary building, a mechanic, who is performing an overhaul on 1-CH-P-1A ("A" charging pump), approaches you and asks for your assistance in lifting the auxiliary oil pump. The mechanic states that your assistance will be required for 20-30 minutes.

Which ONE of the following states the proper response to this request?

A. Provide assistance and when logs are complete, ask health physics to assign the dose received while helping the mechanic to the mechanic's RWP.

B. Render the requested assistance on the Operations RWP as long as the dose received will not cause you to reach either your DOSE RATE LIMIT or DOSE LIMIT.

C. Inform the mechanic that you are unable to render the requested assistance while on the current Operations RWP.

D. Call the health physics supervisor and request to be placed on the mechanic's RWP.

General Discussion

Explanation: Per VPAP-2101, Radiation Protection Program; the primary method of controlling work that involves radiological hazards is the Radiation Work Permit (RWP) system. In addition, workers and supervisors participate in pre-job briefings to ensure work to be performed and controls to be implemented are understood. Therefore the operator must be briefed and obtain RWP authorization for the work the mechanic wants assistance with.

Tier 3 Group 0
Learning Objective:SROU-02B

Answer A Discussion

Incorrect but plausible if the operator believes that the main purpose of an RWP is to assign dose received to the correct task. A worker cannot perform a task in the charging pump cubicle without the proper RWP briefing.

Answer B Discussion

Incorrect: Work can only be performed in the RCS for the RWP that the worker is assigned. Plausible if the operator believes the main purpose of an RWP is to prevent him from exceeding his dose, and that it doesn't matter what RWP he is on.

Answer C Discussion

CORRECT.

Answer D Discussion

Incorrect: DAD assignments are made to a specific RWP; this cannot be changed over the phone. Plausible from an ALARA aspect.

Basis for meeting the KA

Question tests operator's knowledge of RWP compliance.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	BANK	Bank Question 815

Development References	Student References Provided
VPAP-2101	

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

SPS 2021 NRC EXAM, QUESTION 72.

GEN2.4 2.4.1 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

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

Given the following:

- Unit 1 is at Cold Shutdown.
- Annunciator 1A-F3, SI INITIATED TRAIN A, has just come in.
- 500 gpm of High Head SI flow to the Cold Legs is indicated.

Which ONE of the following completes the statements below?

1) Entry to 1-E-0, REACTOR TRIP OR SAFETY INJECTION, __(1)__ required.
2) The automatic Train A Safety Injection signal __(2)__ be manually backed up.

A. 1) is
   2) will not

B. 1) is not
   2) will

C. 1) is not
   2) will not

D. 1) is
   2) will

General Discussion

1) In 2008, Surry experienced a spurious Train "B" SI. At that time, the only guidance was a Step by Step evaluation of 1-E-0. After that OE, the site developed 1-AP-10.20. This addresses a spurious SI <350°F. Although 1-E-0 is still an allowable option (with a step by step evaluation), 1-AP-10.20 is the appropriate procedure to enter. 2) A spurious train of SI initiation below 350°F creates a chalenge to the RCS, specifically with cold plant RCS pressure control. Manually backing up any auto SI initiation is the mornal procedural standard, but in this case it would cause the other train of SI to initiate. That would further complicate reset of the spurious SI by delaying the 60 second SI reset timer and having a second train of SI components requiring repositioning.

Tier 3 Group 0
Objective: ND-91-LP-2E

Answer A Discussion

1) is incorrect because 1-AP-10.20 is the appropriate procedure, based on the unit < 350°F. Plausible because 1-E-0 does allow it to be used, with a step by step evaluation. 2) is correct. Part 1) and Part 2) do not foul each other; if the Candidate correctly applies the approach to a spurious Train A SI, a Step by Step evaluation occurs (as directed on the 1-E-0 cover page) and decide not to manually backup SI.

Answer B Discussion

1) is correct. 2) is incorrect because backing up SI will actuate the opposite train as well, which will exacerbate the effect on the RCS, especially if the unit was in a solid plant condition. Plausible because many EOPs direct manual backup of ECCS and Rx Protection after auto initiation. Also it is a standard Operations practice to back up automatic signals. Part 1) and Part 2) do not foul each other, because manually backing up an automatic safety signal is a common practice used in a wide range of events.

Answer C Discussion

CORRECT.

Answer D Discussion

1) is incorrect because 1-AP-10.20 is the most appropriate procedure to enter based on the unit < 350°F. Plausible because 1-E-0 does allow it to be used, with a step by step evaluation. 2) is incorrect because backing up SI will actuate the opposite train as well, which will exacerbate the effect on the RCS, especially if the unit was in a solid plant condition. Plausible because many EOPs direct manual backup of ECCS and Rx Protection after automatic initiation. Also it is a standard Operations practice to back up automatic signals.

Basis for meeting the KA

Must understand EOP entry conditions, including modes of applicability. Must determine that, although 1-E-0 is allowable, it is not prudent with a more appropriate AOP available.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	NEW	

Development References

1-AP-10.20
1-E-0
ND-91-LP-2E

Student References Provided

GEN2.4 2.4.1 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of EOP entry conditions and immediate action steps. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 73.

GEN2.4 2.4.32 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of operator response to loss of all annunciators. (CFR: 41.10 / 43.5 / 45.13)

Unit 2 is operating at 100% power.

- Reactor Operator notices that 2K-H1 Power indicating lights are “out”.
- Reactor Operator verifies that the light bulbs are “good”.
- Team enters 0-AP-10.13, LOSS OF MAIN CONTROL ROOM ANNUNCIATORS.

Which ONE of the following completes the statements below?

1) The power supplies that are lost to cause a total loss of Unit 2 Annunciators are __(1)__.
2) Local action outside the MCR __(2)__ required to perform a functional test of the Unit 2 annunciators.

A. 1) MCC 2H1-1 and “A” DC bus
   2) is NOT

B. 1) MCC 2H1-1 and “A” DC bus
   2) is

C. 1) MCC 2J1-1 and Vital Bus III
   2) is NOT

D. 1) MCC 2J1-1 and Vital Bus III
   2) is

General Discussion

Explanation: 0-AP-10.13, NOTE prior to step 1, states "If window 2K-H1 indicator lights are NOT LIT, both power supplies to the Unit 1 Annunciator Panels and the VSP Annunciator Panel have been lost. Additionally the Note and procedure provides two examples of "functional checks" which verify that the alarm modules are working. The annunciator test only tests the annunciator lamp bulbs.

Tier 3 Group 0
Learning Objectives:
ND-93.4-LP-7D.
ND-93.4-LP-12G.

Answer A Discussion

Incorrect. 1) Power supply is correct. 2) Incorrect, but plausible if the operator believes for example that the Annunciator test done in the MCR tests the alarm modules. The MCR annunciator test only tests the annunciator bulbs, and the alarm horn and is not a functional check that will test the alarm modules.

Answer B Discussion

CORRECT

Answer C Discussion

Incorrect . 1) Power supply is incorrect as Vital Bus III is not needed for operation of the Annunciators, and 1J1-1 is also not correct. Plausible because Vital Bus III is the power supply for the Hathaway workstation, and the J bus is opposite emergency bus. 2) Incorrect, but plausible if the operator believes for example that the Annunciator test done in the MCR tests the alarm modules. The MCR annunciator test only tests the annunciator bulbs, and the alarm horn and is not a functional check that will test the alarm modules.

Answer D Discussion

Incorrect . 1) Power supply is incorrect as Vital Bus III is not needed for operation of the Annunciators, and 1J1-1 is also not correct. Plausible because Vital Bus III is the power supply for the Hathaway workstation, and the J bus is opposite emergency bus. 2) Correct.

Basis for meeting the KA

Question requires knowledge of the operator actions for loss of all annunciators therefore the question matches the K/A.

Basis for Hi Cog

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Memory	MODIFIED	Bank Question 817

Development References
0-AP-10.13. nd-93.4-lp-7

Student References Provided

GEN2.4 2.4.32 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of operator response to loss of all annunciators. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 74.

GEN2.4 2.4.4 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

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)

Unit 1 is initially at 88% power. A plant transient occurs causing the following changes:

Parameter	Initial	Current
Reactor Power	88%	91%
Generator MWe	810.9 MWe	887.1 MWe
Pressurizer Level	49.5%	48.3%
Pressurizer Pressure	2235 psig	2215 psig
RCS Tave	569.7 °F	568.3 °F
Valve Positioner Limiter Light	Not-lit	Lit

Which one of the following procedures addresses <u>all</u> the conditions given?

A. 1-AP-31.00, Increasing or Decreasing RCS Pressure.

B. 1-AP-16.00, Excessive RCS Leakage.

C. 1-AP-38.00, Main Steam System Control Malfunction.

D. 1-AP-18.00, Loss of HP Heater Drain Pump.

General Discussion

Power increasing (Reactor power and Gen MW), with pressurizer level, and pressure, and Tave decreasing all point to an increase in steam demand caused by a Gov. valve failure. Valve Positioner light also indicates a failure with the EHC system.

Tier 3 Group 0
Learning Objective:ND-89.1-LP-2E.

Answer A Discussion

Incorrect. AP-31 not appropriate for power increase. Plausible because one of the indications (pressure decreasing) is an entry condition and RCS Tave will also lower due to the impact of lowering RCS pressure on the Moderator Pressure coefficient.

Answer B Discussion

Incorrect. AP-16.00 not appropriate for power increase. Plausible because RCS pressure decreasing and Pressurizer level decreasing are entry conditions for AP-16.00. The Candidate may misdiagnose and not associate the lowering Tave with the lowering Pressurizer level.

Answer C Discussion

CORRECT.

Answer D Discussion

Incorrect. AP-18.00 not appropriate for power increase. Plausible because one of the indications (secondary transient) is an entry condition. Also plausible because a loss of HP Drain Pump will result in rising reactor power .

Basis for meeting the KA

Based on a given set of Critical Parameter trends, must evaluate the appropriate AOP to enter. Meets Tier 3 because is requires the same opeator acumen skills for a vide variety of plant events.

Basis for Hi Cog

Must interpret given indications and make the correct diagnosis of the event. Misdiagnosis would result in delayed response and lead to an unnecessary Reactor Trip.

Basis for SRO only

Job Level	Cognitive Level	QuestionType	Question Source
RO	Comprehension	BANK	Bank Question 818

Development References
1-AP-38.00, Main Steam System Control Malfunction.

Student References Provided

GEN2.4 2.4.4 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

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

SPS 2021 NRC EXAM, QUESTION 75.

APE015/017 AA2.01 - Reactor Coolant Pump (RCP) Malfunctions
Ability to determine and interpret the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): (CFR 43.5 / 45.13)
Cause of RCP failure . . . .

Initial Conditions:

- Unit 1 is at Hot Shutdown.
- “A” Reactor Coolant Pump (1-RC-P-1A) is secured.
- The crew is lowering RCS boron concentration in preparation for taking the reactor critical the following shift.

Current Conditions:

- The following conditions exist for the “B” Reactor Coolant Pump (1-RC-P-1B):
  - 1C-B5, RCP 1B SEAL 2 LO INLET PRESS, is LIT.
  - 1C-E4, RCP 1B SEAL LEAKOFF LO FLOW, is LIT.
  - RCP B SEAL PRESS 1-CH-PI-1155A is 1150 psig.
  - RCP SEAL LEAKOFF FLOW on 1-CH-FR-1190 is 0.00 gpm.

Which ONE of the following completes the following statements?

1) 1-RC-P-1B is experiencing a __(1)__.
2) After securing 1-RC-P-1B, there __(2)__ be sufficient forced RCS flow to provide adequate boron mixing in the RCS per Tech Spec Bases.

A. 1) failure of #3 seal
   2) will

B. 1) blockage in the seal return line
   2) will not

C. 1) failure of #3 seal
   2) will not

D. 1) blockage in the seal return line
   2) will

General Discussion

1) If an RCP #3 seal fails, all seal injection flow is redirected from the seal return line through the failed seal. This changes two key critical parameters: Indicated seal injection flow lowers (to zero for a complete failure of the seal) and Seal #2 inlet pressure lowers. The reason for the latter is because there are now only two intact seals in the package; instead of this pressure being 2/3 full RCS pressure, it will now be half as #1 and #2 seals are each accomodating 50% of the total pressure drop from RCS pressure to seal return pressure. [A seal leakoff line blockage would also lower indicated seal leakoff flow to zero, but due to the no flow condition at the seals, #2 seal inlet pressure would experience full RCS pressure.] 2) T.S.3.1.A. basis states that only one RCP or RHR pump is required to provide adequate Boron mixing in the RCS when Boron concentration is being lowered.

Tier 1 Group 1
Objective: ND-88.1-LP-6F

Answer A Discussion

CORRECT.

Answer B Discussion

1) is incorrect but plausible if the Candidate confuses the parameter changes resulting from a different RCP malfunction; one parameter (seal leakoff flow) responds exactly the same. 2) is incorrect but plausible if the Candidate does not recall the correct number of RCPs required per Tech Spec 3.1.A. Basis to provide adequate Boron mixing.

Answer C Discussion

1) is correct. 2) is incorrect but plausible if the Candidate does not recall the correct number of RCPs required per Tech Spec 3.1.A. Basis to provide adequate Boron mixing.

Answer D Discussion

1) is incorrect but plausible if the Candidate confuses the parameter changes resulting from a different RCP malfunction; one parameter (seal leakoff flow) responds exactly the same. 2) is correct.

Basis for meeting the KA

Must take given abnormal RCP critical parameters and determine the correct cause. This is both a K/A and Tier 1 match by diagnosing the correct RCP manfunction and requiring knowledge of Tech Spec Bases.

Basis for Hi Cog

Must use given changes in critical parameters and diagnose the correct malfunction.

Basis for SRO only

10CFR55.43(b)(2): Requires knowledge of Tech Spec Bases supporting minimum RCP operation for given conditions.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	

Development References	Student References Provided
Tech Specs ND-88.1-LP-6F	

APE015/017 AA2.01 - Reactor Coolant Pump (RCP) Malfunctions

Ability to determine and interpret the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): (CFR 43.5 / 45.13)

Cause of RCP failure . . . .

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 76.

APE026 2.4.11 - Loss of Component Cooling Water (CCW)
APE026 GENERIC
Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)

Given the following:

- Both units tripped from 100% power, due to an unisolable CC rupture.
- The following conditions exist for Unit 1:
  - RCPs have been secured.
  - Normal letdown has been isolated.
  - "A" and "B" CC Pumps switches are in Pull-To-Lock.
  - Charging flow has been isolated and Seal Injection throttled to 6 gpm each.
  - Tave is 547°F and stable.
  - PRZR Level is 30.2% and slowly rising.
  - Attempts to crosstie Instrument Air to Containment are unsuccessful.

Which ONE of the following completes the following statements for Unit 1?

1) Short term RCS inventory control will be done using __(1)__.
2) If CC cannot be restored, performance of 0-FCA-16.00, LOCAL OPERATION OF AIR OPERATED VALVES, __(2)__ be required to establish Alternate Letdown.

A. 1) Excess Letdown
   2) will NOT

B. 1) RCS cooldown
   2) will

C. 1) Excess Letdown
   2) will

D. 1) RCS cooldown
   2) will NOT

General Discussion

1) A loss of Component Cooling (CC) requires entry to 1-AP-15.00. Normal Letdown is isolated and Seal Injection flow is lowered as much as reasonably acheivable to minimize PRZR level rise. For short term RCS inventory control, there is not a letdown flow path; RCS cooldown to shrink the coolant is the only means available to stabilize PRZR level. 2) For long term inventory control without CC restored, 1-AP-15.00 will direct performing 0-FCA-1.00, which directs a manual valve alignment to establish the Alternate Letdown path to compensate for Seal Injection flow, stabilizing PRZR Level. The steps in 0-FCA-1.00 direct valve by valve operation to establish Alternate Letdown, using 0-FCA-16.00 IF REQUIRED; the SRO must make the decision based on current conditions. Because Containment IA cannot be restored in this scenario, 0-FCA-16.00 will be requried to use AOV blocking equipment to establish this flow path.

Tier 1 Group 1
Objective: ND-88.5-LP-1D

Answer A Discussion

1) is incorrect because 1-AP-15.00 directs verifying Excess Letdown is isolated. Plausible if the Candidate incorrectly assumes the same actions are taken for other causes of a loss of Normal Letdown directed in various other procedures. 2) is incorrect because Instrument Air has NOT been crosstied to Containment. Plausible if the Candidate incorrectly interprets current conditions and makes the wrong decision in 0-FCA-1.00, determining 1-FCA-16.00 is not required. Also plausible if the Candidate confuses the strategy for establishing Alternate Letdown and does not understand the flow path requried.

Answer B Discussion

CORRECT.

Answer C Discussion

1) is incorrect because 1-AP-15.00 directs verifying Excess Letdown is isolated. Plausible if the Candidate incorrectly assumes the same actions are taken for other causes of a loss of Normal Letdown directed in various other procedures. 2) is correct.

Answer D Discussion

1) is correct. 2) is incorrect because Instrument Air has NOT been crosstied to Containment. Plausible if the Candidate incorrectly interprets current conditions and makes the wrong decision in 0-FCA-1.00, determining 1-FCA-16.00 is not required. Also plausible if the Candidate confuses the strategy for establishing Alternate Letdown and does not understand the flow path requried.

Basis for meeting the KA

Requires knowledge of short term and long term required actions in 1-AP-15.00, Loss of Component Cooling. This is required to stabilize PRZR level short term, and plan for establishing Alternate Letdown to not delay long term inventlry control. Meets Tier 1 as it directly evaluates strategies in an AOP.

Basis for Hi Cog

Basis for SRO only

10CFR55.43(b)(5), Assessment of Facility Conditions and Selection of Appropriate Procedures During Normal, Abnormal, and Emergency Situations: Must assess given plant conditions and determine the correct strategy per detailed knowledge of an AOP/FCA.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References

1-AP-15.00
0-FCA-1.00
0-FCA-16.00

Student References Provided

APE026 2.4.11 - Loss of Component Cooling Water (CCW)
APE026 GENERIC
Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 77.

APE040 2.4.18 - Steam Line Rupture
APE040 GENERIC
Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.1 / 45.13)

Unit 1 is recovering from an Uncontrolled Depressurization of all Steam Generators inside Containment with the following conditions.

- The team just secured the LHSI pumps per 1-ECA-2.1, UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS.
- Containment pressure is 16.3 psia and lowering.
- All Containment and Recirc Spray equipment are operating.

As Containment pressure continues to lower which ONE of the following completes the statement below?

1) Per 1-ECA-2.1 once Ctmt pressure is less than __(1)__, the CS pumps and the OSRS pumps are secured.
2) Per Tech Spec Basis one Containment Spray subsystem and two Recirculation Spray subsystems are capable of cooling and depressurizing the Containment to 1.0 psig within __(2)__ hour(s) following the Design Basis Acccident.

A. 1) 12 psia
2) one

B. 1) 10 psia
2) one

C. 1) 12 psia
2) four

D. 1) 10 psia
2) four

General Discussion

Explanation: Ctmt spray is terminated when Ctmt reaches 12 psia or the RWST level no longer supports CS pump operation. This action minimizes depletion of the RWST and addition of NaOH to Ctmt. Per Tech Spec Basis one Containment Spray subsystem and two Recirculation Spray subsystems are capable of cooling and depressurizing the Containment to 1.0 psig within 1 hour, and to subatmospheric within 4 hours following the Design Basis Acccident.
Tier 1 Group 1
Objective: ND-95.3-LP-22B

Answer A Discussion

Correct.

Answer B Discussion

1) Incorrect because ECA-2.1 states that once pressure drops below 12 psia CS/OSRS pumps are secured. Plausible because this is approximately normal pressure and CS and OSRS pumps should be secured before pressure reaches 10 psia. to prevent exceeding of the Partial pressure limit. 2) Correct.

Answer C Discussion

1) Correct. 2) Incorrect, but plausible if the operator confuses the TS Basis criteria. Four hours is part of the design bais but if the operator confuses which part the 4 hours belongs to (1.0 psig vs subatmospheric) and he could rationalize instead that one hour would lower pressure to less than the CLS setpoint (3 psig) (for example) in one hour and to 1.0 psig in four hours (incorrect).

Answer D Discussion

1) Incorrect because ECA-2.1 states that once pressure drops below 12 psia CS/OSRS pumps are secured. Plausible because this is approximately normal pressure and CS and OSRS pumps should be secured before pressure reaches 10 psia. to prevent exceeding of the Partial pressure limit.2) Incorrect, but plausible if the operator confuses the TS Basis criteria. Four hours is part of the design bais but if the operator confuses which part the 4 hours belongs to (1.0 psig vs subatmospheric) and he could rationalize instead that one hour would lower pressure to less than the CLS setpoint (3 psig) (for example) in one hour and to 1.0 psig in four hours (incorrect).

Basis for meeting the KA

Question requires knowledge of the basis for ECA-2.1 step for securing Containment spray and Recirc Spray pumps therefore this question matches the K/A.

Basis for Hi Cog

Basis for SRO only

This question requires detailed knowledge of a specific EOP step used to recover from a major accident. The consequence of failing to perform this step includes potential damage to the containment. Question also requires knowledge of TS Basis which is an SRO Knowledge area.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References

1-ECA-2.1. ND-95.3-LP-22.

Student References Provided

APE040 2.4.18 - Steam Line Rupture
APE040 GENERIC
Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.1 / 45.13)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 78.

APE056 2.4.41 - Loss of Offsite Power
APE056 GENERIC
Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11)

Initial Conditions (at time 0030):

- Both units are at 100% power.
- The AAC Diesel Generator is tagged out.
- A loss of all offsite power occurred on both units.
- #1 EDG failed to start. .

Current Conditions (at time 0047):

- Breaker 15J3 (#3 EDG to 1J Bus) cannot be closed.
- The Unit 1 RO reports CETC Temperature is 702°F and rising.
- DEENS is in service.

Which ONE of the following completes the statement below?

1) Based on Current Conditions, the highest EAL Classification level is __(1)__.
2) The initial ERO callout will be performed using DEENS by __(2)__.

REFERENCE PROVIDED

A. 1) Alert
   2) Security

B. 1) Site Area Emergency
   2) Security

C. 1) Alert
   2) an Emergency Communicator

D. 1) Site Area Emergency
   2) an Emergency Communicator

General Discussion

1) Site Area Emergency under tab MS1.1 is met after a loss of both onsite and offsite power to both Emergency buses for >15 minutes. An Orange path for Core Cooling meets the threshold for an Alert (FA1.1), but it is not the highest Classification level in this scenario. 2) With the installation of the DEENS notification system in October 2020, Operations department has replaced Security as being responsible for the initial ERO callout. This is true as long as DEENS is in service, and a security event is not in progress.

Tier 1 Group 1.
Objective: ND-95.5-LP-2C/E

Answer A Discussion

1) is incorrect but plausible if the Candidate incorrectly focuses on the potential loss of Fuel Clad barrier (Core Cooling orange path with CETC >700°F), which is in effect but not the highest emergency classification level. 2) is incorrect because DEENS is in service. Plausible because DEENS is in service. DEENS is a recent addition to the Emergency Response Organization; and is used to conduct the ERO callout. Prior to DEENS, Security was responsible for the initial ERO callout under normal conditions. Security would be the department to perform the initial ERO callout if a security event was in progress (per EPIP-5.09, Attachment 3, Step 1.

Answer B Discussion

1) is correct. 2) is incorrect because DEENS is in service. Plausible because DEENS is in service. DEENS is a recent addition to the Emergency Response Organization; and is used to conduct the ERO callout. Prior to DEENS, Security was responsible for the initial ERO callout under normal conditions. Security would be the department to perform the initial ERO callout if a security event was in progress (per EPIP-5.09, Attachment 3, Step 1.

Answer C Discussion

1) is incorrect but plausible if the Candidate incorrectly focuses on the potential loss of Fuel Clad barrier (Core Cooling orange path with CETC >700°F), which is in effect but not the highest emergency classification level. 2) is correct.

Answer D Discussion

CORRECT

Basis for meeting the KA

Must determine highest Emergency Action Level for an extended Loss of Offsite Power scenario, including initial actions to take using the recently installed DEENS.

Basis for Hi Cog

Must evaluate the EAL Matrices against given indications of a loss of power scenario, complicated by indication of degraded core cooling.

Basis for SRO only

10CFR55.43(b)(5), Assessment of Facility Conditions and Selection of Appropriate Procedures During Normal, Abnormal, and Emergency Situations: Must assess given plant conditions and select correct EAL (and associated EPIP). Must have knowledge of EPIP strategy with regards to recent change in notification system.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
EPIP-1.01 ND-95.5-LP-2C/E

Student References Provided
SEAL Matrices

APE056 2.4.41 - Loss of Offsite Power
APE056 GENERIC
Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 79.

APE062 AA2.06 - Loss of Nuclear Service Water

Ability to determine and interpret the following as they apply to the Loss of Nuclear Service Water: (CFR: 43.5 / 45.13)

The length of time after the loss of SWS flow to a component before that component may be damaged ....

Initial Conditions:

- Unit 1 is at Hot Shutdown, Unit 2 is shutdown with fuel offloaded.
- Today is Wednesday.
- 1410: Annunciator 1D-G5, SW OR CC PPS DISCH TO CHRG PPS LO PRESS is in alarm.
- The crew enters 0-AP-12.00, SERVICE WATER SYSTEM ABNORMAL CONDITIONS.

Current Conditions (10 minutes later):

- The RO starts recording Unit 1 operating CHG pump bearing temperatures.
  - 1420 = 170 ºF
  - 1430 = 175 ºF
  - 1440 = 180 ºF
  - 1450 = 185 ºF
  - 1500 = 190 ºF
- 1500: All Unit 1 Charging Service Water is declared inoperable.

Based on the above conditions which ONE of the following answers the questions below?

1) At what time will 0-AP-12.00 direct shifting the operating charging pumps?
2) Assuming no change in Charging Service Water status, what is the latest time Unit 1 must be brought to Cold Shutdown?

A. 1) 1440
   2) Friday at 0300.

B. 1) 1450
   2) Thursday at 2100.

C. 1) 1450
   2) Friday at 0300.

D. 1) 1440
   2) Thursday at 2100.

D

General Discussion

Explanation: 1) At 180 °F 0-AP-12.00 will direct the charging pumps to be shifted. 2) Per Tech Specs 3.0 Basis, if an inoperable condition is discovered in hot shutdown, the 6 hours provided to achieve hot shutdown is not included in the total time to achieve cold shutdown (30 hours). In this scenario, Initial Conditions have Unit 1 at HSD, so CSD is required within 30, not 36, hours.

Tier 1 Group 1
Objective: ND-89.5-LP-2D

Answer A Discussion

1) Correct. 2) Incorrect because Unit 1 is initially at HSD, so T.S.3.0 basis does not allow the 6 hours to be added to the CSD time requirement. Plausible if the Candidate misapplies the 6 hours, as is done if this event occurred at power.

Answer B Discussion

1) Incorrect because AP-12.00 directs shifting the operating charging pumps at 180 °F. Plausible because at 185 °F AP-12.00 will direct securing the charging pumps. 2) is correct.

Answer C Discussion

1) Incorrect because AP-12.00 directs shifting the operating charging pumps at 180 °F. Plausible because at 185 °F AP-12.00 will direct securing the charging pumps. 2) Incorrect because Unit 1 is initially at HSD, so T.S.3.0 basis does not allow the 6 hours to be added to the CSD time requirement. Plausible if the Candidate misapplies the 6 hours, as is done if this event occurred at power.

Answer D Discussion

Correct.

Basis for meeting the KA

Question matches the K/A because the operator must determine the time for shifting charging pumps in order to avoid damage in accordance with direction in 1-AP-8.00

Basis for Hi Cog

Requires analyzing pump data given in a table to determine time to secure, and also reason for Charging pump X tie also requires deeper thought. Question written at or above the analysis level.

Basis for SRO only

10CFR55.43(b)(6): Requires knowledge of Tech Spec bases for the time requirement to reach CSD with both trains of CH Sw inoperable. Specifically, knowledge of the 3.0 Basis, describing when the 6 hour LCO to HSD may or may not be added to the 30 hour LCO to CSD. Misapplication of this Basis may result in failure to comply with LCO requirements, and creation of an LER.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2009 Surry NRC Exam Q 92

Development References	Student References Provided
0-AP-12.00. Tech Specs	

APE062 AA2.06 - Loss of Nuclear Service Water

Ability to determine and interpret the following as they apply to the Loss of Nuclear Service Water: (CFR: 43.5 / 45.13)

The length of time after the loss of SWS flow to a component before that component may be damaged ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 80.

APE065 AA2.03 - 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)
Location and isolation of leaks ....

Given the following:

- Unit 1 is at 100%.
- Annunciator 1B-F6, CTMT INST AIR HDR LO PRESS, alarms.
- You contact the field operator and give the following direction: “Open 1-IA-446, AND 1-IA-447, UNIT 1 INSTRUMENT AIR TO UNIT 1 CONTAINMENT VALVES immediately.”

Which ONE of the following completes the statements below about this event?

1) To restore Containment IA pressure, the operator must be sent to the __(1)__ basement for the necessary local valve operation.
2) A Tech Spec Clock for Containment Integrity __(2)__.

A. 1) Safeguards
   2) must be entered

B. 1) Safeguards
   2) is not entered

C. 1) Auxiliary Building
   2) must be entered

D. 1) Auxiliary Building
   2) is not entered

General Discussion

A leak in the Containment Instrument Air (IA) system causes annunciator 1B-F6 to alarm. In this scenario, 1-IA-TV-100 (Cont IA disch TV) must be closed to isolate the leak from Containment. An alternate source of IA must be aligned. Unit 1 Turbine IA to Containment is prompted by ARP 1B-F6; the locked closed Containment Integrity valves are located in the Auxiliary Building Basement. If immediate opening of the valves is desired, the ARP directs entry to the 4 hour Integrity clock until Administrative Control has been briefed and established.

Tier 1 Group 1.
Objective ND-92.1-LP-1B

Answer A Discussion

1) is the incorrect building. Plausible if the Candidate confuses the location of other Containment Instrument Air components, such as the compressors, outside suction TV and dryers. 2) is correct.

Answer B Discussion

1) is the incorrect building. Plausible if the Candidate confuses the location of other Containment Instrument Air components, such as the compressors, outside suction TV and dryers. 2) is incorrect because the operator has not been briefed yet on Administrative control if 1-IA-446/-447 (due to immediate valve operation being required). A 4 hour T.S.3.8 LCO must be entered until an operator has been briefed on and establishes Admin control. Plausible if the Candidate confuses other actions in the same ARP where there is opportunity to brief procedure 1-OP-IA-005 prior to valve operation.

Answer C Discussion

CORRECT.

Answer D Discussion

1) is correct. 2) is incorrect because the operator has not been briefed yet on Administrative control if 1-IA-446/-447 (due to immediate valve operation being required). A 4 hour T.S.3.8 LCO must be entered until an operator has been briefed on and establishes Admin control. Plausible if the Candidate confuses other actions in the same ARP where there is opportunity to brief procedure 1-OP-IA-005 prior to valve operation.

Basis for meeting the KA

Evaluates location of valves directed in ARP 1B-F6 for isolation and restoration of Containment IA. Evaluates the correct decision in application of T.S. LCO entry vs. Administrative control.

Basis for Hi Cog

Basis for SRO only

10CFR55.43(b)(2): Application of required actions in accordance with rules of application requirements.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References

Student References Provided

APE065 AA2.03 - 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)

Location and isolation of leaks ....

Remarks/Status

SPS 2021 NRC EXAM QUESTION 81.

APE003 2.4.21 - Dropped Control Rod

APE003 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)

Initial Conditions:

- Unit 1 was operating at 100% power, NOP and NOT.
- Delta Flux Target was -1.0.
- Shutdown Bank A rod, N7 dropped fully into the core.

Current Conditions:

- The crew is performing 0-AP-1.00, ROD CONTROL SYSTEM MALFUNCTION.
- Tave is 567 and steady.
- Pzr Pressure is 2174 psig and rising.
- Power Range NI channels and Delta Flux are as shown below.

Which ONE of the following completes the questions below?

1) Based on the conditions given, the most limiting power distribution limit is __(1)__.

2) Per 0-AP-1.00, ROD CONTROL SYSTEM MALFUNCTION, 1-OP-RX-001, SHUTDOWN MARGIN (CALCULATED AT POWER), __(2)__ required to be performed for the **initial** shutdown margin verification to comply with Technical Specifications.

A. 1) Axial Flux Deviation
 2) is NOT

B. 1) Quadrant Power Tilt
 2) is

C. 1) Axial Flux Deviation
 2) is

D. 1) Quadrant Power Tilt

D

General Discussion

1) The indications given show a perturbation in both Axial and Radial Flux. With the given changes Quadrant power tilt is the most limiting Core reactivity effect. 0-AP-1.00, Rod Control System Malfunction will direct performance of Attachment 6 Quadrant Power tilt calculation. 2) 0-AP-1.00 requires SDM be verified with one hour. Because only one rod dropped the SDM verification is met, and 1-OP-RX-001 is not required for 12 hours.

Answer A Discussion

1) Incorrect because although there is an Axial flux perturbation, axial flux is within the target (+ 5%). This is plausible if the operator misinterprets the indications given and believes Delta flux is out of band. 2) Correct.

Answer B Discussion

1) Correct. 2) Incorrect because the question asks if 1-OP-RX-001 is required to be performed within one hour. It is not, but it is required to be performed within 12 hours. Plausible because the procedure does require this procedure to be performed within one hour IF there is > 1 rod inserted. Additionally this procedure will have to be performed within 12 hours.

Answer C Discussion

1) Incorrect because although there is an Axial flux perturbation, axial flux is within the target (+ 5%). This is plausible if the operator misinterprets the indications given, and believes Delta flux is out of band. 2) Incorrect because the question asks if 1-OP-RX-001 is required to be performed within one hour. It is not, but it is required to be performed within 12 hours. Plausible because the procedure does require this procedure to be performed within one hour IF there is > 1 rod inserted. Additionally this procedure will have to be performed within 12 hours.

Answer D Discussion

CORRECT

Basis for meeting the KA

This question requires the SRO candidate to assess the parameters given and determine which core reactivity function is most affected.

Basis for Hi Cog

Question written at the comprehension level. Requires analysis of indications given.

Basis for SRO only

Requires detailed knowledge of the procedure.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
0-AP-1.00

Student References Provided

APE003 2.4.21 - Dropped Control Rod

APE003 GENERIC

Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc. (CFR: 41.7 / 43.5 / 45.12)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 82.

APE036 AA2.03 - Fuel Handling Incidents
Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: (CFR: 43.5 / 45.13)
Magnitude of potential radioactive release ....

Initial Conditions:

- Unit 1 is at Refueling Shutdown (RSD).
- During Core offload, the Containment Manipulator Crane mast failed, dropping a latched assembly onto the refueling cavity floor
- The fuel clad is significantly damaged.

Current Conditions:

- The Team is performing 0-AP-22.00, FUEL HANDLING ABNORMAL CONDITIONS.
- HP has confirmed Radiation protection conditions are adequate to allow Containment re-entry for Containment Closure.

Which ONE of the following completes BOTH statements?

1) Per 0-AP-22.00, Containment closure will be established in a maximum time of __(1)__.
2) Tech Spec 3.10 Basis states the fuel handling accident analysis assumes the gap activity has decayed for a minimum of __(1)__ following full power operation.

A. 1) 45 minutes
   2) 100 hours

B. 1) 45 minutes
   2) 48 hours

C. 1) 4 hours
   2) 100 hours

D. 1) 4 hours
   2) 48 hours

General Discussion

1) During refueling operations, Containment integrity is not required. However, a Containment closure team is established to ensure, if required, Refueling Integrity can be established within 45 minutes. 2) Tech Spec 3.10 Basis states: The fuel handling accident has been analyzed based on the methodology outlined in Regulatory Guide 1.183. The analysis assumes 100% release of the gap activity from the assembly with maximum gap activity after a 100-hour decay period following operation at 2605 MWt.

Tier 1 Group 2
Objective: ND-92.5-LP-1D

Answer A Discussion

CORRECT.

Answer B Discussion

1) is correct. 2) is incorrect but plausible if the Candidate confuses the time requirement stated in a number of other places in Tech Specs, such as RCS Activity and Gas Waste storage.

Answer C Discussion

1) is incorrect but plausible if the Candidate confuses the requirement for establishing Containment Integrity after a failed Containment Isolation valve with Containment Integrity required (i.e. unit > 200°F). 2) is correct.

Answer D Discussion

1) is incorrect but plausible if the Candidate confuses the requirement for establishing Containment Integrity after a failed Containment Isolation valve with Containment Integrity required (i.e. unit > 200°F). 2) is incorrect but plausible if the Candidate confuses the time requirement stated in a number of other places in Tech Specs, such as RCS Activity and Gas Waste storage.

Basis for meeting the KA

Relates acident analysis assumptions and time requirement for Containment closure to mitigating the magnitude of a radioactive release due to a failed fuel assembly.

Basis for Hi Cog

Basis for SRO only

10CFR55.43(b)(6): Requires knowlede of Tech Spec bases for reactivity controls. Specifically, knowledge of the minimum time after shutdown prior to allowing refueling operations.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References

0-AP-22.00
Tech Specs
ND-92.5-LP-1D

Student References Provided

APE036 AA2.03 - Fuel Handling Incidents

Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: (CFR: 43.5 / 45.13)

Magnitude of potential radioactive release ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 83.

APE037 2.4.6 - Steam Generator (S/G) Tube Leak
APE037 GENERIC
Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)

Initial Conditions:

- Unit 2 is operating at 100% power.
- 2-AP-16.00, Excessive RCS Leakage, in progress due to RCS leakage of 30 gpm into the "C" SG.
- Conditions degrade, RCS Leakage rises to 100 gpm, and the RO is directed to trip the reactor and perform 2-E-0, REACTOR TRIP OR SI.

Current Conditions:

- RCS temperature is 545°F and stable.
- RCS pressure is 1978 psig and stable.
- Steam Generator Tube leakage is 90 gpm and stable.

1) Using the procedures below, which of the following is the procedural step and action that will first be taken following the immediate actions of 2-E-0?

2-ES-0.1	REACTOR TRIP RESPONSE
2-AP-24.01	LARGE SG TUBE LEAK

2) Assuming the SG leakage does not exceed 90 gpm, how will the RCS cooldown and depressurization be initially conducted?

A. 1) 2-ES-0.1, CHECK RCS TEMPERATURE CONTROL.
2) RCS cooldown at max rate until below target CETC. When below CETC depressurize RCS to stop breakflow.

B. 1) 2-AP-24.01, CHECK SI IN SERVICE.
2) Cooldown at a controllable rate < 100 °F/hour. RCS depressurization to block SI can be performed simultaneously with RCS cooldown.

C. 1) 2-ES-0.1, CHECK RCS TEMPERATURE CONTROL.
2) Cooldown at a controllable rate < 100 °F/hour. RCS depressurization to block SI can be performed simultaneously with RCS cooldown.

D. 1) 2-AP-24.01, CHECK SI IN SERVICE.
2) RCS cooldown at max rate until below target CETC. When below CETC depressurize RCS to stop breakflow.

General Discussion

Explanation: 1) The scenario presented requires use of 2-AP-24.01 to provide required actions from Reactor trip to Cold shutdown. Step 4 of E-0 directs the crew to perform ES-0.1 if SI is not required. In this case with the leak at < 150 gpm SI will not be required. A Note immediately before step 1 of ES-0.1 directs the crew to go to AP-24.01 and to not perform ES-0.1. 2) The normal method for cooling down and depressurizing to stop breakflow in E-3 is to cooldown below CETC, wait until below CETC, then depressurize to stop breakflow. In AP-24.01 the cooldown is to be done at a controllable rate and must be < 100 deg. F/hour. Depressurization can occur at the same time to block SI.

Tier 1 Group 2
Objective: ND-95.1-ST-9B

Answer A Discussion

1) Incorrect but plausible because the operators are trained to transition to ES-0.1, read the Note and then go to AP-24.01 and perform the first step there. Plausible for the operator to believe that he stays in ES-0.1 until directed out because most times in the EOPs this is how transitions are made. 2) Incorrect but plausible because this is the normal method for cooling down and depressurizing for a SGTR per E-3. For a SG Tube leak cool down must be < 100 deg. F/hour and depressurization can be done in parallel to block SI.

Answer B Discussion

Correct.

Answer C Discussion

1) Incorrect but plausible because the operators are trained to transition to ES-0.1, read the Note and then go to AP-24.01 and perform the first step there. Plausible for the operator to believe that he stays in ES-0.1 until directed out because most times in the EOPs this is how transitions are made. 2) Correct.

Answer D Discussion

1) Correct. 2) Incorrect but plausible because this is the normal method for cooling down and depressurizing for a SGTR per E-3. For a SG Tube leak cool down must be < 100 deg. F/hour and depressurization can be done in parallel to block SI.

Basis for meeting the KA

Question tests the operator’s knowledge of AP-24.01 mitigation by asking specifically how the RCS is cooled down and depressurized.

Basis for Hi Cog

Candidate must evaluate parameters and determine which procedural step is performed and specific actions to cooldown and depressurize.

Basis for SRO only

Requires detailed knowledge regarding cooldown and depressurization for SGTL as compared to a SGTR. We would not expect ROs to know this. This question requires the SRO to assess plant conditions, select procedure and steps to mitigate. [10CFR 55.43(b)(5)]

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
2-ES-0.1. 2-AP-24.01. 2-E-3. ND-95.1-ST-9

Student References Provided

APE037 2.4.6 - Steam Generator (S/G) Tube Leak
APE037 GENERIC
Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 84.

APE068 AA2.04 - Control Room Evacuation
Ability to determine and interpret the following as they apply to the Control Room Evacuation: (CFR: 43.5 / 45.13)
S/G pressure ....

Initial Conditions:

- A fire has started in the Main Control Room.

Current Conditions (10 minutes later):

- Efforts to put out the fire have failed.
- Both units' reactors are tripped and RCPs secured.
- The Control Room Team has evacuated.
- The Unit 2 team is determining S/G Levels per 0-FCA-11.00, REMOTE MONITORING.
- The following indications are reported:
  - S/G Wide Range Levels are 55%.
  - S/G Pressures are 850 psig.

Which ONE of the following completes the following statements?

1) Unit 2 S/G Levels __(1)__ at the level required by 0-FCA-11.00.
2) Based on current conditions, the SEM will declare __(2)__.

REFERENCE PROVIDED

A. 1) are not
   2) an Alert

B. 1) are
   2) a NOUE

C. 1) are not
   2) a NOUE

D. 1) are
   2) an Alert

General Discussion

1) After Control Room evacuation, S/G Narrow Range (NR) level is determined using Attachment 4 of 0-FCA-11.00, Remote Monitoring. This evaluates S/G Wide Range (WR) Level against current S/G Pressure, converting WR level to an equivalent NR level. 0-FCA-11.00, directs maintaining S/G NR level between 22 and 50%. With WR level at 55% and S/G Pressure at 850 psig, NR level is below the minimum 22%. 2) A confirmed fire in the Control Room warrants declaration of a NOUE. If subsequent Control Room evacuation is required, it requires escalation to an Alert.

Tier 1 Group 2
Objective: ND-95.6-LP-2B

Answer A Discussion

CORRECT.

Answer B Discussion

1) is incorrect but plausible if the Candidate either incorrectly applies 0-FCA-11.00 Attachment 4, or incorrectly applies normal S/G Pressure at HSD (1005 psig). The Candidate may incorrectly extrapolate to verify S/G levels greater than 12% NR; this is the normal minimum heat sink requirement in EOPs to ensure heat sink function is met. 2) is incorrect because Control Room evacuation was requried. Plausible because the highest EAL classification level that specifically mentions a fire is a NOUE.

Answer C Discussion

1) is correct. 2) is incorrect because Control Room evacuation was requried. Plausible because the highest EAL classification level that specifically mentions a fire is a NOUE.

Answer D Discussion

1) is incorrect but plausible if the Candidate either incorrectly applies 0-FCA-11.00 Attachment 4, or incorrectly applies normal S/G Pressure at HSD (1005 psig). The Candidate may incorrectly extrapolate to verify S/G levels greater than 12% NR; this is the normal minimum heat sink requirement in EOPs to ensure heat sink function is met. 2) is correct.

Basis for meeting the KA

Scenario involves Control Room evacuation and one of the applicabile procedures (0-FCA-11.00). Must use given critical parameters, including S/G Pressure, to determine if S/G level is in an acceptable range. Tier 1 question, as it requires use of 0-FCA-11.00 and the EAL Matrices.

Basis for Hi Cog

Must evaluate given conditions to determine correct EAL classification level. Must also use given critical parameters to correctly interpret a given graph.

Basis for SRO only

10CFR55.43(b)(5): Must assess given emergency plant conditions and select the correct Emergency Action Level and subsequent Implementing Procedure to mitigate the consequences of Control Room evacuation.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References	Student References Provided
0-FCA-11.00 SEAL Matrices	

APE068 AA2.04 - Control Room Evacuation

Ability to determine and interpret the following as they apply to the Control Room Evacuation: (CFR: 43.5 / 45.13)

S/G pressure ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 85.

SYS004 2.4.11 - Chemical and Volume Control System
SYS004 GENERIC
Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)

Given the following:

- Unit 1 is operating at 100% power.
- 1-CH-P-1C, Charging pump is running.
- A failure of the VCT causes the following:
  - 1-CH-LI-1115, VCT Level fails HIGH.
  - Annunciator 1D-G1, VCT HI-LO LVL is Lit.
  - Annunciator VCT HI-LO PRESS is lit.
  - VCT level is 0%, VCT Pressure is 0 psig.
- Multiple Aux Building radiation monitor alarms are coming in.
- The crew enters 1-AP-8.00, LOSS OF NORMAL CHARGING.
- The RO reports that Charging pump discharge pressure, Charging flow, and Charging motor amps are erratic.
- Unit 2 is directed to <u>make preparations to supply Unit 1 Charging</u> using the Charging Crosstie if no Unit 1 Charging pumps can be restored.

Which ONE of the following describes system response and operator actions?

1) With the conditions given the Shift Manager will declare __(1)__ as INOPERABLE.
2) The Tech Spec Basis for the Charging Cross tie is to permit the opposite unit's charging pumps (Unit 2) to bring the disabled unit to a __(2)__ condition.

A. 1) 1-CH-P-1C ONLY
   2) Hot Shutdown

B. 1) ALL Unit 1 Charging pumps
   2) Cold Shutdown

C. 1) 1-CH-P-1C ONLY
   2) Cold Shutdown.

D. 1) ALL Unit 1 Charging pumps
   2) Hot Shutdown

General Discussion

Explanation: 1)The scenario given is a VCT rupture that causes VCT level and pressure to drop rapidly. The indications given are classic indications of gas binding of 1-CH-P-1C. AP-8.00 requires that all running and non-running charging pumps are placed in pull to lock. Any charging that needs to be subsequently started must be thoroughly vented using Attachment 1 to prevent pump damage. Therefore ALL Unit 1 Charging pumps are inoperable. 2) It is required to maintain available one charging pump with a source of borated water on the opposite unit. This will maintain the capability to cross-connect the two unit's charging pump discharge headers. In the event the operating unit's charging pumps become inoperable. This permits the opposite unit's charging pumps to be used to bring the disabled unit to COLD SHUTDOWN condition.

Tier 2 Group 1
Objective: ND-88.3-LP-2G

Answer A Discussion

1) Incorrect because AP-8.00 requires ALL running and non-running charging pumps to be placed in PTL. Plausible because it is logical for the operator to believe that because the symptoms of gas binding are only evident on one Charging pump, the other Charging pumps can be considered operable until they have the same indications. 2) Hot Shutdown is incorrect because the TS Basis specifically states that the cross-tie allows bringing a disabled unit to COLD SHUTDOWN. Plausible if the operator confuses this requirement with the required action for an inoperable Charging Cross-tie line which is to bring the unit to HOT SHUTDOWN.

Answer B Discussion

Correct.

Answer C Discussion

1) Incorrect because AP-8.00 requires ALL running and non-running charging pumps to be placed in PTL. Plausible because it is logical for the operator to believe that because the symptoms of gas binding are only evident on one Charging pump, the other Charging pumps can be considered operable until they have the same indications. 2) Correct.

Answer D Discussion

1) Correct. 2) Hot Shutdown is incorrect because the TS Basis specifically states that the cross-tie allows bringing a disabled unit to COLD SHUTDOWN. Plausible if the operator confuses this requirement with the required action for an inoperable Charging Cross-tie line which is to bring the unit to HOT SHUTDOWN.

Basis for meeting the KA

Question requires knowledge of 1-AP-8.00, LOSS OF NORMAL CHARGING, therefore the question matches the K/A, in addition to TS Basis.

Basis for Hi Cog

Question requires the operator to first analyze VCT Level indicators to determine what VCT LT failed. Question then requires the operator to analyze the scenario to determine correct actions.

Basis for SRO only

Question requires knowledge of Tech Spec Basis therefore this question is written at the SRO level.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
1-AP-8.00. TECH SPEC BASIS

Student References Provided

SYS004 2.4.11 - Chemical and Volume Control System
SYS004 GENERIC
Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 86.

SYS006 2.4.50 - Emergency Core Cooling System (ECCS)
SYS006 GENERIC
Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 41.10 / 43.5 / 45.3)

Initial Conditions:

- A Large Break LOCA occurred on Unit 1. .

Current Conditions (45 minutes later):

- The team is in 1-ES-1.3, TRANSFER TO COLD LEG RECIRCULATION.
- The SRO is reading 1-ES-1.3 Step 6, Monitor for ECCS leakage.
- Annunciator 1A-B7, RWST EMPTY, has just come in.

Which ONE of the following completes the statements below?

1) Annunciator 1A-B7 comes in as soon as RWST level reaches __(1)__.
2) Based on current conditions, the __(2)__ pumps will be secured.

A. 1) 3%
   2) CS

B. 1) 3%
   2) CS and LHSI

C. 1) 6%
   2) CS

D. 1) 6%
   2) CS and LHSI

General Discussion

1A-B7, RWST EMPTY, alarms at 3% level. At 3%, the ARP directs securing the CS pumps. 1A-B7 directs securing the listed pumps if they are taken suction from the RWST (CS, LHSI, CH pumps). By step 6 of 1-ES-1.3, as mentioned in the question, the PHSI and CH pumps are no longer taking suction off the RWST. The RWST must be at a minimum of 6% level to provide adequate suction to the LHSI pumps. This level is pointed out in 1-ECA-1.1 Step 5 RNO, which sends the team to step 33 (which secures the SI pumps).

Tier 2 Group 1
Objective: ND-95.3-LP-10B

Answer A Discussion

CORRECT

Answer B Discussion

1) is correct. 2) is incorrect but plausible if the Candidate does not apply the qualifying statement in ARP 1A-B7 that only the pumps aligned to take suction from the RWST are to be secured.

Answer C Discussion

1) is incorrect but plausible if the Candidate confuses the RWST level in 1-ECA-1.1 which directs securing LHSI and CH pumps (due to loss of suction). 2) is correct.

Answer D Discussion

1) is incorrect but plausible if the Candidate confuses the RWST level in 1-ECA-1.1 which directs securing LHSI and CH pumps (due to loss of suction). 2) is incorrect but plausible if the Candidate does not apply the qualifying statement in ARP 1A-B7 that only the pumps aligned to take suction from the RWST are to be secured.

Basis for meeting the KA

Requires knowledge of annunciator setpoint and determine required actions based on current plant alignment.

Basis for Hi Cog

Basis for SRO only

10CFR55.43(b)(5), Assessment of Facility Conditions and Selection of Appropriate Procedures During Normal, Abnormal, and Emergency Situations: Must assess given plant conditions and determine the correct RNO (Response Not Obtained) procedural actions to implement, based on abnormal plant lineup.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References
1A-B7 1-ES-1.3 ND-95.3-LP-10B

Student References Provided

SYS006 2.4.50 - Emergency Core Cooling System (ECCS)
SYS006 GENERIC
Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 41.10 / 43.5 / 45.3)

Remarks/Status

SPS 2021 NRC EXAM QUESTION 87.

SYS012 A2.02 - Reactor Protection System (RPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

Loss of instrument power ....

Initial Conditions:

- Unit 1 is operating at 100% power.
- Multiple NIS annunciators alarm.
- The RO reports that the Control Power fuses for Power Range NIS Channel 4 (N44) has blown.
- The operating crew enters 1-AP-4.00, NUCLEAR INSTRUMENT MALFUNCTION.
- The operator reports that the Instrument power fuses are intact.

Current Conditions:

- The team is performing actions to place N44 in trip per AP-4.00, Attachment 1.

Which ONE of the following answers the questions below?

1) With this type of failure, Annunciator 1E-H5, NIS PWR RNG HI STPT CH4 will be __(1)__.
2) Per Technical Specifications, this channel may be bypassed for up to __(2)__ hours for surveillance testing of the redundant channels.

A. 1) NOT lit
   2) 2

B. 1) lit
   2) 2

C. 1) lit
   2) 12

D. 1) NOT lit
   2) 12

General Discussion

Explanation: 1) With a failure of the Control power fuses, the Reactor protection bistables will trip the indication will remain as is (100%), and Annunciator 1E-H5 will be lit. This would be a similar response as a loss of instrument power. Both loss of control and instrument power provides some similar indications such as reactor protection bistables tripping. They differ in the channel lights and Benchboard indication changes. 2) Technical Specifications allows the inoperable channel to be bypassed for up to 12 hours for surveillance testing of the other redundant channels. With a loss of a Reactor trip breaker 2 hours is allowed for surveillance testing.

Tier 2 Group 1
Objective: ND-93.2-LP-4C,E

Answer A Discussion

1) Incorrect, but plausible if the operator confuses the response of the reactor protection bistable tripping causing 1E-H5 to alarm, with the response of the bistable backboard indication. The channel bistable lights are NOT lit for a loss of control power, but they are lit for a loss of instrument power. 2) Incorrect because Tech Spec will allow up to 12 hours for surveillance testing. Plausible because other Tech Spec functions such as Reactor trip breakers only allow 2 hours for surveillance testing of the other channels.

Answer B Discussion

1) Correct. 2) Incorrect because Tech Spec will allow up to 12 hours for surveillance testing. Plausible because other Tech Spec functions such as Reactor trip breakers only allow 2 hours for surveillance testing of the other channels.

Answer C Discussion

Correct.

Answer D Discussion

1) Incorrect, but plausible if the operator confuses the response of the reactor protection bistable tripping causing 1E-H5 to alarm, with the response of the bistable backboard indication. The channel bistable lights are NOT lit for a loss of control power, but they are lit for a loss of instrument power. 2) Correct.

Basis for meeting the KA

Question requires the operator to demonstrate knowledge regarding loss of instrument power to PRNIS with respect to indications, and also actions required by Tech Specs. Loss of Cntrl power is similar to loss of instrument power in that this power is also used to power the drawer.

Basis for Hi Cog

Question written at or above the analysis level. Operator must evaluate multiple indications and determine how PRNI will respond, and TS actions.

Basis for SRO only

Requires detailed knowledge of Tech Spec actions for loss of PRNI, therefore this meets the SRO only threshold. (10CFR 55.43(b)(2).

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
1-AP-4.00. TECH Specs.

Student References Provided

SYS012 A2.02 - Reactor Protection System (RPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5)

Loss of instrument power ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 88.

SYS059 A2.12 - 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)

Failure of feedwater regulating valves ....

Initial Conditions:

- Unit 2 was stable at 100% power.
- The PCS Calorimetric is based on the Ultrasonic (UFM) detectors.
- A SGWLCS failure occurred that caused "B" Feedwater Regulating Valve (FRV) to travel open.
- During the immediate action steps, the RO noted the "B" FRV is stuck open and had to stabilize "B" S/G level by alternate means.

Current Conditions:

- The SRO has determined the need to place Unit 2B FRV on the Jack in accordance with 2-MOP-FW-015, MAIN FEEDWATER REGULATING VALVE JACKING OPERATIONS.

Which ONE of the following completes both statements?

1) The NRC Resident __(1)__ required to be notified when placing the 2B FRV on the jack.
2) If the 2B FRV bypass HCV is used for fine control of feedwater flow, the UFM system will __(2)__ FUNCTIONAL.

A. 1) is
   2) not be

B. 1) is not
   2) not be

C. 1) is
   2) remain

D. 1) is not
   2) remain

General Discussion

1) 2-MOP-FW-015, MAIN FEEDWATER VALVE JACKING OPERATIONS, contains the requirement for notifying the NRC resident whenever a FRV is placed on the jack. (This notification is not driven by the other standard procedures which dictate NRC notification time requirements). 2) The UFM detector is in line with both the FRVs and Bypass HCV, so if CALCALC is based on UFM, it will still be FUNCTIONAL if the bypass HCV is used; no TRM actions will be required. The Feed flow venturis are not normally in line with the Bypass HCVs, so if that basis was used, CALCALC would be unreliable.

Tier 2 Group 1
Objective: ND-89.3-LP-3C

Answer A Discussion

1) is correct. 2) is incorrect but plausible if the Candidate confuses the locations of the UFM detectors (used for UFM based calorimetric) and the Feedwater venturis (used for Feed Flow based calorimetric). If CALCALC was initially based on Feed Flow, then swap to UFM would be requried.

Answer B Discussion

1) is incorrect because 2-MOP-FW-015 Step 4.7 states the NRC Resident Inspector SHALL be notified if any MFRV is placed on the jack. Plausible if the Candidate only considers the normal requirements for NRC notification (EPIPs and VPAP-2802), which have no requirements for NRC notification for this evolution. 2) is incorrect but plausible if the Candidate confuses the locations of the UFM detectors (used for UFM based calorimetric) and the Feedwater venturis (used for Feed Flow based calorimetric). If CALCALC was initially based on Feed Flow, then swap to UFM would be requried.

Answer C Discussion

CORRECT.

Answer D Discussion

1) is incorrect because 2-MOP-FW-015 Step 4.7 states the NRC Resident Inspector SHALL be notified if any MFRV is placed on the jack. Plausible if the Candidate only considers the normal requirements for NRC notification (EPIPs and VPAP-2802), which have no requirements for NRC notification for this evolution. 2) is correct.

Basis for meeting the KA

Tests (a) impact of station operation after a FRV failure (which mode of Calorimetric monitoring must be in place), and (b) one of the required actions during performance of the mitigating procedure.

Basis for Hi Cog

Basis for SRO only

10CFR55.43(b)(5): Evaluates knowledge of the content of the procedure to establish the correct means of monitoring reactor power during performance of the mitigating procedure. Also tests knowledge of requirement for NRC notification.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References	Student References Provided
2-MOP-FW-015 ND-89.3-LP-3C	

SYS059 A2.12 - 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)

Failure of feedwater regulating valves ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 89.

SYS064 A2.21 - 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)
Significance and interpretation of opening of ring bus during test ....

Initial Conditions:

- 2-OPT-EG-001, NUMBER 2 EMERGENCY DIESEL GENERATOR MONTHLY START EXERCISE TEST, is in progress.
- #2 EDG has been aligned for testing and is operating at test load.

Current Conditions:

- Breaker 252, 34.5KV RSST B SUPPLY BREAKER, spuriously opened.

Which ONE of the following completes the statement below?

1) 2-OPT-EG-001 Attachment 7, EDG CONTINGENCY ACTIONS, ___(1)___ required to be performed.
2) Based on current offsite power availability a TS 3.16 LCO clock __(2)__ in effect.

A. 1) is not
   2) is

B. 1) is
   2) is

C. 1) is not
   2) is not

D. 1) is
   2) is not

General Discussion

During EDG testing, the Diesel is loaded in parallel with the Reserve Station Service Bus to supply the Emergency Bus. To setup the EDG testing, EDG Speed Droop is raised. If a loss of Reserve Satation Service supply to the Emergency Bus occurs, several contingency actions are required and outlined in a specific attachment in each EDGs Monthly OPT (For #2 EDG, it is Attachment 7 of 2-OPT-EG-001). Multiple actions are required, including lowering Speed Droop slowly to zero, now that #2 EDG is supplying the 2H Bus as the sole source.
If a loss of the normal offsite AC power source occurs, a 7 Day T.S. LCO is in effect, but unit operation may continue, provided a dependable offsite AC source can be made OPERABLE within 8 hours, per Tech Spec 3.16.B.2.

Answer A Discussion

1) is incorrect because in this scenario, #2 EDG has become the sole source to the 2H Emergency Bus. Plausible if the Candidate incorrectly analyzes the plant response to the spurious opening of breaker 252, or does not recognize the applicability of Attachment 7. 2) is correct.

Answer B Discussion

CORRECT

Answer C Discussion

1) is incorrect because in this scenario, #2 EDG has become the sole source to the 2H Emergency Bus. Plausible if the Candidate incorrectly analyzes the plant response to the spurious opening of breaker 252, or does not recognize the applicability of Attachment 7. 2) is incorrect because a 7 Day T.S.3.16 LCO is in effect. Plausible if the Candidate does not correctly relate the effect of the loss of breaker 252 as a loss of the normal offsite source in T.S.3.16 Bases, or incorrectly determines that EITHER the normal or dependable offsite source is required to satisfy the LCO requirement.

Answer D Discussion

1) is correct. 2) is incorrect because a 7 Day T.S.3.16 LCO is in effect. Plausible if the Candidate does not correctly relate the effect of the loss of breaker 252 as a loss of the normal offsite source in T.S.3.16 Bases, or incorrectly determines that EITHER the normal or dependable offsite source is required to satisfy the LCO requirement.

Basis for meeting the KA

Evaluates knowledge of impact of opening Switchyard breaker to affected Emergency Bus during EDG testing. Includes required Tech Spec LCO applicability in response to the event.

Basis for Hi Cog

Must interpret initial conditions to determine EDG alignment, including initial vs required Speed Droop setting. Must also relate the plant response to opening breaker 252 (i.e. interlock between Transfer bus voltage and 25H8 breaker.).

Basis for SRO only

10CFR55.43(b)(2): Requres knowledge of application of T.S.3.16.B.2. required actions, including specific clock. Analyze scenario and apply correct LCO, as it relates to the definitions of the Normal and Dependable Offsite AC sources in Tech Spec 3.16 Bases.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References	Student References Provided
Tech Spec 3.16 2-OPT-EG-001	

SYS064 A2.21 - 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)

Significance and interpretation of opening of ring bus during test ....

Remarks/Status

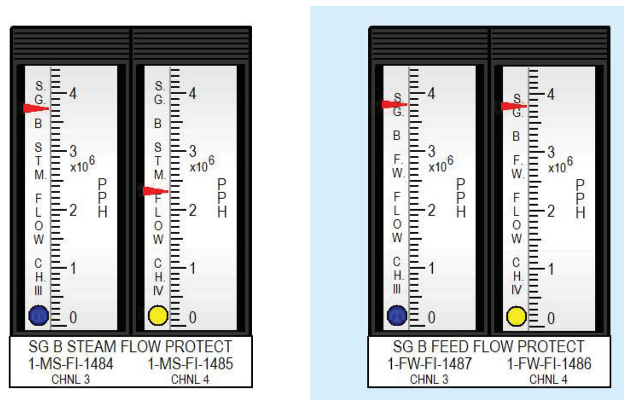
SPS 2021 NRC EXAM QUESTION 90.

A

SYS035 2.4.31 - Steam Generator System (S/GS)
SYS035 GENERIC
Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

Given the following:

- Unit 1 was operating at 100% power.
- A failure occurred, resulting in the indications shown to the right (all shown indications are stable), with 1-MS-FI-1485, CHNL 4, continuing to lower.



- The following Tech Spec tables are being reviewed for applicability:
  - Table 3.7-1, REACTOR TRIP INSTRUMENT OPERATING CONDITIONS.
  - Table 3.7-2, ENGINEERING SAFEGUARDS ACTION INSTRUMENT OPERATING CONDITIONS.

Which ONE of the following system response and Tech Spec applicability?

1) With no operator action, the reactor __(1)__ automatically trip.
2) Assuming the team performs 0-AP-53.00, LOSS OF VITAL INSTRUMENTATION / CONTROLS, Tech Spec __(2)__ will contain the required actions for the failure.

A. 1) will not
   2) Tables 3.7-1 AND 3.7-2

B. 1) will
   2) Table 3.7-1 ONLY

C. 1) will not
   2) Table 3.7-1 ONLY

D. 1) will
   2) Tables 3.7-1 AND 3.7-2

General Discussion

1) For this event, Channel 4 Steam flow is failing low. Without an immediate change in FW flow, it indicates that the failing Steam Flow channel is NOT selected as a SGWLCS input. A reator trip will not occur. If Channel 4 was selected, Feedwater Flows would already be lowering and a reactor trip would occur with no operator action. 2) 0-AP-53.00 will still be performed, whether the failing channel is selected or not. Operator actions are required to be taken in BOTH Tech Spec Tables 3.7-1 and 3.7-2, because both Reactor Protection and Engineered Safeguards are impacted by this event (Channel 4 Steam Flow failed low).

Tier 2 Group 2
Objective: ND-93.3-LP-10C

Answer A Discussion

CORRECT.

Answer B Discussion

1) is incorrect because Channel 4 Steam Flow is not selected, based on no current change in FW flow indication. Plausible if the Candidate incorrectly diagnoses the channel failure. 2) is incorrect because Table 3.7-2 also applies. Plausible because it is partially correct.

Answer C Discussion

1) is correct. 2) is incorrect because Table 3.7-2 also applies. Plausible because it is partially correct.

Answer D Discussion

1) is incorrect because Channel 4 Steam Flow is not selected, based on no current change in FW flow indication. Plausible if the Candidate incorrectly diagnoses the channel failure. 2) is correct.

Basis for meeting the KA

Must be able to interpret given indications and relate to 0-AP-53.00, as well as required Tech Spec actions.

Basis for Hi Cog

Must interpret given indicators to determine the correct indicator failure and select the applicable reactor trip signal.

Basis for SRO only

10CFR55.43(b)(2): Application of required actions (Section 3) in accordance with rules of application requriements.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References

ARP 1F-D7
Tech Specs
ND-93.3-LP-10C

Student References Provided

SYS035 2.4.31 - Steam Generator System (S/GS)
SYS035 GENERIC
Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)

Remarks/Status

SPS 2021 NRC EXAM QUESTION 91.

SYS071 A2.05 - Waste Gas Disposal System (WGDS)

Ability to (a) predict the impacts of the following malfunctions or operations on the Waste Gas Disposal 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)

Power failure to the ARM and PRM Systems ....

Given the following:

- Unit 1 is operating at 100%, Unit 2 is in a Refueling outage.
- "A" WGDT is in service (lined up).
- "B" WGDT release is in progress in accordance with OP-23.2.4, RELEASE OF WASTE GAS DECAY TANK 1B.
- Annunciator 0-RMA-C5, PROCESS VENT RAD MON TRBL, is received.
- The BOP reports that the 1-GW-RI-130A, Process Vent Particulate Indicator, green "Operate" light is NOT LIT.

Which ONE of the following completes the statements:

1) The automatic actions for Unit 1 per 0-RMA-C5 that should be checked is 1-GW-FCV-101 – CLOSED, and __(1)__.

2) The Tech Spec Basis for the quantity of radioactivity in the Waste Gas Decay Tanks is based on providing assurance that in the event of an uncontrolled release of the WGDT, the resulting total body exposure at the exclusion boundary will not exceed __(2)__ in an event of 2 hours.

A. 1) 1-GW-FCV-160, Ctmt Vac Pump Disch Hdr Isol-CLOSED
   2) 5.0 rem

B. 1) 1-CV-P-1A, and 1-CV-P-1B, CTMT Vacuum Pumps OFF
   2) 0.5 rem

C. 1) 1-CV-P-1A, and 1-CV-P-1B, CTMT Vacuum Pumps OFF.
   2) 5.0 rem

D. 1) 1-GW-FCV-160, Ctmt Vac Pump Disch Hdr Isol-CLOSED
   2) 0.5 rem

General Discussion

Explanation: 1) The automatic actions for Process Vent Part Hi for 1-GW-RI-130A as indicated by alarm 0-RMA-C5, is to automatically isolate 1-GW-FCV-101 and 1-GW-FCV-160. The Ctmt Vacuum pumps are not automatically isolated, but are checked or placed in OFF after verifying 1-GW-FCV-160 is CLOSED. 2) Tech Spec 3.11, Radioactive Gas Storage states the basis is to limit the total body exposure to an individual at the exclusion area boundary to < 0.5 rem in the event of an uncontrolled release of the WGDT for 2 hours.

Tier 2 Group 2
Objective: ND-92.4-LP-1D. ND-93.5-LP-3C

Answer A Discussion

1) Correct. 2) Incorrect because TS 3.11 states that the limit is 0.5 rem. 5.0 rem is plausible because that is the Federal whole body limit, and the operator could easily confuse 0.5 with 5.0 rem.

Answer B Discussion

1) Incorrect because the automatic actions are to close FCV-101, and GW-FCV-160. Plausible because the Ctmt Vacuum pumps are not automatically isolated, but are checked or placed in OFF after verifying 1-GW-FCV-160 is CLOSED. 2) Correct.

Answer C Discussion

1) Incorrect because the automatic actions are to close FCV-101, and GW-FCV-160. Plausible because the Ctmt Vacuum pumps are not automatically isolated, but are checked or placed in OFF after verifying 1-GW-FCV-160 is CLOSED. 2) Incorrect because TS 3.11 states that the limit is 0.5 rem. 5.0 rem is plausible because that is the Federal whole body limit, and the operator could easily confuse 0.5 with 5.0 rem.

Answer D Discussion

CORRECT

Basis for meeting the KA

Question poses a scenario where there is a failure of Process Vent Rad monitor, therefore this meets the K/A.

Basis for Hi Cog

Question requires the candidate to analyze the scenario to determine outcome.

Basis for SRO only

Question requires knowledge of the Tech Spec Basis therefore this question meets SRO requirements [10CFR55.43(b)(2)].

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	Bank Question 1691

Development References

0-RMA-C5. ND-92.4-LP-1. ND-93.5-LP-3.

Student References Provided

SYS071 A2.05 - Waste Gas Disposal System (WGDS)

Ability to (a) predict the impacts of the following malfunctions or operations on the Waste Gas Disposal 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)

Power failure to the ARM and PRM Systems ....

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 92.

SYS086 A2.04 - Fire Protection System (FPS)
Ability to (a) predict the impacts of the following malfunctions or operations on the Fire Protection 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)
Failure to actuate the FPS when required, resulting in fire damage ....

Given the following conditions:

- Unit 1 and Unit 2 are operating at 100% power when a fire occurs in the Unit 1 Emergency Switchgear Room.
- Annunciator 0-VSP-M2, EMERG SWGR RM HALON SYS FIRE/TRBL alarms.
- An Operator is dispatched and he reports from the Unit 2 ESGR that there is a fire in the Unit 1 ESGR.
- An Operator attempts to manually actuate the Halon Fire protection system from the MCR but the system would NOT actuate.
- The team enters 0-AP-48.00, FIRE PROTECTION OPERATIONS RESPONSE.

Which ONE of the following completes both statements?

1) The PULL station for actuating Halon for Unit 1 ESGR is located at the__(1)__.
2) Per the TRM Bases, closure and latching of the sliding door between U1 and U2 ESGR, 1-BS-DR-18 __(2)__ required to maintain functionality of the Unit 1 ESGR Halon System.

A. 1) Unit 1 Turbine building
 2) is

B. 1) Unit 1 Turbine building
 2) is NOT

C. 1) Unit 2 ESGR
 2) is

D. 1) Unit 2 ESGR
 2) is NOT

General Discussion

1)The pull station for the Unit 1 Halon system is located in U2 Emergency Switchgear (ESGR), just ouside the entry to U1 ESGR. The pull station for the Unit 2 Halon system is located in the Unit 1 Turbine building, just outside U2 ESGR. 2) Per the TRM Basis, closure and latching of a gas boundary door with the leading edge are required to maintain functionality of a Halon system. Therefore the sliding door, 1-BS-DR-18 , sliding door between Unit 1 and Unit 2 ESGR is required to be capable of being closed and latched. allows 14 days as a maximum amount of time (TRM 3.7.5).

Answer A Discussion

1) Incorrect but plausible if the Candidate confuses the location of the Unit 2 Halon pull station. Also plausible because the U2 Halon pull station is located just outside the ESGR complex, and the Candidate may incorrectly assume that is the correct and safe location to initiate Halon for either Unit ESGR. 2) Correct.

Answer B Discussion

1) Incorrect but plausible if the Candidate confuses the location of the Unit 2 Halon pull station. Also plausible because the U2 Halon pull station is located just outside the ESGR complex, and the Candidate may incorrectly assume that is the correct and safe location to initiate Halon for either Unit ESGR. 2) Incorrect but plausible if the operator confuses the type of door 1-BS-DR-18 is, or doesn't understand the relationship between this door and the Halon TS Basis because APP R doors are covered in a different TRM Section.

Answer C Discussion

CORRECT.

Answer D Discussion

1) Correct. 2) Incorrect but plausible if the operator confuses the type of door 1-BS-DR-18 is, or doesn't understand the relationship between this door and the Halon TS Basis because APP R doors are covered in a different TRM Section.

Basis for meeting the KA

Question stem includes failure of Halon system which meets intent of K/A, "failure to actuate FPS when required". Question requires the student to determine the correct alternate course of action to initiate Halon Fire Protection. Part 2 supports the knowledge required of SRO candidates to understand the TRM Basis.

Basis for Hi Cog

Comprehension level since the operator needs to apply a subsequent malfunction (sliding door) to knowledge of the TRM Basis.

Basis for SRO only

Application of the TRM and knowledge of the TRM Basis is an SRO function.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
0-OP-FP-006, ARP 0-VSP-M2. ND-92.2-LP-1

Student References Provided

SYS086 A2.04 - Fire Protection System (FPS)

Ability to (a) predict the impacts of the following malfunctions or operations on the Fire Protection 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)

Failure to actuate the FPS when required, resulting in fire damage ....

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 93.

GEN2.1 2.1.2 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of operator responsibilities during all modes of plant operation. (CFR: 41.10 / 45.13)

Given the following:

- Today (Day 8) a start-up, following a mid-cycle reactor trip, is planned for the next shift.
- One Reactor Operator must be held over two hours for the start-up.
- Shown below is the work history (excluding shift turnover time) of the available Reactor Operators on shift.
- All operators began their shift at the same time each day. (Day Shift)
- All operator will have tomorrow (Day 9) off.
- Emp Center is NOT available.

Day	1	2	3	4	5	6	7	8
Operator #1	12	12	12	12	0	0	0	15
Operator #2	12	8	12	12	12	12	0	13
Operator #3	0	11	0	12	12	12	12	12
Operator #4	12	0	12	12	12	12	8	14
Operator #5	0	0	0	11	12	12	13	12
Operator #6	0	12	12	12	8	2	12	12

Which ONE of the following operators can be held over (forced) for an additional two hours without obtaining management overtime approval?

REFERENCE PROVIDED

A. Operators #1, 2, and 3.

B. Operators #1, 4 and 5.

C. Operators #2, 4 and 6.

D. Operators #3, 5, and 6.

General Discussion

Explanation: Per LI-AA-700, Fatigue Management and Work Hour Limits for Covered Workers, 3.3.1 an operator cannot work more than 16 consecutive hours or cannot work more than 16 hours in any rolling 24 hour period. Additionally an operator cannot work more than 26 hours in any 48 hour period, and cannot work more than 72 hours in any 7 day period. Operator #1 would exceed 16 hours in a 24 hour period. Operator 2 would have a total of 71 hours over 7 days so he can work. Operator #3 currently has 71 hours so he cannot work an additional 2 hours. Operator #4 currently has 70 hours so he could work an additional 2 hours. Operator 5 only has 62 hours but he would exceed 26 hours in a 48 hour period so he can't work. Operator 6 currently has 70 hours so he could work another 2 hours.

Tier 3
Objective: SROU-02B

Answer A Discussion

A.Incorrect because Operator's 1 and 3 exceed LI-AA-700 requirements. Operator 1 exceeds 16 hours in 24 hour period and Operator #3 would exceed 72 hours in 7-day period. Plausible because this is partially correct. Operator # 2 is allowed.

Answer B Discussion

B.Incorrect because Operators 1 and 5 exceed LI-AA-700 requirements. Operator 1 exceeds 16 hours in 24 hour period and Operator #5 would exceed 26 hours in a 48 hour period. Plausible because Operator # 4 is allowed.

Answer C Discussion

Correct.

Answer D Discussion

D.Incorrect because Operators 3 and 5 exceed LI-AA-700 requirements. Operator 3 exceeds 72 hours in 7 day period, and Operator #5 would exceed 26 hours in a 48 hour period.

Basis for meeting the KA

Question matches the K/A because one of the SRO's responsibility is to ensure no one on shift exceeds their emp center requirements.

Basis for Hi Cog

Question requires the operator to make calculations of total hours and using LI-AA-700 determine if any requirements are exceeded.

Basis for SRO only

This is an SRO Task because he would be held responsible for ensuring LI-AA-700 requirements are met if Emp Center would be lost.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
LI-AA-700

Student References Provided
LI-AA-700, Section 3 (28 pages)

GEN2.1 2.1.2 - GENERIC - Conduct of Operations
Conduct of Operations
Knowledge of operator responsibilities during all modes of plant operation. (CFR: 41.10 / 45.13)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 94.

GEN2.2 2.2.1 - GENERIC - Equipment Control

Equipment Control

Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity. (CFR: 41.5 / 41.10 / 43.5 / 43.6 / 45.1)

Given the following:

- A Unit 2 startup is in progress.
- Low Power Physics Testing is about to occur, starting with Shutdown Bank "A" (SBA).
- A Reactivity SRO is stationed at Unit 2.

Which ONE of the following completes both statements?

1) Per T.S.3.12 Basis, when the SBA rods are inserted, Tech Spec 3.12 LCO entry __(1)__ be required.
2) Per OP-AP-300, REACTIVITY MANAGEMENT, the Reactivity SRO __(2)__ permitted to Peer Check the RO when inserting the SBA rods.

A. 1) will not
   2) is

B. 1) will not
   2) is not

C. 1) will
   2) is

D. 1) will
   2) is not

General Discussion

1) Tech Spec 3.12.A, clarified by 3.12 Bases, states whenever the reactor is critical, except for phycis tests and control rod assembly surveillance testing, each shutdown bank shall be fully withdrawn. Because rods are inserted for physics testing, the 2 hour LCO entry is not required. 2) For various planned evolutions, a Reactivity SRO is required per OP-AP-300, REACTIVITY MANAGEMENT. OP-AP-300 states the Reactivity SRO will provide peer checks to the RO when moving Control Rods.

Tier 3 Group 0
Objectives: ND-93.3-LP-3F, SROU-02A

Answer A Discussion

CORRECT.

Answer B Discussion

1) is correct. 2) is incorrect because OP-AA-300 states the Reactivity SRO conducts peer checks for the RO when moving Control Rods. Plausible because the SRO does not normally perform peer checks, only supervisory oversight; this scenario is an exception.

Answer C Discussion

1) is incorrect but plausible if the Candidate confuses any other instance where Shutdown Banks are less than fully withdrawn, per T.S.3.12. 2) is correct.

Answer D Discussion

1) is incorrect but plausible if the Candidate confuses any other instance where Shutdown Banks are less than fully withdrawn, per T.S.3.12. 2) is incorrect because OP-AA-300 states the Reactivity SRO conducts peer checks for the RO when moving Control Rods. Plausible because the SRO does not normally perform peer checks, only supervisory oversight; this scenario is an exception.

Basis for meeting the KA

Using a given plant startup evolution, this question evaluates knowledge of the correct Reactivity Management principles, as well as the correct applicability of Tech Specs.

Basis for Hi Cog

Basis for SRO only

10CFR55.43(b)(6): Requres knowledge of administrative requirements associated with low power physics testing.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References

OP-AP-300
ND-93.3-LP-3F
SROU-02A

Student References Provided

GEN2.2 2.2.1 - GENERIC - Equipment Control

Equipment Control

Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity. (CFR: 41.5 / 41.10 / 43.5 / 43.6 / 45.1)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 95.

C

GEN2.2 2.2.13 - GENERIC - Equipment Control
Equipment Control
Knowledge of tagging and clearance procedures. (CFR: 41.10 / 45.13)

A Tagout is being generated using a Relief Valve as part of the boundary with two breakers that may require grounding devices.

In accordance with OP-AA-200, EQUIPMENT CLEARANCES:

1) The highest level approval that is required to use relief valves as part of the boundary is __(1)__.
2) The minimum voltage that requires grounding devices when working on electrical conductors, are those conductors that operate greater than __(2)__ volts.

A. 1) a Licensed SRO
   2) 600

B. 1) a Licensed SRO
   2) 150

C. 1) the Operations Manager on Call (OMOC)
   2) 600

D. 1) the Operations Manager on Call (OMOC)
   2) 150

General Discussion

Explanation:1) When using relief valves as part of the boundary the Manager Nuclear Ops Approval provides approval. An OMOC qualified individual may provide this permission as long as it is documented on Tagging record or the Narrative Log. 2) For conductors that operate greater than 600 volts grounding devices are required.

Tier 3

RO/SROSROUTP-SDS-02A, Administrative Procedures-Tier 1 procedure.

Answer A Discussion

Incorrect. 1) Incorrect because OP-AA-200, specifically requires the Manager Nuclear Operations, or OMOC to approve use of relief valves. Plausible because the Shift Manager or designee (Licensed SRO) is authorized to approve clearances. 2) Correct.

Answer B Discussion

Incorrect. 1) Incorrect because OP-AA-200, specifically requires the Manager Nuclear Operations, or OMOC to approve use of relief valves. Plausible because the Shift Manager or designee (Licensed SRO) is authorized to approve clearances. 2) Incorrect because OP-AA-200 specifically requires grounding devices to be used for conductors that operate greater than 600 volts. Plausible because grounding devices are optional (not required) for voltages < 600 volts. Also plausible if candidate confuses voltage requirement for grounding devices, with voltage requirement for lifting jumpers that require plant manager permission (150 volts).

Answer C Discussion

CORRECT

Answer D Discussion

Incorrect. 1) Correct. 2) Incorrect because OP-AA-200 specifically requires grounding devices to be used for conductors that operate greater than 600 volts. Plausible because grounding devices are optional (not required) for voltages < 600 volts. Also plausible if candidate confuses voltage requirement for grounding devices, with voltage requirement for lifting jumpers that require plant manager permission (150 volts).

Basis for meeting the KA

This question matches the KA in that it requires the candidate to have in-depth knowledge of the tagging process, specifically whose permission is required for use of relief valves and requirements for placement of grounding devices.

Basis for Hi Cog

Basis for SRO only

SRO ONLY TASK: Task # D784, Authorize placement/clearance of a tagging report.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	BANK	Bank Question 339

Development References	Student References Provided
OP-AA-200.	

GEN2.2 2.2.13 - GENERIC - Equipment Control

Equipment Control

Knowledge of tagging and clearance procedures. (CFR: 41.10 / 45.13)

Remarks/Status

SPS 2021 NRC EXAM, QUESTION 96.

GEN2.3 2.3.12 - GENERIC - Radiation Control

Radiation Control

Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 45.9 / 45.10)

Given the following:

- Unit 1 is at Cold Shutdown (CSD).
- I&C Technicians need to perform an instrument calibration in a Locked High Rad Area.

Which ONE of the following completes the statements below regarding Locked High Radiation Area?

1) In accordance with TS 6.4.B.2, Unit Operating Procedures and Programs, the Shift Manager __(1)__ allowed to delegate administrative control of the key for the Locked High Radiation Area to the I&C Technicians.
2) The Shift Manager __(2)__ required to be notified for every LHRA entry.

A. 1) is NOT
   2) is NOT

B. 1) is
   2) is NOT

C. 1) is NOT
   2) is

D. 1) is
   2) is

General Discussion

Areas designated as Locked High Radiation Areas (LHRA) must have access controlled by a locked door. 1) The keys used to access a LHRA must be maintained under the administrative control of the Shift Manager and/or the Health Physics Shift Supervisor. This is stated in Tech Specs 6.4.B.2.. 2) VPAP-2101 gives no general requrement for SM notification of entry to a LHRA, but it is specifically required for Very High Radiation Area access in the procedure.

Answer A Discussion

1) is incorrect but plausible because there is a person the Shift Manager can delegate the keys to: the senior station individual assigned the responsibility for health physics and radiation protection. 2) is correct.

Answer B Discussion

CORRECT.

Answer C Discussion

1) is incorrect but plausible because there is a person the Shift Manager can delegate the keys to: the senior station individual assigned the responsibility for health physics and radiation protection. 2) is incorrect because the ability to immediately exit is required as a safe radiological practice. Plausible because "entry" is correct. Also plausible if the Candidate incorrectly applies other access controls, such as Vital Area access.

Answer D Discussion

1) is correct. 2) is incorrect because the ability to immediately exit is required as a safe radiological practice. Plausible because "entry" is correct. Also plausible if the Candidate incorrectly applies other access controls, such as Vital Area access.

Basis for meeting the KA

This question evaluates the radiological safety principles associated with Locked High Radiation Area access. This includes knowing who is responsible for maintaining the keys for LHRA access, as well as knowing proper radiological practices dealing with LHRA entry/exit.

Basis for Hi Cog

N/A

Basis for SRO only

10CFR55.43(b)(2): requires knowledge of Tech Spec requirements linked to Shift Manager responsibilities.
10CFR55.43(b)(4): requires knowledge of administrative procedures associated with radiation hazards during a periodically performed station evolution.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Memory	NEW	

Development References
Tech Specs Section 6.4.B VPAP-2101

Student References Provided

GEN2.3 2.3.12 - GENERIC - Radiation Control

Radiation Control

Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 45.9 / 45.10)

Remarks/Status
SPS 2021 NRC EXAM QUESTION 97.

GEN2.3 2.3.13 - GENERIC - Radiation Control

Radiation Control

Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 43.4 / 45.9 / 45.10)

Initial Conditions:

- An operator is adjusting seal inject needle valves in the Auxiliary Building where Radiation levels are 125 mRem/hr at 30 cm.
- The operator has a heart attack, falls and is knocked unconscious.
- The First Aid team has been called out per AP-47.00, PERSONNEL INJURY.

Current Conditions:

- EMT personnel are at the scene and are administering first aid.
- The operator is conscious, but contaminated and will need to be transported to a local hospital for further treatment.
- An ambulance is en-route to the scene.
- No further notifications were made.

Which ONE of the following completes the statements below?

1) First Aid personnel entering this area __(1)__ need a key to enter the area.

2) This event must be reported to the NRC within a maximum time of __(2)__.

REFERENCE PROVIDED

A. 1) will NOT
   2) 8 hours

B. 1) will
   2) 8 hours

C. 1) will NOT
   2) 4 hours

D. 1) will
   2) 4 hours

General Discussion

Explanation: 1) IAW TS-6.4.B.1, AND VPAP-2101 each high radiation area in which the intensity of radiation is greater than 100 mrem/hr but less than 1000 mrem/hr shall be barricaded and conspicuously posted as a high radiation area. 2) Per VPAP-2802 transport of a contaminated injured person is an 8-hour report.

Tier 3.
Learning Objective:SROUTP-SDS-02, Admin Procs, Objective B, Tier 2 Procedures.
VPAP-2101, Radiation Protection Program (Dose limits/Area Postings/RWP process and types of RWPs)

Answer A Discussion

Correct.

Answer B Discussion

1) Incorrect, but plausible if the operator confuses LHRA and HRA entry requirements. LHRA area requires a key locked gate or door. 2) Correct.

Answer C Discussion

1) Correct. 2) Incorrect but plausible if the operator believes that contacting an ambulance would constitute contacting a government agency which is a 4-hour reportable event.

Answer D Discussion

1) Incorrect, but plausible if the operator confuses LHRA and HRA entry requirements. LHRA area requires a key locked gate or door. 2) Incorrect but plausible if the operator believes that contacting an ambulance would constitute contacting a government agency which is a 4-hour reportable event.

Basis for meeting the KA

Question matches K/A. Candidate must select the appropriate response based on knowledge of high radiation area entry IAW VPAP-2101.

Basis for Hi Cog

Question requires use of VPAP-2802 to determine reportability requirements.

Basis for SRO only

Use of VPAP-2802 to determine reportability requirements is an SRO job function.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
Surry Technical Specifications. VPAP-2101. VPAP-2802.

Student References Provided
VPAP-2802

GEN2.3 2.3.13 - GENERIC - Radiation Control

Radiation Control

Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 43.4 / 45.9 / 45.10)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 98.

GEN2.4 2.4.20 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of the operational implications of EOP warnings, cautions, and notes. (CFR: 41.10 / 43.5 / 45.13)

Initial Conditions:

- Unit 1 was at 100%.
- Security notified the Control Room that there was steam blowing out the Unit 1 Safeguards louvers.
- The team manually tripped the Reactor and initiated Safety Injection (SI).

Current Conditions:

- The RO reports 1-E-0 immediate actions are complete with no High Head SI flow to the core.
- All Steam Generator Pressures are 800 psig and lowering at the same rate.
- The SRO is evaluating the priority of the following attachments:
  - Attachment 1, System Alignment Verification
  - Attachment 2, Checking SI Valve Alignment
  - Attachment 3, Auxiliary Ventilation, AC Power, and SFP Status Checks
  - Attachment 8, Faulted SG(s) Isolation and AFW Flow Control

Based on these indications, the SRO will direct which priority for each RO?

A. RO Performs Attachment 2 then 8, Assistant RO Performs Attachments 1 and 3.

B. RO Performs Attachment 8, Assistant RO Performs Attachments 1, 2 and 3.

C. RO Performs 1-E-0 with SRO, Assistant RO Performs Attachment 2, then 1 and 3.

D. RO Performs Attachment 2, Assistant RO Performs Attachments 1 and 3.

General Discussion

1-E-0 has several attachments designated as "preemptive action" attachments. These are performed in the event those are applicable. They cannot, however, impede progression through 1-E-0, Attachment 1. Attachment 2 is one of these actions, and it is applicable

Tier 3 Group 0
Objective: ND-95.3-LP-3B

Answer A Discussion

Incorrect, based on the NOTE at step 1 of Attachment 8, stating this attachment shall NOT be used if all three S/Gs are faulted. Plaubile because it is partially correct (Attachment 2 is the highest priority for the RO and Attachment 1 for the Assistant RO). Also plausible if the RO does not recall the NOTE in Attachment 8.

Answer B Discussion

Incorrect, based on the NOTE at step 1 of Attachment 8, stating this attachment shall NOT be used if all three S/Gs are faulted. Plaubile because it is partially correct (Attachment 1 is the highest priority for the Assistant RO). Also plausible if the RO does not recall the NOTE in Attachment 8.

Answer C Discussion

Incorrect because Attachment 1 must be performed when prompted by Step 5 of 1-E-0. Attachment 1 is higher priority than performing steps in the body of 1-E-0. Plausible because Manual SI Alignment (Attachment 2) is required in the 1-E-0 CAP in this scenario. Attachment 2 would take priority over any other Preemptive action Attachments in 1-E-0, as each of those Attachments are directed (IF SI is in progress). If this choice listed Attachments 1, 2 and 3 in order, this choice could be correct technically, although not desired by Operations Management.

Answer D Discussion

CORRECT.

Basis for meeting the KA

Must use NOTES in 1-E-0 to determine which Attachments are applicable, as well as the correct order of priority. This knowledge must be applied for a wide variety of plant events where SI is required.

Basis for Hi Cog

Must use given indications to make the correct decision for EOP priority (ex: all S/Gs faulted, so attachment 8 does not apply).

Basis for SRO only

10CFR55.43(b)(5), Assessment of Facility Conditions and Selection of Appropriate Procedures During Normal, Abnormal, and Emergency Situations: Must assess given plant conditions and determine the correct priority of 1-E-0 attachments, and that Attachment 8 is not applicable for this scenaio.

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	NEW	

Development References
1-E-0 ND-95.3-LP-3B

Student References Provided

GEN2.4 2.4.20 - GENERIC - Emergency Procedures / Plan
Emergency Procedures / Plan
Knowledge of the operational implications of EOP warnings, cautions, and notes. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 99.

GEN2.4 2.4.5 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions. (CFR: 41.10 / 43.5 / 45.13)

Given the following:

- A Station Blackout has occurred on Unit 1.
- The crew is performing 1-ECA-0.0, LOSS OF ALL AC POWER.
- Per 1-ECA-0.0 the SGs have been depressurized to 175 psig.
- RCS Subcooling based on Core exit T/Cs is 10°F.
- #1 EDG was started and is supplying the 1H bus.
- The crew has reached the last step of 1-ECA-0.0 and is preparing to transition to the appropriate recovery procedure.
- The STA reports that a RED Path exists on the Heat Sink CSF Status Tree.

Which ONE of the following identifies the required recovery procedure strategy?

A. Transition to 1-ECA-0.1, LOSS OF ALL AC POWER RECOVERY WITHOUT SI REQUIRED, and enter 1-FR-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK when allowed by 1-ECA-0.1.

B. Transition to 1-ECA-0.2, LOSS OF ALL AC POWER RECOVERY WITH SI REQUIRED, and enter 1-FR-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK when allowed by 1-ECA-0.2.

C. Transition to 1-FR-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK, and enter 1-ECA-0.1, LOSS OF ALL AC POWER RECOVERY WITHOUT SI REQUIRED, when 1-FR-H.1 is complete.

D. Transition to 1-FR-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK, and enter 1-ECA-0.2, LOSS OF ALL AC POWER RECOVERY WITH SI REQUIRED, when 1-FR-H.1 is complete.

General Discussion

Explanation: At the end of 1-ECA-0.0 the last step is to identify the recovery procedure. With Subcooling < 30 °F, ECA-0.2 is the required procedure to transition to. The first note of ECA-0.2 is to monitor but not implement status trees before step 16. Therefore the SRO will first transition to 1-ECA-0.2, "Loss of All AC Power Recovery With SI Required," and enter 1-FR-H.1, "Response to Loss of Secondary Heat Sink" when allowed by 1-ECA-0.2.

Tier 3
Objective:ND-95.3-LP-17A

Answer A Discussion

Incorrect because subcooling is too low. Plausible because ECA-0.1 would normally be performed if SI not required and power restored. Also plausible because ECA-0.1 has a similar note therefore FR-H.1 would not be performed until directed.

Answer B Discussion

Correct.

Answer C Discussion

Incorrect because while in ECA-0.0 CSF Status trees should be monitored for information only. Plausible if the SRO forgets this exception because normally CSF status trees are implemented immediately when in other EOP procedures after transitioning from E-0.

Answer D Discussion

Incorrect because while in ECA-0.0 CSF Status trees should be monitored for information only. Plausible if the SRO forgets this exception because normally CSF status trees are implemented immediately when in other EOP procedures after transitioning from E-0. Also plausible because ECA-0.2 is partially correct, both of these procedures will be performed but in a different order.

Basis for meeting the KA

This question requires knowledge of the organization flow path of EOPs AND integration of Status Trees.

Basis for Hi Cog

Question requires the operator to sort through the different conditions and determine the procedures that need to be performed and the order of performing them.

Basis for SRO only

Requires knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific contingency procedures (10 CFR 55.43(b)(5).

Job Level	Cognitive Level	QuestionType	Question Source
SRO	Comprehension	BANK	2015 Sequoyah NRC Exam Q 100

Development References
1-ECA-0.0. 1-ECA-0.1. 1-ECA-0.2

Student References Provided

GEN2.4 2.4.5 - GENERIC - Emergency Procedures / Plan

Emergency Procedures / Plan

Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions. (CFR: 41.10 / 43.5 / 45.13)

Remarks/Status
SPS 2021 NRC EXAM, QUESTION 100.

Facility: Surry Power Station Scenario No.: 3 Op-Test No.: 2021-301

Examiners: ______________ Operators: ______________

Initial Conditions: Unit 1 100% MOL. 1-SD-P-1B degraded requiring ramp down to 84%.

- Containment Smoke and heat detectors are non-functional due local fire panel failure. TRM Section 3.3.1, Fire Detection Instrumentation, Condition B, Smoke Detectors, and Condition C, Heat Detectors is in effect. Containment air temperatures monitored once/hour, and restore to Functional status in 14 days. OC-18 for Containment Temperature Monitoring being performed by Unit 2 BOP for both Units.

Turnover: The Team will pre-brief ramp to 84% power in accordance with 1-OP-TM-005 prior to Simulator entry, and commence the ramp following turnover.

Event No.	Event Type*	Event Description
1	R – RO/SRO N - BOP	Upon assuming the Unit, the Team will commence a Ramp down to 84% power at the normal rate per 1-OP-TM-005 (.5%/ min).
2	I – BOP I - SRO TS-SRO	Power Range Channel 1, N41, fails LOW. AP-53.00/AP-4.00.
3	C – BOP C - SRO	“A” CN pump trips on overcurrent, “C” CN pump fails to auto start. **(CT-1)** AP-21.00.
4	C – RO/SRO TS - SRO	Presurizer Pressure Master Pressure Controller Fails Low. AP-53.00/AP-31.00.
5	C – BOP/RO C - SRO	Momentary Loss of Vital Bus I. (1-AP-10.01)
6	M - All	Steam break on MS Header in Turbine Building; Upon reactor trip, TDAFW pump steam supply line ruptures, causing 3 faulted SG condition. Steam header break isolated by MSTVs. E-0, E-2, ECA-2.1. **(CT-2 and CT-3).**
7	C - BOP	Failures for BOP to identify/correct in E-0 Attachments. 1-CH-MOV-1381, auto close fail. 1-VS-MOD-103B auto close fail. MDAFW pumps fail to auto start.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

LIST OF CRITICAL TASKS

CT #	EVENT	DESCRIPTION	MET (✓)
CT-1	CN pump trip	The BOP must start the standby Condensate pump prior to SG level causing an auto or manual reactor trip.	
CT-2	3 Faulted SGs	Restore at least one MDAFW pump prior to SG WR level lowering to FR-H.1 Feed and Bleed criteria (12%). Failing to do this would significantly complicate the scenario by challenging heat sink.	
CT-3	3 Faulted SGs	Lower AFW flowrate to 60 gpm to each SG if RCS cooldown rate is > 100°F/hour to prevent entry into FR-P.1. Failing to do this could cause an entry into FR-P.1 which is not needed.	

Event 1: Unit 1 Ramp to 84% power IAW 1-OP-TM-005. *(R- SRO/RO. N – BOP).*

This Event is a ramp down in power using control rods, CVCS blender (boration), and turbine controls to raise reactor power to 100%.

Verifiable Action(s):

1) RO will manipulate control rods to control delta flux and/or Tave.
2) RO will manipulate CVCS control to establish a normal dilution to assist in Tave control.
3) BOP will manipulate Turbine Controls to establish power increase.

Event 2: Power Range Channel 1 (N41) Fails LOW. *(I – BOP, I – SRO, TS – SRO).*

After the Team has ramped up in power at the normal rate >88% and the Evaluating Team is ready, the failure of N41 in the LOW direction is initiated. The Team will address the failure IAW AP-53.00 and AP-4.00.

Verifiable Actions(s):

1) BOP: Stop turbine ramp by placing in “HOLD”.
2) BOP: Will perform Attachment 1 of AP-4.00 to place N44 in “TRIP”.

Technical Specifications:

1) TS Table 3.7-1, Item 2, Operator Action 2, Place Failed Channel in trip within 72 hours, Inoperable channel may be bypassed up to 12 hours for surveillance testing, Either Thermal Power restricted to ≤ 75% of rated power and Neutron Flux trip setpoint reduced to ≤ 85% of Rated Power within 78 hours; OR the Quadrant Power Tilt monitored at least once per 12 hours. QPT shall be monitored using the in-core detectors.
2) TS-3.12.D, Quadrant Power Tilt. If the reactor is operating above 75% power with one ex-core nuclear channel out of service, the QPT shall be determined once per day, or a change in power level > 10%, or 30 inches of control rod motion.

Event 3: Trip of Running “A” CN pump with Failure of auto start of “C” CN pump. *(C – BOP, C - SRO).*

When the evaluating Team is ready, the malfunction for the trip of a running condensate pump will be initiated. The BOP will identify the trip of one of the running CN pumps and feed flow less steam flow on all SGs. BOP will perform the Immediate Actions of AP-21.00 and start the non-running condensate pump. The Team will complete AP-21.00 actions.

Verifiable Action(s):

1) BOP: Perform Immediate Actions of AP-21.00, Loss of Feedwater, and start a second Condensate pump.

Critical Task:

CT-1: The BOP must start the standby Condensate pump prior to SG level dropping low enough to cause an auto or manual reactor trip.

Event #4: Pressurizer Pressure MPC Fails LOW. *(C – RO, C – SRO, TS - SRO)*

When the Evaluating Team is ready, the failure of Pressurizer Pressure Master Pressure Controller 1-RC-PC-1444J (LOW) is implemented. This failure results in Master Pressure output lowering to minimum, causing all heaters to turn on, and preventing spray valves from opening. Pressurizer pressure will rise until the operator takes manual control of either the Master Pressure controller or spray controllers to lower pressure. If the operator fails to take corrective action in a timely manner, the Pressurizer PORV 1-RC-PCV-1455C will cycle open and close around its setpoint.

Verifiable Actions:

1) RO: Place Master Pressure controller in Manual and raise demand to open the PRZR spray valves; or place both spray valves in Manual and raise demand to open them. Restore pressure to normal band.

Technical Specifications:

1) TS-3.12.F.1, DNB Parameters. 2 hour clock to restore RCS pressure above 2205 psig or reduce Thermal Power to < 5% of Rated Power within the next 6 hours.

2) TS 3.1.A.6.a, Relief Valves. With one or both PORVs inoperable but capable of being manually cycled, within 1 hour either restore the PORV(s) to OPERABLE status or close the associated block valve(s) and maintain power to the associated block valve(s). Otherwise, be in at least HOT SHUTDOWN within the next 6 hours and reduce Reactor Coolant System average temperature to < 350°F within the following 6 hours.

Event 5: Momentary loss of Vital Bus I. *(C – BOP/RO/SRO, TS - SRO)*

When Evaluating Team is ready, the next event will be initiated. This event is a momentary loss of Vital Bus II. The loss is due to a trip of the Inverter output breaker on fault, followed by the Static switch closing (2 sec later) to power Vital bus II. Component cooling to the 'B' RCP thermal barrier is lost due closure of 1-CC-TV-105B.

Verifiable Action(s):

1) BOP:Open 1-CC-TV-140B, 1-RM-TV-100A, 1-RM-TV-100C, 1-IA-TV-100, 1-IA-TV-101, 1-MS-TV-109, 1-CH-TV-1204A.
2) BOP: Return Normal Letdown to service IAW 1-OP-CH-020.
3) RO: Close Letdown Isolation valves, 1-CH-LCV-1460A and 1-CH-LCV-1460B.
4) BOP: Start the CTMT Particulate Rad monitor pump.
5) RO:Start CTMT Vacuum pump and CTMP Sump pump..
6) RO/BOP: Reset NI-41 Dropped rod signal.

Event #6/7: Steam break on Header followed by 3 Faulted SGs in SFGDs. (M –All)

When the evaluating Team is ready, the Major event will be initiated. This event is a steam break on the MS header in the Turbine Building, followed three (3) faulted SGs in Unit 1 SFGDs. The MSTVs close to isolate the Steam Break in the Turbine Building. During the transient the MDAFW pumps will not start following auto/manual initiation of SI, and only the 'A' MDAFW pump will manually start. The Team progresses through E-0, E-2, and then a transition to ECA-2.1 is made. The Team will identify a cooldown rate in excess of 100°F/hour and throttle AFW to ~ 60 gpm. This will result in a transition to FR-H.1, then a return to ECA-2.1.

Verifiable Actions:

1) RO: Trip the reactor and perform E-0 Immediate Actions.
2) BOP: Perform E-0 Attachments 1, 2, and 3. Identify and correct failure of the "A" FRV failing to close on the SI, 1-CH-MOV-1381 auto close, and 1-VS-MOD-103B failing to auto close. Also manually starts the MDAFW pumps, 1-FW-P-3A/3B.

Critical Task:

1) **CT-2:** Restore at least one MDAFW pump prior to SG WR level lowering to FR-H.1 Feed and Bleed criteria (12%). This would take approximately 30 minutes with no operator action. Failing to do this would significantly complicate the scenario by challenging heat sink.
2) **CT-3**: Lower AFW flowrate to 60 gpm to each SG if RCS cooldown rate is > 100°F/hour to prevent entry into FR-P.1. Failing to do this could cause an entry into FR-P.1 which is not needed.

The scenario may be terminated when the Evaluation Team is ready and after return to ECA-2.1 from FR-H.1.

Scenario Recapitulation

Total Malfunctions: 9
Abnormal Events: 6: AP-53.00 (two), AP-4.00, AP-10.01, AP-31.00, AP-21.00, Major
Transients: 2 (MSL Rupture, 3 Faulted SGs)
EOPs Entered: 2 (E-0, E-2)
EOP Contingencies: 2 (ECA-2.1, FR-H.1)

Initial Conditions: Unit 1 100% MOL. 1-SD-P-1B degraded requiring ramp down to 84%. Turnover: The Team will pre-brief ramp to 84% power in accordance with 1-OP-TM-005 prior to Simulator entry, and commence the ramp following turnover.
Equipment Status/ Procedures/ Alignments/ Data Sheets/ etc.: ○ Containment Smoke and heat detectors are non-functional due local fire panel failure (2 days ago). TRM Section 3.3.1, Fire Detection Instrumentation, Condition B, Smoke Detectors, and Condition C, Heat Detectors is in effect. Containment air temperatures monitored once/hour, and restore to Functional status in 14 days.
Turnover: The Team will pre-brief ramp to 84% power in accordance with 1-OP-TM-005 prior to Simulator entry, and commence the ramp following turnover. Another shift will perform the actual Heater Drain pump swap, and subsequent ramp up to 100%.

Scenario Objectives.

A. Given the Unit at 100% Power, commence a ramp to 84% in accordance with 1-OP-TM-005, Unit Ramping Operations.

B. Given the failure of N-41, Channel I Power Range Channel in the low direction, respond to the failure in accordance with 0-AP-53.00, Loss of Vital Instrumentation/Controls and 1-AP-4.00, Nuclear Instrumentation Malfunction.

C. Given the momentary loss of VB I, stabilize the plant iaw 1-AP-10.02, LOSS OF VB II.

D. Given the failure of the of Pressurizer Pressure Master Pressure Controller 1-RC-PC-1444J (LOW); respond in accordance with 0-AP-53.00, Loss of Vital Instrumentation/Controls and 1-AP-31.00, Increasing or Decreasing RCS Pressure, to regain control of RCVS pressure prior to automatic opening of a PRZR PORV..

E. Given an overcurrent trip of the “B” CN pump and the failure of the “A” CN pump to start, respond in accordance with 1-AP-21.00, Loss of Main Feedwater Flow, to restore feedflow to normal.

F. Given a steam break in Unit 1 Turbine Building, automatic steam line isolation, reactor trip, and a subsequent fault on the TDAFW steam supply line, respond in accordance with 1-E-0, Reactor Trip or Safety Injection, 1-E-2, Faulted Steam Generator Isolation, and 1-ECA-2.1, Uncontrolled Depressurization of All Steam Generators.

G. Given the failure of 1-CH-MOV-1381, Seal Return Isolation MOV, and 1-VS-MOD-103B, MCR Isolation Damper, to reposition on the Safety Injection signal, utilize E-0, Attachments 1 and 3 to identify and correct the condition

.

OPERATING PLAN:

Unit 1 is at 100% power with RCS boron concentration of 795 ppm.

During the last shift, 1-SD-P-1B, “B” High Pressure Drain Pump has started to degrade based on elevated vibration levels. The Team will ramp the unit to 84% based on 1-OP-TM-005 to ~84% power. All systems and crossties are operable with the following exception:

- Unit 1 and 2 Containment Temperature to the MCR Fire Panel are non-functional. In accordance with TRM Section 3.3.1, Fire Detection Instrumentation, Condition B, Smoke Detectors, and Condition C, Heat Detectors, are in effect. Containment air temperatures monitored once/hour, and restore to Functional status in 14 days. OC-18 for Containment Temperature Monitoring being performed by Unit 2 BOP for both Units.

Unit #2 is at 100% power with all systems and crossties operable.

Shift orders are to commence a Ramp to 84% power in accordance with 1-OP-TM-005, Unit Ramping Operations, using the Ramp Plan provided, upon relieving the watch. The SM has directed a 0.5%/min ramp rate to be used for the ramp. Performance of 1-OP-TM-005 has been authorized and has been PSA analyzed for current plant conditions. Another operator will operate the MSRs IAW 1-OP-TM-007, MSR Operation During or Following power reductions. The next shift will perform the Heater Drain pump swap and subsequent ramp up to 100%.

The last shift borated and diluted as necessary for the ramp to 74.5% power. Previous to the power reduction, shifts had been performing two 30 gallon dilutions per shift.

Op-Test No.: Surry 2021-1 Scenario No.: 3 Event No.: 1

Event Description: 1-OP-TM-005, Unit Ramping Operations, Ramp Down to 84% Power

Cue: Following Turnover, and Evaluators Ready

Time	Position	Applicant's Action or Behavior
	Team	1-OP-TM-005, Unit Ramping Operations Team will pre-brief Initial Conditions, Precautions and Limitations, and procedure prior to entering simulator. The team will be provided with a copy of 1-OP-TM-005, Unit Ramping (Marked up to Section 5.2); 1-OP-CH-021, Alternate Dilution Using Blender; and a Reactivity plan.
	SRO	1-OP-TM-005, Unit Ramping Operations Section 5.1 will be completed (signed off), but will be reviewed by the team prior to entering the simulator. Section 5.2 begins on page 12 of this guide.
	SRO	1-OP-TM-005, Unit Ramping Operations 5.1 Preparations for Turbine Ramp Down 5.1.1 Review all lighted annunciator windows for adverse conditions that could impact the performance of this procedure. **Will be initialed as complete. – No annunciators Lit.** 5.1.2 Review the Tagout File for tagouts that could impact this procedure. **Will be initialed as complete. – MCR FP Panel Tagged out, OC-18 performed by Unit 2 BOP.** 5.1.3 Review the Plant Status Log for conditions that could impact this procedure. **Will be initialed as complete. – No items in the plant status log.**

Event Description: 1-OP-TM-005, Unit Ramping Operations, Ramp Down to 84% Power

Cue: Following Turnover, and Evaluators Ready

	SRO	1-OP-TM-005, Unit Ramping Operations Note prior to Step 5.1.4: Rod height adjustments should be used to maintain Delta Flux as recommended by Reactor Engineering. Boration or dilution should be used to account for power defect and Xenon changes to maintain reference temperature. 5.1.4 Check or align letdown orifices for anticipated power change IAW 1-OP-CH-006, Shifting or Increasing/Decreasing Letdown Flow. **Will be initialed as complete.** 5.1.5 For scheduled power level changes greater than 10%, verify that a reactivity plan has been provided by Reactor Engineering. Otherwise, direct the STA to notify Reactor Engineering and request recommendations for control of core parameters. • Delta Flux control • Recommendations for Rod height and/or RCS Boron adjustments • Expected Xenon transient **Will be initialed as complete. The team will be given a reactivity plan.** 5.1.6 <u>TM</u> Have an Electricial remove the seal-in contacts from the MSR STM SUP valves IAW Attachment 5, Moisture Separator MOV Seal-in Contact Defeat. **Will be initialed as complete.** 5.1.7 Enter the Temporary Modification as a Procedurally Controlled Modification (PCTM) in the Unit 1 Temporary Modification Log. **Will be initialed as complete.** Caution prior to Step 5.1.8: Energizing additional PRZR heaters may cause a change in RCS average temperature due to a difference in boron concentration between the PRZR and the RCS. 5.1.8 Return PRZR Backup Heaters to the MANUAL ON position IAW 1-OP-RC-019, Pressurizer Heater Operation. **Will be initialed as complete.** 5.1.9 Record the Target Power Level, the Current Power Level, and the Percent Power Change below. <u>IF</u> the Target Power Level is unknown, <u>THEN</u> enter N/A for this step. Current Power Level <u>100%</u> Minus Target Power Level - <u>84%</u> Equals Percent Power Change = <u>16%</u> **Will be initialed as complete.**

Op-Test No.: Surry 2021-1 Scenario No.: 3 Event No.: 1 Page 11 of 87

Event Description: 1-OP-TM-005, Unit Ramping Operations, Ramp Down to 84% Power

Cue: Following Turnover, and Evaluators Ready

		Note prior to Step 5.1.10: If a shift turnover is required while Subsection 5.2 is in progress, Steps 5.1.10, 5.1.11 and 5.1.12, as applicable, must be performed for the relieving shift. Multiple signoffs are provided for this purpose. 5.1.10 Check that the Shift Manager (who is the designated Test Coordinator) or his designee has reviewed the Detailed Pre-Job Briefing Checklist and Responsibilities in Attachment 1 (page 3 of 5) and conducted a Detailed Pre-Job Briefing with all personnel performing the unit ramp. **Will be initialed as complete.** 5.1.11 Check that the Senior Operations Manager or Operations Manager on Call has reviewed the Management Expectations Briefing Checklist in Attachment 1(page 2 of 5) and briefed the Operations Department and support personnel on management expectations. This step may be marked N/A if the ramp is required due to an emergent issue and a Senior Operation Manager or Operations Manager On Call is not available in a timely manner. **Will be initialed as complete.** 5.1.12 The pre-job brief shall include the items in Attachment 2, Pre-job Brief Expectations for Reactivity Control. **Will be initialed as complete.** . 5.1.13 Determine the specific rate of Reactor Power change and the methods which will be used to achieve this rate of change. Rate of Power Change _____0.5% per minute_________ Minus Target Power Level - ___Turbine, Boration, Rods____ **Will be filled in, and initialed as complete**. 5.1.14 Notify Energy Supply (MOC), Chemistry, and the Polishing Building that the power change is imminent. **Will be initialed as complete. Team will re-perform these steps prior to entering simulator.** The Team will commence with Section 5.2. Several steps may be completed prior to entering the simulator (i.e., marked N/A).

Event Description: 1-OP-TM-005, Unit Ramping Operations, Ramp Down to 84% Power

Cue: Following Turnover, and Evaluators Ready

	SRO/RO	1-OP-TM-005, Unit Ramping Operation 5.2 Power Reduction Between 100% and 50% Reactor Power Caution prior to Step 5.2.1: To maintain positive control of the Reactor, control rods shall be moved in a deliberate, carefully controlled manner while the response of the Reactor is closely monitored. Note prior to step 5.2.1: Steps in this subsection may be performed out of sequence with permission from Shift Supervision. 5.2.1 Initiate Attachment 4, Reactivity Control and Monitoring During Ramp. ***Attachment 4, 1-OP-TM-005, is provided for reference on pages 15-17 of this guide.*** **Crew performs step and initials step completion.** Notes prior to Step 5.2.2: • The ramp rate may be changed, or stopped as required to control Plant parameters. • Normal ramp rate is obtained using Position 6 on the LOAD RATE % PER MIN thumbwheel. A change in the ramp rate thumbwheel to position 8, or position 1, or stopping and starting the ramp, may be necessary to control plant parameters. • If the power reduction is stopped during the ramp down, IMP OUT may be used to assist in stabilizing the Turbine. 5.2.2 Check or place Turbine in IMP IN or IMP OUT as determined by Shift Supervision. **Crew places Turbine in IMP IN or IMP OUT (normally use IMP IN)** **5.2.3** Commence the power reduction at the ramp rate specified by Shift Supervision. **Crew places Turbine to “GO” and commences ramp rate at 0.5%/min.** Note prior to step 5.2.4: During power reduction, the Valve Position Limiter should be maintained approximately 2 to 3 percent avobe the steady state power level. The Turbine control valves should <u>not</u> run up against the Valve Position Limiter. 5.2.4 Lower the Valve Position Limiter and maintain the Limiter <u>as close as reasonably possible</u> above the actual turbine load during power reduction. **Crew operates Valve Position Limiter and signs off the step.**

Event Description: 1-OP-TM-005, Unit Ramping Operations, Ramp Down to 84% Power

Cue: Following Turnover, and Evaluators Ready

	SRO/RO BOP	1-OP-TM-005, Unit Ramping Operation Caution prior to step 5.2.6: The Turbine will momentarily (1.5 seconds) shift to MANUAL when placing in IMP IN. To minimize Governor valve oscillations, the GV Tracking Meter should read as close to zero as possible before transferring to IMP IN. 5.2.6 IF the Turbine control is in IMP OUT, THEN perform the following substeps WHEN Reactor power is approximately 90 – 91%. IF the Turbine control is in IMP IN, THEN enter N/A to the following substeps. a. Stabilize the unit.. b. Check the GV Tracking Meter as close to zero as possible. c. Place the Turbine in IMP IN. d. Recommence the load reduction. **Crew performs step and initials step completion. (Anticipate step is N/A)** 5.2.7 Operate MSRs IAW 1-OP-TM-007, MSR Operation During or Following Power Reductions, as the Turbine load lowers. **Another operator will be briefed and perform this function.** 5.2.8 IF the 2nd Point Extraction can NOT continue to supply the Auxiliary Steam Heater, **THEN** check that 1-AS-PCV-100, Auxiliary Steam Header PCV, is controlling Auxiliary Steam Header pressure between 160 psib and 180 psig. Enter N/A if the Auxiliary Steam Header is being supplied from an alternate source. **Crew performs step and initials step completion** Note: steps 5.2.9 thru step 5.2.13 deal primarily with actions at 60 % power (which is above the power limit specified to ramp to.)
		5.2.14 Continue the power escalation to 90 to 91 percent (approximate) power. ***Team will begin at this Step***. *Evaluator's Note: No further actions are expected for this event.*
		-- END EVENT 1 --

Op-Test No.: Surry 2021-1 Scenario No.: 3 Event No.: 1 Page 14 of 87

Event Description: 1-OP-TM-005, Unit Ramping Operations, Ramp Down to 84% Power

Cue: Following Turnover, and Evaluators Ready

DOMINION ENERGY
Surry Power Station

1-OP-TM-005
Revision 38
Page 40 of 43

(Page 1 of 3)

Attachment 4

REACTIVITY CONTROL AND MONITORING DURING RAMP

______ 1. WHEN greater than 50% Reactor Power, THEN begin logging data on Attachment 4 (page 2 of 3) at a maximum interval of 30 minutes. Use multiple sheets as required.

______ 2. Begin logging reactivity manipulations on Attachment 4 (page 3 of 3) as applicable. Use multiple sheets as required.

______ 3. Maintain Tave and Tref approximately matched and Delta Flux in band (use Control Rods, Boration and/or Dilution) as discussed during the pre-job brief. Use the Reactivity Plan as a guide. (**Reference 2.4.6**)

______ 4. If significant deviation from the Reactivity Plan is required to maintain core parameters, consult with the STA and Reactor Engineering. Otherwise, enter N/A.

______ 5. If the ramp deviates from the Reactivity Plan (e.g. a change in ramp rate or an unplanned hold becomes necessary), consult with the STA and Reactor Engineer on the need for a revised reactivity plan. Otherwise, enter N/A.

______ 6. If critical plant parameters can not be maintained within prescribed limits, the contingency actions discussed in the pre-job brief shall be implemented. Otherwise, enter N/A.

______ 7. Continue logging data on Attachment 4 (pages 2 and 3) until the ramp is complete and unit conditions are stable.

______ 8. Attach completed log sheets to original procedure.

Op-Test No.: Surry 2021-1 **Scenario No.: 3** **Event No.: 1** **Page 15 of 87**

Event Description: 1-OP-TM-005, Unit Ramping Operations, Ramp Down to 84% Power

Cue: Following Turnover, and Evaluators Ready

DOMINION ENERGY
Surry Power Station

1-OP-TM-005
Revision 38
Page 41 of 43

(Page 2 of 3)

Attachment 4

REACTIVITY CONTROL AND MONITORING DURING RAMP

Circle the channel to be monitored.

Time	N 41 / 42 / 43 or 44 B	Δθ N 41 / 42 / 43 or 44C	Pimp PI 446 or 447	ΔT A / B or C	Tave A / B or C

Event Description: 1-OP-TM-005, Unit Ramping Operations, Ramp Down to 84% Power

Cue: Following Turnover, and Evaluators Ready

DOMINION ENERGY
Surry Power Station

1-OP-TM-005
Revision 38
Page 42 of 43

(Page 3 of 3)

Attachment 4

REACTIVITY CONTROL AND MONITORING DURING RAMP

Circle the channel to be monitored.

Time	Δ Rod Height	D-Bank Rod Height	BA added	Total BA added	PG added	Total PG added

Event Description: Power Range N41 Fails Low

Cue: By Evaluator; Ensure Rod Control in Automatic.

Time	Position	Applicant's Action or Behavior
	Team	N41 Fail Low Diagnose this failure using the following alarms and indications: Annunciator 1G-E4, NIS PWR RNG CH AVG FLUX DEVIATION Annunciator 1G-H1, NIS DROPPED ROD FLUX DECREASE > 5% PER 2 SECS N41 indication on Benchboard and NI Drawer Fail Low.
	RO	0-AP-53.00, Loss of Vital Instrumentation/Controls. Perform Immediate Actions of AP-53.00: [1] CHECK REDUNDANT INSTRUMENT CHANNEL(S) INDICATION – NORMAL. [2] PLACE AFFECTED CONTROL(S)/ COMPONENT(S) IN MANUAL CONTROL AND STABILIZE PARAMETER USING REDUNDANT INDICATION NOTE: Crew may go straight to AP-4.00 (this is <u>not</u> incorrect). **Reports to SRO: Immediate Actions of AP-53.00 complete, N41 failed LOW**.
	SRO	0-AP-53.00 The SRO will lead a transient brief. During the brief, the failure of N41 will be discussed. The RO/BOP will report Annunciators received related to the event, and Critical Parameters affected. STA will have no input for the brief.
	SRO RO	0-AP-53.00 3. CHECK REACTOR POWER – LESS THAN OR EQUAL TO 100% Report reactor power is less than 100%, and provides current reactor power indication.

Event Description: Power Range N41 Fails Low

Cue: By Evaluator; Ensure Rod Control in Automatic.

	SRO	0-AP-53.00 Notes prior to Step 4. • Step 4 failures are listed in order of performance priority. Only the failed instrument/control and associated step number should be read aloud. • When the affected instrument/controller malfunction(s) has been addressed by this procedure, recovery actions should continue at Step 13. 4. DETERMINE THE FAILED INSTRUMENT / CONTROL AND GO TO APPROPRIATE STEP OR PROCEDURE: • NI Malfunction, 1-AP-4.00 ***SRO Transitions to AP-4.00*.**
	SRO	1-AP-4.00, Nuclear Instrument Malfunction SRO will conduct focus brief, changes to parameters or Unit status will be discussed. RO/BOP will provide input for Unit Status change. STA will have no input for the brief. SRO will continue 1-AP-4.00
	SRO RO	1-AP-4.00, Nuclear Instrument Malfunction NOTE Prior to STEP 1: Attachments 6, 7, and 8 show one-line diagrams of Nuclear Instrumentation. Acknowledges Note.
	SRO RO	1-AP-4.00, Nuclear Instrument Malfunction. 1 CHECK NI MALFUNCTION – POWER RANGE FAILURE. Reports Yes, N41 Failed.
	SRO RO	1-AP-4.00, Nuclear Instrument Malfunction. 2. STABILIZE UNIT CONDITIONS RO reports that Unit conditions are stable.
	SRO RO	1-AP-4.00, Nuclear Instrument Malfunction. 3. CHECK N-44 – FAILED. RO reports that NO, N-41 has Failed. 3RNO. GO TO STEP 6

Event Description: Power Range N41 Fails Low

Cue: By Evaluator; Ensure Rod Control in Automatic.

	SRO RO	1-AP-4.00, Nuclear Instrument Malfunction. 6. CHECK N-43 - FAILED Reports NO, N41 has failed. GOES TO STEP 8.
	SRO RO	1-AP-4.00, Nuclear Instrument Malfunction. 8. CHECK POWER RANGE CHANNELS - ONLY ONE FAILED Reports Yes, only N41 Failed.
	SRO BOP	1-AP-4.00, Nuclear Instrument Malfunction. NOTE Prior to Step 9: Performance of Attachment 1 to place the failed Power Range Channel in trip requires I&C assistance for N-41, N-42, or N-43. Acknowledges NOTE.
	SRO	1-AP-4.00, Nuclear Instrument Malfunction. 9. INITIATE ATTACHMENT 1 TO PLACE FAILED CHANNEL IN TRIP WITHIN 72 HOURS Directs BOP to perform 1-AP-4.00, Attachment 1, Part 1, 2, and 3. Attachment 1 actions are at the end of this section.
	SRO RO	1-AP-4.00, Nuclear Instrument Malfunction. 10. CHECK NI MALFUNCTION – INTERMEDIATE RANGE FAILURE Reports No, Power Range Failure SRO GOES to Step 19
	SRO RO	1-AP-4.00, Nuclear Instrument Malfunction. 19. CHECK NI MALFUNCTION – SOURCE RANGE FAILURE Reports No, Power Range Failure SRO Goes to Step 38

Event Description: Power Range N41 Fails Low

Cue: By Evaluator; Ensure Rod Control in Automatic.

	SRO	1-AP-4.00, Nuclear Instrument Malfunction. 38. NOTIFY THE FOLLOWING • Instrument Shop • OM on call
	SRO	Notifies Shift Manager of Unit status, procedures used, and Tech Spec Requirements. Requests that the Shift Manager notify I&C and the OMOC.
		--- END OF EVENT 2 ---

Event Description: Power Range N41 Fails Low

Cue: By Evaluator; Ensure Rod Control in Automatic.

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Action or Behavior</th></tr>
<tr><td></td><td>

BOP</td><td>1-AP-4.00, Attachment 1: ONE POWER RANGE CHANNEL INOPERABLE

1. Record the following indications for the failed Power Range Channel:
• Power Level
• Delta Flux
• Upper Detector Current
• Lower Dectector Current

Applicant records indications.</td></tr>
<tr><td></td><td>

BOP</td><td>1-AP-4.00, Attachment 1: ONE POWER RANGE CHANNEL INOPERABLE

2. Perform the following at the NIS panel within 72 hours.

• Comparator and Rate Drawer
a. Select the failed channel on the COMPARATOR CHANNEL DEFEAT switch. (N-41)
b. Check annunciator 1G-E4, NIS PWR RANGE CH AVG FLUX DEVIATION - NOT LIT. Annunciator will be NOT LIT.

• Miscellaneous Control and Indication Panel
a. Select the failed channel on the ROD STOP BYPASS switch. (N-41).
b. Check annunciator 1G-G1, NIS PWR RNG HI FLUX ROD STOP - NOT LIT. Annunciator will be NOT LIT.
c. Select the failed channel on the UPPER SECTION defeat switch. (N-41).
d. IF Reactor power greater than 50%, THEN check annunciator 1G-C4, UPPER ION CHAMBER DEVIATION OR AUTO DEFEAT < 50% - NOT LIT. (annunciator will remain LIT if any Power Range channel less than 50%)
e. Select the failed channel on the LOWER SECTION defeat switch. (N-41).
f. IF Reactor power greater than 50%, THEN check annunciator 1G-D4, LOWER ION CHAMBER DEVIATION OR AUTO DEFEAT < 50% - NOT LIT. (annunciator will remain LIT if any Power Range channel less than 50%)</td></tr>
</table>

Event Description: Power Range N41 Fails Low

Cue: By Evaluator; Ensure Rod Control in Automatic.

<table>
<tr><td></td><td>BOP</td><td>1-AP-4.00, Attachment 1: ONE POWER RANGE CHANNEL INOPERABLE

NOTE Prior to Step 3: Annunciator NIS PWR RNG HI STPT (1E-E5, 1E-F5, 1E-G5, or 1E-H5) for the channel being placed in trip, NIS PWR RNG LOSS OF DET VOLT (1G-C3), and NIS DROPPED ROD FLUX DECREASE > 5% PER 2 SEC (1G-H1) will alarm when the instrument power fuses are pulled

If Reactor power is less than 10%, annunciator NIS PWR RNG LO STPT HI FLUX (1E-D5) will alarm when the instrument power fuses are pulled.

Acknowledges NOTE.</td></tr>
<tr><td></td><td>BOP</td><td>1-AP-4.00, Attachment 1: ONE POWER RANGE CHANNEL INOPERABLE

BOP Notifies RO prior to Removing Instrument Fuses (a. Below)

3. Place the failed Power Range channel in trip IAW the following:
a. At the Power Range drawer, remove the INSTRUMENT POWER fuses. (N-41).
b. At the Power Range drawer, put the POWER RANGE TEST switch in the TEST position. (N-41).
c. Check annunciator 1G-H1, NIS DROPPED ROD FLUX DECREASE > 5% PER 2 SEC - LIT. Annunciator will be LIT.
d. Check annunciator 1G-C3, NIS PWR RNG LOSS OF DET VOLT - LIT.
Annunciator will be LIT.
e. IF Reactor power less than 10%, THEN check annunciator 1E-D5, NIS PWR RNG LO STPT HI FLUX - LIT. Annunciator will not be NOT LIT.</td></tr>
<tr><td></td><td>BOP</td><td>1-AP-4.00, Attachment 1: ONE POWER RANGE CHANNEL INOPERABLE

4. Remove the following PCS points for the failed channel from scan:
• N-41, N0041A and N0042A
• N-42, N0043A and N0044A
• N-43, N0045A and N0046A
• N-44, N0047A and N0048A

The BOP will remove these points from scan.

Only N-41 points (in BOLD Above) will be taken off scan.</td></tr>
<tr><td></td><td>SRO</td><td>1-AP-4.00, Attachment 1: ONE POWER RANGE CHANNEL INOPERABLE

5. Notify I&C to initiate 0-ICM-ZZ-001, Placing Technical Specifications Channel in Trip to place OTDT and OPDT for the failed Power Range channel in TRIP and check the associated annunciators LIT.</td></tr>
</table>

Event Description: Power Range N41 Fails Low

Cue: By Evaluator; Ensure Rod Control in Automatic.

<table>
<tr><td></td><td></td><td>1-AP-4.00, Attachment 1: ONE POWER RANGE CHANNEL INOPERABLE

6. IF Reactor power is greater than 75%, THEN do either a OR b below.

a. Determine the core quadrant balance using the incore movable detectors when any of the following occur:
• Twelve hours have passed since the last core quadrant balance was performed.
• A change in Reactor power level greater than 10%.
• Control Rod movement of greater than 30 inches. (48 steps)
OR
b. Within 12 hours, reduce Reactor power to less than or equal to 75% of rated power, and within 78 hours, reduce the High Flux trip setpoint to less than or equal to 85% of rated power.</td></tr>
<tr><td></td><td></td><td>1-AP-4.00, Attachment 1: ONE POWER RANGE CHANNEL INOPERABLE

7. IF Reactor power is less than or equal to 75%, and will remain there, THEN within 78 hours, reduce the High Flux trip setpoint to less than or equal to 85% power.</td></tr>
<tr><td></td><td></td><td>1-AP-4.00, Attachment 1: ONE POWER RANGE CHANNEL INOPERABLE

8. Refer to Tech Spec Table 3.7-1, Item 2, 5, 6, and 20.
9. Refer to Tech Spec 3.12.D.

SRO Consults Tech Specs and identifies:

<table><tr><th>TS Ref.</th><th>Req Actions</th><th>TIME</th></tr><tr><td></td><td></td><td></td></tr><tr><td>Table 3.7-1, Item 2</td><td>OA2: Channel to TRIP</td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table>
1) TS Table 3.7-1, Item 2, Operator Action 2, Place Failed Channel in trip within 72 hours, Inoperable channel may be bypassed up to 12 hours for surveillance testing, Either Thermal Power restricted to ≤ 75% of rated power and Neutron Flux trip setpoint reduced to ≤ 85% of Rated Power within 78 hours; OR the Quadrant Power Tilt monitored at least once per 12 hours. QPT shall be monitored using the in-core detectors.
2) TS Table 3.7-1, Item 5 OTDT, Operator Action 6, Place Failed channel in trip within 72 hours. Inoperable channel may be bypassed up to 12 hours for surveillance testing. If the conditions are not satisfied in the time permitted, be in at least Hot Shutdown within 6 hours.
3) TS Table 3.7-1, Item 6 OPDT, Operator Action 6 (same as above).
4) TS-3.12.D, Quadrant Power Tilt. If the reactor is operating above 75% power with one ex-core nuclear channel out of service, the QPT shall be</td></tr>
</table>

Event Description: Power Range N41 Fails Low

Cue: By Evaluator; Ensure Rod Control in Automatic.

		determined once per day, or a change in power level > 10%, or 30 inches of control rod motion
		BOP will return Attachment to SRO and report Parts 1-4 are complete. Return to AP-4.00 step 10.

Event Description: **Loss of 1-CN-P-1A w/flr of 1-CN-P-1C to auto start**

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
	Team	Trip "A" CN Pump, "B" CN pump Fails to auto start Diagnose the failure based on the following alarms and indications: • Annunciator 1K-D4, 4KV BKR AUTO TRIP. • Feedflow less than Steam flow on all SGs. • SG NR level lowering on all three SGs
	BOP	1-AP-21.00 Perform Immediate Actions of 1-AP-21.00. [1] CHECK MAIN FEED PUMP STATUS: a) Check Reactor Power – GREATER THAN 80% b) Check Main Feed Pumps – TWO RUNNING Identify power > 80% AND two Main Feed pumps running.
	BOP	1-AP-21.00 [2] START AN ADDITIONAL CONDENSATE PUMP Identify 1-CN-P-1B, "B" CN Pump, failed to auto start. **Start 1-CN-P-1B**. **CT-1:** The BOP must start the standby Condensate pump prior to SG level dropping low enough to cause an auto or manual reactor trip.

Event Description: **Loss of 1-CN-P-1A w/flr of 1-CN-P-1C to auto start**

Cue: By Examiner.

	BOP	1-AP-21.00 [3] REDUCE TURBINE LOAD TO MATCH STEAM FLOW WITH FEED FLOW Use Valve Position Limiter OR Reduce Turbine load using Turbine Manual Monitor Feed flow/Steam flow mismatch and determine load reduction is not necessary. Report Immediate Actions of AP-21.00 are complete and SG levels are trending to program level.
	SRO	1-AP-21.00 Conduct Transient Brief, describe event that occurred, procedure used, procedure used to continue further actions. RO/BOP will provide alarms received during the event and Critical Parameters. STA will provide no input. SRO will finalize the Transient Brief, direct the RO to contact the Unit 1 Turbine Building Operator and the Service Building Operator to perform local checks on the “A” CN pump (post start), “B” CN pump (indications of cause for tripping) and status of “A” CN pump breaker. SRO will then continue with AP-21.00. **NOTE**: Team may use 1K-D4 ARP to place the “B” CN pump in PTL; common alarm for a number of loads; allows alarm to be received if other loads subsequently trip.
	SRO BOP SRO	1-AP-21.00 4. CHECK CONDENSATE POLISHING BLDG BYPASS - REQUIRED Main Feed Pump Suction Pressure - LESS THAN 400 PSIG Reports No, Feed Pump suction >400 psig (will report actual indicated pressure) Goes to Step 6
	SRO RO	1-AP-21.00 6. ENERGIZE ALL PRZR HEATERS Reports all pressurizer heaters energized.

Event Description: **Loss of 1-CN-P-1A w/flr of 1-CN-P-1C to auto start**

Cue: By Examiner.

		1-AP-21.00
	SRO	7. CHECK STEAM DUMP OPERATION - REDUCING TAVE/TREF MISMATCH BASED ON DEMAND SIGNAL
	BOP	Reports Yes, steam dumps operating properly.
		1-AP-21.00
	SRO	**NOTE Prior to Step 8**: Depending on initial plant conditions, rod insertion or boration may be used to stabilize RCS temperature and maintain ΔFlux in band.
	RO	Acknowledges NOTE.
	SRO	8. CHECK CONTROL RODS - INSERTING IF NECESSARY
	RO	Reports No, not necessary
		1-AP-21.00
	SRO	9. CHECK ANNUNCIATOR 1E-E3, ΔFLUX DEVIATION - NOT LIT
	RO	Reports Yes, Not Lit.
		1-AP-21.00
	SRO	10. CHECK ALL SG FLOWS - STEAM FLOW IS LESS THAN OR EQUAL TO FEED FLOW
	BOP	Reports Yes, Steam Flow is equal to Feed Flow.
		1-AP-21.00
	SRO	11. CHECK ALL SG LEVELS - AT OR TRENDING TO PROGRAMMED LEVEL
	BOP	Reports Yes, all SGs are ~ 44%.
		1-AP-21.00
	SRO	12. CHECK TAVE - MATCHED WITH TREF
	RO	Reports Yes, (will provide actual Tave/Tref mismatch.)
		1-AP-21.00
	SRO	13. CHECK FEED HEADER TO STEAM HEADER ΔP - AT LEAST 50 PSID
	BOP	Yes, (will provide actual ΔP indicated.)

Event Description: **Loss of 1-CN-P-1A w/flr of 1-CN-P-1C to auto start**

Cue: By Examiner.

	SRO BOP	1-AP-21.00 14. CHECK AMPs ON EACH MOTOR OF THE RUNNING MAIN FEED PUMP(s) – LESS THAN 420 AMPS Reports Yes, (provides actual MFP amps indicated.)
	SRO BOP	1-AP-21.00 NOTE: The polishing building should be returned to service as soon as reasonably achievable to minimize iron transport and prevent entry in an Action Level. 15. CHECK OPERATION OF MAIN FEED PUMP(s) • Recirc valve position (**Closed**) • Discharge MOV position (**Open**) • Pump amps (Normal, may provide actual MFP Amp indication.)
	SRO RO	1-AP-21.00 16. CHECK REACTOR POWER CHANGE – LESS THAN 15% IN ONE HOUR Reports Yes, (will provide indicated reactor power.)
	SRO	1-AP-21.00 17. NOTIFY THE FOLLOWING: OMOC Maintenance Foreman SRO notifies Shift Manage of Plant Status, Completion of AP-21.00, Report results of local investigation of “B” CN pump and breaker, and requests OMOC and Maintenance Foreman be notified of the event.
		---End EVENT #3---

Event Description: PRZR Master Pressure Controller fails LOW (0-AP-53.00)

Cue: When initiated by Team

Time	Position	Applicant's Action or Behavior
	RO	0-AP-53.00 Diagnoses Failure based on the following indications: • Master pressure controller output lowering from approximately 35% to 0%. • PRZR Spray Valves, 1-RC-PCV-1455A, and 1-RC-PCV-1455B remain closed. • All Pressurizer Heater Banks energize. • Annunciator 1C-G8, PRZR HI PRESS (5 min)
	RO	0-AP-53.00 Performs the Immediate Actions of AP-53.00 [1] **Checks redundant indications of pressurizer pressure – NORMAL** [2] **Places the Master Pressure Controller in MANUAL and raises output to ~ 30%.** Announces completion of Immediate Actions of AP-53.00.
	SRO	0-AP-53.00 Conducts brief using Brief Placard. RO Will report Critical parameters. BOP will report Critical Parameters. STA will state "Nothing to add".
	SRO RO	0-AP-53.00 *3. VERIFY REACTOR POWER – LESS THAN OR EQUAL TO 100% Reports reactor power approximately 100% using PCS indication.

Op-Test No.: Surry 2021-3 Scenario No.: 3 Event No.: 4 Page 30 of 87

Event Description: PRZR Master Pressure Controller fails LOW (0-AP-53.00)

Cue: When initiated by Team

	SRO	0-AP-53.00 CAUTION: If Reactor power has been affected by a secondary transient, Turbine adjustment may be needed to control Tave. NOTES before Step 4 • Step 4 failures are listed in order of performance priority. Only the failed instrument/control and associated step number should be read aloud. • When the affected instrument/controller malfunction(s) has been addressed by this procedure, recovery actions should continue at Step 13.
	SRO RO	0-AP-53.00 *4. DETERMINE THE FAILED INSTRUMENT / CONTROL AND GO TO APPROPRIATE STEP OR PROCEDURE: • PRZR Pressure Control, Step 5
	SRO SRO RO	0-AP-53.00 **NOTE**: RCS pressure decrease will cause a slight decrease in RCS Tave due to negative reactivity from the moderator pressure coefficient. 5. CHECK PRZR SPRAY VALVE CONTROLLERS – NORMAL Reports PRZR Spray Valve Controller Normal.
	SRO	0-AP-53.00 6. GO TO 1-AP-31.00, INCREASING OR DECREASING RCS PRESSURE Transitions to 1-AP-31.00.
	SRO RO	1-AP-31.00 [1] CHECK PRZR PORVS – CLOSED Checks PRZR PORVs closed.

Event Description: PRZR Master Pressure Controller fails LOW (0-AP-53.00)

Cue: When initiated by Team

	SRO	SRO will hold a brief on entry to AP-31.00. SRO will direct RO to maintain RCS pressure at 2235 psig ± band, and pressure to be monitored by RO at a specific frequency.
	SRO RO	1-AP-31.00 CAUTION: A Safety Injection may occur if the unit is not tripped prior to RCS pressure decreasing below 2100 psig. 2. CHECK RCS PRESSURE – LOWERING Reports No, RCS pressure initially rising.
		1-AP-31.00 Step 2RNO IF procedure was entered due to rising RCS pressure, THEN GO TO Step 12. GOES TO Step 12
	SRO RO	1-AP-31.00 12. CHECK RCS PRESSURE – RISING. Reports No, pressure is currently stable (reports value and trend). Goes to Step 17.
	SRO RO	1-AP-31.00 17. CHECK MASTER CONTROLLER – IN MANUAL Reports, "Yes, MASTER PRESSURE CONTROLLER IS IN MANUAL.
	SRO	1-AP-31.00 18. DECLARE 1-RC-PCV-1455C INOPERABLE. Declares 1-RC-PCV-1455C is INOPERABLE.
	SRO RO	1-AP-31.00 19. CHECK PRZR PORVS – EITHER INOPERABLE. • **1-RC-PCV-1455C** • 1-RC-PCV-1456 Reports, Yes, 1-RC-PCV-1455C is inoperable.

Event Description: PRZR Master Pressure Controller fails LOW (0-AP-53.00)

Cue: When initiated by Team

	SRO RO	1-AP-31.00 20. CLOSE BLOCK VALVE FOR INOPERABLE PORV • **1-RC-MOV-1536 if 1-RC-PCV-1455C INOPERABLE**. • 1-RC-MOV-1535 if 1-RC-PCV-1456 INOPERABLE. • Note: The SRO may determine that this action stops the 1 hour clock.
	SRO RO	1-AP-31.00 21. CHECK PRZR PORVS – EITHER INCAPABLE OF BEING MANUALLY CYCLED. Reports NO, both PORVs are capable of being manually cycled. Goes to RNO, THEN goes to Step 23
	SRO	1-AP-31.00 23. NOTIFY THE FOLLOWING: • OMOC • STA • I&C Contacts the above named individuals
	SRO	1-AP-31.00 24. REFER TO TECH SPECS: • 3.1.A.5 – Not applicable for this event. • **3.1.A.6. a, Relief Valves - With one or both PORVs inoperable but capable of being manually cycled, within 1 hour either restore the PORV(s) to OPERABLE status or close the associated block valve(s) and maintain power to the associated block valve(s).** Otherwise, be in at least HOT SHUTDOWN within the next 6 hours and reduce Reactor Coolant System average temperature to < 350°F within the following 6 hours • 3.1.C – Not applicable for this event. • 3.12.F – This LCO is met if pressure > 2205 psig
	SRO STA	1-AP-31.00 25. REVIEW APPLICABILITY: • VPAP-2802 • EAL MATRIX SU6.1 The STA will report that he has reviewed these documents and discussed the results with the Shift Manager.

Event Description: PRZR Master Pressure Controller fails LOW (0-AP-53.00)

Cue: When initiated by Team

	SRO	1-AP-31.00 26. RESTORE PRESSURE CONTROL SYSTEM(S) TO NORMAL Maintains Pressurizer Pressure Control Systems in MANUAL.
		---END OF EVENT 4---

Event Description: Momentary Loss of Vital Bus I

Cue: Cue by Evaluator.

Time	Position	Applicant's Action or Behavior
	Team	Momentary Loss of Vital Bus I Diagnose this failure using the following alarms and indications: Annunciator 1E-A2/A3/A4, RC LOOP 1A/1B/1C LO FLOW CH-1. Annunciator 1E-B2, RC LOOP 1A LO FLOW CH-2 Annunciator 1E-F6, PRZR LO LVL CH-1 Annunciator 1E-F4, RX TRIP CH-1 PRZR LO PRESS Annunciator 1E-F7, PRZR LO PRESS SI CH-1 Annunciator 1F-E7, STM GEN 1A LO-LO LVL CH-1 Momentary loss of Vital Bus I on Vertical Board Team enters 1-AP-10.01, LOSS OF VITAL BUS I. **Note: At Chief Examiner's discretion** Security will contact MCR and report that while on rounds the butt of his firearm bumped UPS 1A-1. He heard what sounded like breakers operating.
	SRO	1-AP-10.01 Conducts Transient Brief of 1-AP-10.01
	SRO RO	1-AP-10.01 1. CHECK UNIT AT POWER RO reports that Yes Unit 1 is at power.
	SRO RO/BOP	1-AP-10.01 2. CHECK LETDOWN STATUS a) Check 1-CH-TV-1204A-CLOSED or DEENERGIZED. b) Close Letdown Isolation valves; 1-CH-LCV-1460A and 1-CH-LCV-1460B. c) Manually control charging flow to minimize PRZR rate of fill. RO CLOSES 1-CH-LCV-1460A and 1-CH-LCV-1460B and reduces Charging flow.
	SRO BOP	1-AP-10.01 3. CHECK CONDENSER VACUUM STATUS a) Check for Vacuum lowering or 1-SV-TV-103 Closed or deenergized. BOP reports NO and team GOES to step 4.

Op-Test No.: Surry 2021-1 Scenario No.: 3 Event No.: 5 Page 35 of 87

Event Description: Momentary Loss of Vital Bus I

Cue: Cue by Evaluator.

	SRO RO/BOP	1-AP-10.01 4. CHECK CTMT IA STATUS a) Check 1-IA-TV-100A DEENERGIZED (NO goes to RNO). RNO: Check open or open 1-IA-TV-100. **RO opens 1-IA-TV-100.**
	SRO	1-AP-10.01 5. CHECK SI ACTUATED. NO goes to step 7.
	SRO	1-AP-10.01 7. CHECK PRZR PRESSURE CONTROL SYSTEM a) Check PRZR heaters – DEENERGIZED (NO) RNO: GO TO STEP 8.
	SRO	1-AP-10.01 8. CHECK RCP COOLING STATUS a) Check 1-CC-TV-140B – DEENERGIZED (NO **opens 1-CC-TV-140B**)
	SRO	1-AP-10.01 9. CHECK CTMP PARTICULATE/GAS RM STATUS. a) Check 1-RM-TV-100A OR 1-RM-TV-100C DEENERGIZED (NO GOES TO STEP 10)
	SRO	1-AP-10.01 10.CHECK CTMT VACUUM PUMP STATUS a) Check 1-CV-TV-150A or 1-CV-TV-150C DEENERGIZED (NO GOES TO STEP 11)
	SRO	1-AP-10.01 11. CHECK CTMT SUMP PUMP STATUS a) a) Check 1-DA-TV-100 – DEENERGIZED (NO GOES TO STEP 12)
	SRO	1-AP-10.01 12. CHECK PDTT PUMP STATUS a) Check 1-DG-TV-108A – DEENERGIZED (NO GOES TO STEP 13)

Event Description: Momentary Loss of Vital Bus I

Cue: Cue by Evaluator.

	SRO	1-AP-10.01 13. REFER TO ATTACHMENT 1 FOR A LIST OF MAJOR COMPONENT FAILURES. Team may or not refer to the Attachment at this time because power is restored.
	SRO	1-AP-10.01 14. Direct STA to initiate 0-NSP-CM-001, PLANT COMPUTER SYSTEM (PCS) OPERABILITY. Not necessary to do at this time since power is restored.
	SRO RO	1-AP-10.01 NOTES before step 15 • A de-energized AC Vital Bus shall be re-energized within 2 hours OR the unit must be placed in Hot Shutdown within the next 6 hours. • Vital Bus 1-IA voltage can be read on PCS (ERF if not removed) Computer point V1VB002A. • All Vital Bus voltages can be read on Group Review 25. • Loss of Vital Bus 1-IA de-energizes ICCM Train A. Acknowledges the Notes.
	SRO	1-AP-10.01 15. CHECK BOTH SECTION OF VITAL BUS DE-ENERGIZED. Per 15 RNO team will go to step 17 because the bus is restored.
	SRO	1-AP-10.01 NOTE: Shift Supervision must determine the appropriateness of the following steps depending on initial plant condition when Vital Bus was lost. 17. CHECK EXCESS LETDOWN IN SERVICE. RO answers NO, team directed to GO TO STEP 20.

Event Description: Momentary Loss of Vital Bus I

Cue: Cue by Evaluator.

	SRO RO/BOP	1-AP-10.01 20. RETURN NORMAL LETDOWN TO SERVICE IAW 1-OP-CH-020. BOP directed to perform 1-OP-CH-020. Note: 1-OP-CH-020 is at the end of this section. The BOP will probably be assigned to do this.
	SRO	1-AP-10.01 21. CHECK RCP SEAL LEAKOFF TEMPERATURE – LESS THAN 235°F. RO answers YES and team proceeds to step 22.
	SRO	1-AP-10.01 22. OPEN CC WATER THERMAL BARRIER RETURN TVs. This step was already done, team proceeds to next step.
	SRO RO/BOP	1-AP-10.01 23. RETURN CTMT PARTICULATE GAS RADIATION MONITOR TO SERVICE. a) OPEN CTMT GAS and Particulate Radiation Monitoring Trip valves: • 1-RM-TV-100A • 1-RM-TV-100B • 1-RM-TV-100C b) Start the Radiation Monitor Pump. c) Notify HP that the radiation monitor has been returned to service. **Operator opens 1-RM-TV-100A, 100C, and starts Radiation Monitor pump.**
	SRO RO/BOP	1-AP-10.01 24. RESTORE CTMT IA COMPRESSOR TO SERVICE: a) Open 1-IA-TV-100 (opens 1-IA-TV-100) b) Open 1-IA-TV-101 (opens 1-IA-TV-101) c) Open or check open 1-IA-TV-100B (Checks open) d) Start 1-IA-C-4A or 1-IA-C-4B (Checks that one is running) e) Place IA compressor NOT started in AUTO (One comp should be in auto) f) Locally close 1-IA-446, 447. (Should already be closed) Team proceeds to next step.

Event Description: Momentary Loss of Vital Bus I

Cue: Cue by Evaluator.

	SRO	1-AP-10.01 25. RETURN AIR EJECTOR RADIATION MONITOR TO SERVICE. Air Ejector Rad monitor is in service.
	SRO RO/BOP	1-AP-10.01 26. Return the following pumps to service: • CTMT Sump Pumps; 1-DA-P-4A and 1-DA-P-4B. • CTMT Vacuum Pumps; 1-CV-P-1A and 1-CV-P-1B. • Primary Drain Xfer pumps; 1-DG-P-1A and 1-DG-P-1B. Operator starts one of each and verifies the other pump is in AUTO.
Remaining steps in AP-10.01 are mostly administrative or require other operator support. At Chief Examiner's discretion proceed to the next event.		
	SRO	1-AP-10.01 27. Restore SG Blowdown IAW 1-OP-BD-001, STEAM GENERATOR BLOWDOWN SYSTEM OPERATIONS. This should be done by another operator.
	SRO RO/BOP	1-AP-10.01 28. OPEN MS LINE TRAP TVs: • 1-MS-TV-109. Operator opens 1-MS-TV-109.
	SRO	1-AP-10.01 29. ALIGN AREA VENTILATION IAW SHIFT SUPERVISION DIRECTION: • Fuel Building. • Decon Building. Operators assigned to restore ventilation as necessary.
	SRO RO/BOP	1-AP-10.01 30. RESET NI-41 DROPPED ROD SIGNAL BY PLACING POWER RANGE TEST SWITCH TO RESET. RO places power range test switch to reset.

Event Description: Momentary Loss of Vital Bus I

Cue: Cue by Evaluator.

	SRO	1-AP-10.01 31. RESET CTMT ISOLATION TVs: • 1-SS-TV-102 • 1-DA-TV-100A • 1-DG-TV-108A • 1-VG-TV-109A • 1-SI-TV-101A • 1-SS-TV-100A • 1-SS-TV-101A • 1-SS-TV-102A • 1-SS-TV-106A Another operator will be assigned this.
	SRO	1-AP-10.01 32. NOTIFY THE FOLLOWING • OMOC • Manager Operations
		---END OF EVENT 5---

Event Description: Momentary Loss of Vital Bus I

Cue: Cue by Evaluator.

Init Verif

5.0 INSTRUCTIONS

______ 5.1 **Placing Letdown in Service Following Auto or Manual Isolation**

CAUTION

To make certain that the design flow of 60 gpm will not be exceeded, the Cation Bed Demin will **not** be in service when putting in Normal Letdown.

______ 5.1.1 Verify removed or remove the Cation Bed Demin from service IAW 1-OP-CH-012, Removal from and Return to Service of CVCS Cation Bed Demin.

______ 5.1.2 Verify PRZR level is greater than 14.4 percent on selected channels.

______ 5.1.3 Verify Annunciator 1C-E8, PRZR LO LVL HTRS OFF & LETDOWN ISOL, is NOT LIT.

______ 5.1.4 Verify or place at least one CC pump is in service.

5.1.5 Verify closed or close all of the following valves.

______ • 1-CH-LCV-1460A, LETDOWN LINE ISOL

______ • 1-CH-LCV-1460B, LETDOWN LINE ISOL

______ • 1-CH-HCV-1200A, LETDOWN ORIFICE ISOL

______ • 1-CH-HCV-1200B, LETDOWN ORIFICE ISOL

______ • 1-CH-HCV-1200C, LETDOWN ORIFICE ISOL

Event Description: Momentary Loss of Vital Bus I

Cue: Cue by Evaluator.

5.1.6 Verify open or open both of the Letdown Line Trip valves.

_______ • 1-CH-TV-1204A, LETDOWN LINE I/S TV

_______ • 1-CH-TV-1204B, LETDOWN LINE O/S TV

_______ 5.1.7 Verify or adjust 1-CH-PCV-1145, LETDOWN LINE PRESS CNTRL, setpoint as required. (approximately 5.0 for 300 psig)

_______ 5.1.8 Verify or place 1-CH-PCV-1145, LETDOWN LINE PRESS CNTRL, in MAN and OPEN (0% demand).

_______ 5.1.9 Verify or place 1-CH-TCV-1143, LETDOWN LINE DIVERT, in the DIVERT position. Enter N/A if Shift Supervision determines that IXs are to remain in service.

_______ 5.1.10 Verify or place 1-CH-HCV-1244, DEBOR DEMINS DIVERT, in the NORMAL position. Enter N/A if Shift Supervision determines that IX is to remain in service.

_______ 5.1.11 Verify or place 1-CH-LCV-1115A, VCT LEVEL DIVERT,in AUTO and is aligned to the VCT (red light LIT).

NOTE: Flashing in the Non-Regen Heat Exchanger is indicated by unstable letdown flow as indicated on 1-CH-FI-1150.

5.1.12 Initiate Normal Charging and Letdown by performing the following substeps.

_______ a. Open 1-CH-FCV-1122, CHG FLOW CNTRL, and establish a charging flow of greater than or equal to 45 gpm as indicated on 1-CH-FI-1122A, CHG LINE FLOW.

b. Open both of the following Letdown Line Isolation valves.

_______ • 1-CH-LCV-1460A, LETDOWN LINE ISOL

_______ • 1-CH-LCV-1460B, LETDOWN LINE ISOL

Event Description: Momentary Loss of Vital Bus I

Cue: Cue by Evaluator.

NOTE:
- If RCS pressure is low, both 60 gpm orifices or all three may need to be placed in service.
- The 45 gpm orifice should normally be placed in service first.
- Care must be taken to ensure letdown flow does not exceed 125 gpm. Alarm setpoint for 1D-F4, LO PRESS LETDOWN LINE HI FLOW, is 130 gpm.

_____ c. Open one of the following valves and place the control switch in AUTO. (✓)

____ 1-CH-HCV-1200A, LETDOWN ORIFICE ISOL

____ 1-CH-HCV-1200B, LETDOWN ORIFICE ISOL

____ 1-CH-HCV-1200C, LETDOWN ORIFICE ISOL

_____ d. Verify 1-CH-FI-1150, LETDOWN LINE FLOW, indicates proper flow rate based on orifice placed in service.

_____ e. Verify 1-CC-TCV-103, NRHX OUTLET TEMP CNTRL, is controlling in AUTO as indicated by output demand.

_____ f. Verify 1-CH-TI-1144, NON-REGEN HX OUTLET TEMP, is at approximately 100°F.

Event Description: Momentary Loss of Vital Bus I

Cue: Cue by Evaluator.

NOTE: If two additional orifices will be placed in service at this time, only one may be placed in service at a time and flow rates must be allowed to stabilize before the third orifice is placed in service.

5.1.13 IF additional orifices are desired at this time, THEN place additional Letdown Orifices(s) in service IAW the following substeps. Otherwise, enter N/A.

______ a. Open and place in AUTO the following Letdown Orifice Isolation valves, as required. (✓)

____ 1-CH-HCV-1200A, LETDOWN ORIFICE ISOL

____ 1-CH-HCV-1200B, LETDOWN ORIFICE ISOL

____ 1-CH-HCV-1200C, LETDOWN ORIFICE ISOL

______ b. Verify 1-CH-FI-1150, LETDOWN LINE FLOW, indicates correct flow for orifices in service.

______ 5.1.14 Slowly close 1-CH-PCV-1145 to obtain letdown line pressure between 300 psig and 350 psig as indicated on 1-CH-PI-1145. **(Ref. 2.4.1)**

______ 5.1.15 Place 1-CH-PCV-1145 in AUTO.

______ 5.1.16 Verify Letdown parameters are normal for existing plant conditions and that there are no signs of flashing in the letdown system. Adjust charging flow as required.

______ 5.1.17 IF Ion Exchangers are NOT in service, THEN return Letdown Ion Exchangers to service IAW 1-OP-CH-011. Otherwise, enter N/A.

______ 5.1.18 Manipulate charging flow as required for existing plant conditions.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

Time	Position	Applicant's Action or Behavior
	Team	Diagnose the failure based upon the following alarms and indications: Annunciator 1H-G5, STM GEN 1A LVL ERROR Annunciator 1H-G6, STM GEN 1B LVL ERROR Annunciator 1H-G7, STM GEN 1C LVL ERROR Annunciator 1H-A4, T AVG < > T REF DEVIATION Annunciator 1F-F4,(G4), STM GEN 1A CH3 (CH4) HI STM LINE FLOW Annunciator 1F-F5 (G5), STM GEN 1B CH3 (CH4) HI STM LINE FLOW Annunciator 1F-F6 (G6), STM GEN 1C CH3 (CH4) HI STM LINE FLOW All SG NR Level indications rising
	SRO	Direct RO to trip the reactor and perform the Immediate Actions of 1-E-0.
	RO	1-E-0, Reactor Trip or Safety Injection [1] CHECK REACTOR TRIP: a) Manually trip reactor **Presses reactor trip button.** b) Check the following: All Rods On Bottom light – LIT Identifies All Rods on Bottom LIT on CERPI Screen. Reactor trip and bypass breakers – OPEN Identifies Reactor Trip and Bypass breakers Open on Benchboard Mimic. Neutron flux – LOWERING Identifies PR NI N41, N42, and N41 indications at ~0%; and IR indicators N35/N36 Lowering. Reports to SRO “Reactor Tripped”.

Op-Test No.: Surry 2021-1 Scenario No.: 3 Event No.: 6/7 Page 45 of 87

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

	RO	1-E-0, Reactor Trip or Safety Injection [2] CHECK TURBINE TRIP: a) Manually trip the turbine **Presses both Turbine Trip pushbuttons – simultaneously**. b) Check all turbine stop valves – CLOSED Identifies Turbine SVs closed using indication lights on Turbine Control section. c) Isolate reheaters by closing MSR steam supply SOV 1-MS-SOV-104 **Places 1-MS-SOV-104 control switch in close.** d) Check generator output breakers – OPEN (Time Delayed) Identifies Main generator output breakers open. Reports to SRO “Turbine is Tripped”.
	RO	1-E-0, Reactor Trip or Safety Injection [3] CHECK BOTH AC EMERGENCY BUSES – ENERGIZED Identifies “H” and “J” buses are energized by checking Voltage indicated on #1 and #3 EDG control panels. Reports “Both AC Emergency Buses energized.”

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

	RO	1-E-0, Reactor Trip or Safety Injection [4] CHECK IF SI INITIATED: a) Check if SI is actuated: LHSI pumps – RUNNING Identifies A/B LHSI pumps running using breaker and amp indications. SI annunciators – LIT A-F-3 (SI Initiated Train A) A-F-4 (SI Initiated Train B) Identifies both Annunciators LIT. b) Manually initiate SI **Presses Manual SI buttons, Train "A" and Train "B".** Reports E-0 Immediate Actions are complete, Have SI flow to the core."
	SRO	1-E-0, Reactor Trip or Safety Injection Hands out Continuous Action Pages for E-0 to RO and BOP, provides Attachments 1, 2, and 3 to BOP. Leads a Transient Brief to describe the Plant Status, and asks RO/BOP if any items identified during the E-0 Immediate Actions would have higher priority than continuing with E-0. RO/BOP may identify MSTVs close following reactor trip and safety injection. STA will have no input for the brief. SRO closes the Transient Brief and continues E-0 with the RO.
	SRO	1-E-0, Reactor Trip or Safety Injection 5. INITIATE ATTACHMENT 1 Directs BOP to perform E-0 Attachment 1, 2, and 3. **CT-2:** Restore at least one MDAFW pump prior to SG WR level lowering to FR-H.1 Feed and Bleed criteria (12%). Failing to do this would significantly complicate the scenario by challenging heat sink E-0 Attachments and components BOP will identify and reposition begin at the end of this section.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

		1-E-0, Reactor Trip or Safety Injection
	SRO	*6. CHECK RCS AVERAGE TEMPERATURE STABLE AT 547°F OR TRENDING TO 547°F
	RO	
		Report NO, RCS Temperature lowering (and provide current Tave value).
	SRO	Goes to Step 6 RNO
		IF temperature less than 547°F AND lowering, THEN do the following:
		a) Stop dumping steam.
	RO	Reports Yes, Steam Dumps are closed.
	SRO	b) IF cooldown continues, THEN control total feed flow. Maintain total feed flow greater than 350 gpm [450 gpm] until narrow range level greater than 12% [18%] in at least one SG.
	RO	Identify RCS Tave Lowering.
	SRO	Direct RO to throttle AFW to all SGs to ~120 gpm.
	RO	**Throttle AFW to the SGs to ~120 gpm per SG** and report when complete.
	SRO	c) IF Cooldown continues, THEN close MSTVs.
	RO	Reports MSTVs are closed. May report that all three SGs appear to be faulted.

Op-Test No.: Surry 2021-1 Scenario No.: 3 Event No.: 6/7 Page 48 of 87

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

		1-E-0, Reactor Trip or Safety Injection
	SRO	7. CHECK PRZR PORVs AND SPRAY VALVES:
		a) PRZR PORVs – CLOSED
	RO	Reports Yes, PRZR PORVs closed.
	SRO	b) PRZR spray controls Demand at Zero OR **Controlling pressure** *(previous to Rx Trip, RO controlling pressure manually)***.**
	RO	Reports Yes, Demand at zero.
	SRO	c) PORV block valves - AT LEAST ONE OPEN
	RO	Reports Yes, one block valve open.
		1-E-0, Reactor Trip or Safety Injection
	SRO	NOTE Prior to Step 8: Seal injection flow should be maintained to all RCPs.
	RO	Acknowledges NOTE.
	SRO	*8. CHECK RCP TRIP AND MINIFLOW RECIRC CRITERIA:
		a) Charging Pumps - AT LEAST ONE RUNNING AND FLOWING TO RCS
	RO	Reports Yes, 3 running and flowing to the RCS. May report 2 running depending upon BOP speed of progression through E-0, Attachment 1.
	SRO	b) RCS subcooling - LESS THAN 30°F [85°F]
	RO	Reports No, subcooling is (provides actual subcooling value.)
	SRO	Step 8 RNO: Goes to Step 9.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

	SRO RO SRO SRO	1-E-0, Reactor Trip or Safety Injection 9. CHECK IF SGs ARE NOT FAULTED: Check pressures in all SGs: STABLE OR RISING AND GREATER THAN 100 PSIG Reports No, SG pressures are (current value) and lowering. Step 9 RNO: IF any SG pressure lowering in an uncontrolled manner OR is completely depressurized, THEN GO TO 1-E-2, FAULTED STEAM GENERATOR ISOLATION. SRO Announces transition to E-2; RO/BOP acknowledge transition.
	SRO RO SRO	1-E-2, Faulted SG Isolation SRO conducts a focus brief, identifies that all three SGs as faulted, and asks if RO has identified any condition that would prevent continuing with E-2 to a transition to ECA-2.1. Report No, agree on continuing with E-2. SRO closes Focus Brief and continues with E-2.
	SRO RO SRO RO	1-E-2, Faulted SG Isolation **CAUTIONS Prior to Step 1**: • At least one SG must be maintained available for RCS cooldown. • Any faulted SG or secondary break should remain isolated during subsequent recovery actions unless needed for RCS cooldown. Acknowledges CAUTIONS. 1. CHECK MSTV AND BYPASS VALVE ON AFFECTED SG(s) – CLOSED Reports Yes, MSTVs and bypass valves closed.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

		1-E-2, Faulted SG Isolation
	SRO	2. CHECK IF ANY SG SECONDARY SIDE IS INTACT:
		Check pressures in all SGs – ANY STABLE OR RISING
	RO	Reports No, All SG pressures are (provides current pressure) and lowering.
	SRO	Step 7 RNO: IF all SG pressures lowering in an uncontrolled manner, THEN GO TO 1-ECA-2.1, UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS.
	SRO	Announces transition to ECA-2.1. RO/BOP acknowledge transition.
		1-ECA-2.1, Uncontrolled Depressurization of All Steam Generators.
	SRO	SRO conducts Focus brief to update on Plant Status, and handout Continuous Action Pages for ECA-2.1. SRO will ask team members if any conditions have been identified that precludes continuing with ECA-2.1.
	RO/BOP	Report that no conditions have been identified.
	SRO	Continues with ECA-2.1.

Op-Test No.: Surry 2021-1 **Scenario No.: 3** **Event No.: 6/7**

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

		1-ECA-2.1, Uncontrolled Depressurization of All Steam Generators
	SRO	CAUTION Prior to Step 1: If the TD AFW pump is the only available source of feed flow, steam supply to the TD AFW pump must be maintained from at least one SG.
		1. CHECK SECONDARY PRESSURE BOUNDARY: • MSTVs and bypass valves – CLOSED
	RO	Report Yes, closed.
		• SG PORVs – CLOSED
		Report Yes, Closed.
		• Main Steam line NRVs – CLOSED (1-MS-NRV-101A / B / C)
	RO	Report No, Open
		SRO will direct RO to Close the NRVs
	RO	**RO will close NRVs and report when they completed stroking close**d.
		• TD AFW pump steam supply valves – CLOSED
		Report No, Safeguards inaccessible.
		• Feed REG valves – CLOSED
		Report Yes, Closed
		• SG FW bypass flow valves – CLOSED
		Report Yes, Closed
		• SG FW isolation MOVs – CLOSED
		Report No, Open
	SRO	SRO will direct RO to Close the FW isolation MOVs.
	RO	**RO will close FW isolation MOVs and report when they completed stroking close**d.
		• SG blowdown TVs – CLOSED
		Report Yes, Closed.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

		1-ECA-2.1, Uncontrolled Depressurization of All Steam Generators
	SRO	CAUTION Prior to Step 2: A minimum of 60 gpm [100 gpm] feed flow must be maintained to each SG with a narrow range level less than 12% [18%].
	RO	Acknowledges CAUTION.
	SRO	NOTE prior to Step 2: Shutdown Margin should be monitored during RCS cooldown.
	STA	Acknowledge NOTE.
	SRO	2. CONTROL FEED FLOW TO MINIMIZE RCS COOLDOWN: a) Check cooldown rate in RCS cold legs - LESS THAN 100°F/hr
	RO	Reports No, Cooldown rate is (provides current value.) STA will agree with Cooldown Rate determined by RO.
	SRO	Step 2 RNO: Lower feed flow to 60 gpm [100 gpm] to each SG. GO TO Step 2c. Directs RO to throttle flow to ~ 60 gpm to each SG. When AFW is throttled less than a total of 350 gpm, STA will report that a RED Path on the Heat Sink Status Tree is indicated.
	SRO	Will announce transition to FR-H.1. RO/BOP will acknowledge transition. BOP will suspend E-0 Attachments. SRO will read CAUTION Prior to STEP 1, FR-H.1: If total feed flow is less than 350 gpm [450 gpm] due to operator action, this procedure should NOT be performed. SRO will announce Transition back to ECA-2.1. RO/BOP will acknowledge transition.
		CT-3: Lower AFW flowrate to 60 gpm to each SG if RCS cooldown rate is > 100°F/hour to prevent entry into FR-P.1. Failing to do this could cause an entry into FR-P.1 which is not needed.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

		1-ECA-2.1, Uncontrolled Depressurization of All Steam Generators
	SRO	**NOTE** Prior to Step 3: Seal injection flow should be maintained to all RCPs.
	RO	Acknowledges NOTE.
	SRO	3. CHECK RCP TRIP AND MINIFLOW RECIRC CRITERIA:
		a) Charging Pumps - AT LEAST ONE RUNNING AND FLOWING TO RCS
	RO	Reports Yes, (identifies number of CH pumps running). **Note**: based on speed of BOP progression through Attachment 1 of 1-E-0, 3 or 2 CH pumps may be running at this time.
	SRO	b) RCS subcooling - LESS THAN 30°F [85°F].
	RO	Reports No, (identifies actual subcooling).
	SRO	GOES to Step 4.
		1-ECA-2.1, Uncontrolled Depressurization of All Steam Generators
	SRO	**CAUTION Prior to Step 4**: If any PRZR PORV opens because of high PRZR pressure, the PORV must be checked closed or isolated after pressure lowers to less than 2335 psig.
	RO	Acknowledges CAUTION.
	SRO	4. CHECK PRZR PORVs AND BLOCK VALVES:
		a) Power to PRZR PORV block valves – AVAILABLE
	RO	Reports Yes, power available to both Block Valves.
	SRO	b) PRZR PORVs – CLOSED
	RO	Reports Yes, both PRZR PORVs closed.
	SRO	c) PRZR PORV block valves - AT LEAST ONE OPEN
	RO	Reports Yes, One block valve open.

Op-Test No.: Surry 2021-1 **Scenario No.: 3** **Event No.: 6/7**

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

		1-ECA-2.1, Uncontrolled Depressurization of All Steam Generators
	SRO	5. CHECK SECONDARY RADIATION:
		a) Initiate periodic activity sampling of all SGs IAW Attachment 1.
	SRO	Confers with Shift Manager to initiate periodic sampling.
	SRO	b) Check unisolated secondary radiation monitors:
	RO/Unit 2 RO Unit 2	Main steamline – Report Yes, Main Steam Radiation Normal. TD AFW pump exhaust – Reports Yes, TDAFW Radiation normal. Condenser air ejector – Reports Yes, Condenser A/E Radiation normal.
	SRO	c) Secondary Radiation – NORMAL
	RO	Reports Yes, Secondary Radiation Normal.
		1-ECA-2.1, Uncontrolled Depressurization of All Steam Generators
	SRO	**CAUTION Prior to Step 6**: RCS pressure should be monitored. If RCS pressure lowers in an uncontrolled manner to less than 250 psig [400 psig], one LHSI pump must be manually restarted to supply water to the RCS.
	RO	Acknowledges CAUTION
	SRO	6. CHECK IF LHSI PUMPS SHOULD BE STOPPED:
		a) Check LHSI pumps - ANY RUNNING WITH SUCTION ALIGNED TO RWST
	RO	Report Yes, (identifies number of LHSI pumps running) with suction aligned to RWST.
	SRO	b) Check RCS pressure:
		1) Pressure – GREATER THAN 250 PSIG [400 PSIG]
		2) Pressure - STABLE OR RISING
	RO	Reports Yes, RCS pressure is (gives actual pressure) Reports No, RCS pressure lowering.
	SRO	6. b) RNO GO TO Step 7.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

		Scenario Termination based on Evaluator Cue, SI Re-initiation, and Cooldown rate has been controlled. **---END OF EVENT 6/7---** **---END OF SCENARIO** #3---

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 1
REVISION 77	SYSTEM ALIGNMENT VERIFICATION	PAGE 1 of 8

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. ___	CHECK FW ISOLATION:	☐ Manually close valves and stop pumps.
	• Feed pump discharge MOVs - CLOSED	
	☐ • 1-FW-MOV-150A	
	☐ • 1-FW-MOV-150B	
	☐ • MFW pumps - TRIPPED	
	☐ • Feed REG valves - CLOSED	
	☐ • SG FW bypass flow valves - DEMAND AT ZERO	
	☐ • SG blowdown TVs - CLOSED	
2. ___	CHECK CTMT ISOLATION PHASE I:	☐ Manually close valves.
	☐ • Phase I TVs - CLOSED	
	☐ • 1-CH-MOV-1381 - CLOSED	
	☐ • 1-SV-TV-102A - CLOSED	
	• PAM isolation valves - CLOSED	
	☐ • 1-DA-TV-103A	
	☐ • 1-DA-TV-103B	
3. ___	CHECK AFW PUMPS RUNNING:	
	☐ a) MD AFW pumps - RUNNING (Time Delayed)	☐ a) Manually start pumps.
	☐ b) TD AFW pump - RUNNING IF NECESSARY	b) Manually open steam supply valves.
		☐ • 1-MS-SOV-102A
		☐ • 1-MS-SOV-102B

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE SYSTEM ALIGNMENT VERIFICATION	ATTACHMENT 1
REVISION 77		PAGE 2 of 8

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4.___	CHECK SI PUMPS RUNNING: ☐ • CHG pumps - RUNNING ☐ • LHSI pumps - RUNNING	☐ Manually start pumps.
5.___	CHECK CHG PUMP AUXILIARIES: ☐ • CHG pump CC pump - RUNNING ☐ • CHG pump SW pump - RUNNING	☐ Manually start pumps.
6.___	CHECK INTAKE CANAL: ☐ • Level - GREATER THAN 24 FT ☐ • Level - BEING MAINTAINED BY CIRC WATER PUMPS	☐ IF level is less than 24 ft OR lowering in an uncontrolled manner, THEN initiate 0-AP-12.01, LOSS OF INTAKE CANAL LEVEL.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 1
REVISION 77	SYSTEM ALIGNMENT VERIFICATION	PAGE 3 of 8

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
7. ___	CHECK IF MAIN STEAMLINES SHOULD BE ISOLATED:	
	a) Check if ANY of the following annunciators - HAVE BEEN LIT	a) Do the following:
	☐ • E-F-10 (High Steam Flow SI) ☐ • B-C-4 (Hi Hi CLS Train A) ☐ • B-C-5 (Hi Hi CLS Train B)	☐ IF annunciator E-H-10 (Hdr/Line SI) LIT, THEN GO TO Step 7.d. ☐ IF annunciator E-H-10 NOT LIT, THEN GO TO Step 8.
	☐ b) Check MSTVs - CLOSED	☐ b) Manually close valves.
	c) Check either of the following - ACTUATED ☐ • Hi steam flow SI OR ☐ • Header to line SI	☐ c) GO TO Step 8.
	d) Check RWST crosstie valves - OPEN ☐ • 1-SI-TV-102A ☐ • 1-SI-TV-102B ☐ • 2-SI-TV-202A ☐ • 2-SI-TV-202B	☐ d) Manually open valves.
	☐ e) Check RCS pressure - LESS THAN 185 PSIG	☐ e) Put BOTH RMT mode transfer switches in REFUEL.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE SYSTEM ALIGNMENT VERIFICATION	ATTACHMENT 1
REVISION 77		PAGE 4 of 8

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
*8. ___	CHECK IF CS REQUIRED:	
	☐ a) CTMT pressure - HAS EXCEEDED 23 PSIA	a) Do the following: 1) IF CTMT pressure has exceeded 17.7 psia, THEN check or align the following valves: ☐ • 1-RM-TV-100A - CLOSED ☐ • 1-RM-TV-100B - CLOSED ☐ • 1-RM-TV-100C - CLOSED ☐ • 1-SV-TV-102 - CLOSED ☐ • 1-IA-TV-101A - CLOSED ☐ • 1-IA-TV-101B - CLOSED ☐ • 1-IA-AOV-103 - OPEN ☐ 2) GO TO Step 10.
	☐ b) Manually initiate HI HI CLS	
	☐ c) Trip all RCPs	

(STEP 8 CONTINUED ON NEXT PAGE)

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 1
REVISION 77	SYSTEM ALIGNMENT VERIFICATION	PAGE 5 of 8

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
8.	CHECK IF CS REQUIRED: (Continued)	
	☐ d) Check CS pumps - RUNNING	d) Perform the following to start CS pumps: 1) For 1-CS-P-1A: ☐ a. Open or check open CS pump suction 1-CS-MOV-100A. ☐ b. Start 1-CS-P-1A. c. Open or check open the following CS pump discharge valves: ☐ • 1-CS-MOV-101A ☐ • 1-CS-MOV-101B 2) For 1-CS-P-1B: ☐ a. Open or check open CS pump suction 1-CS-MOV-100B. ☐ b. Start 1-CS-P-1B. c. Open or check open the following CS pump discharge valves: ☐ • 1-CS-MOV-101C ☐ • 1-CS-MOV-101D
	☐ e) Initiate Attachment 4	

Op-Test No.: Surry 2021-1 Scenario No.: 3 Event No.: 6/7 Page 61 of 87

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 1
REVISION 77	SYSTEM ALIGNMENT VERIFICATION	PAGE 6 of 8

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
*9. ___	CHECK IF RS REQURIED:	
	☐ a) Check RWST level - LESS THAN OR EQUAL TO 60%	a) Do the following: ☐ 1) Continue to monitor RWST level. 2) GO TO Step 10. IF RWST level lowers to less than or equal to 60%, THEN perform Step 9.b through Step 9.d.
	☐ b) Check ISRS pumps - RUNNING	☐ b) Manually Start Pumps.
	☐ c) Check OSRS pumps - RUNNING (Time Delayed)	☐ c) Manually Start Pumps.
	☐ d) Check OSRS pumps - NOT CAVITATING	☐ d) Put affected OSRS pump in PTL.
*10. ___	BLOCK LOW PRZR PRESS SI SIGNAL:	
	☐ a) Check PRZR pressure - LESS THAN 2000 psig	☐ a) GO TO Step 11. WHEN PRZR pressure less than 2000 psig, THEN perform Steps 10.b and 10.c.
	☐ b) Turn both LO PRZR PRESS & STM HDR/LINE ΔP switches to block	
	☐ c) Check Permissive Status light C-2 - LIT	
*11. ___	BLOCK LOW TAVE SI SIGNAL:	
	☐ a) Check RCS Tave - LESS THAN 543°F	☐ a) GO TO Step 12. WHEN Tave less than 543°F, THEN perform Steps 11.b and 11.c.
	☐ b) Turn both HI STM FLOW & LO TAVG OR LP switches to block	
	☐ c) Check Permissive Status light F-1 - LIT	

Op-Test No.: Surry 2021-1 Scenario No.: 3 Event No.: 6/7 Page 62 of 87

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 1
REVISION 77	SYSTEM ALIGNMENT VERIFICATION	PAGE 7 of 8

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE:
- CHG pumps should be run in the following order of priority: C, B, A.
- Subsequent SI signals may be reset by reperforming Step 12.

12. ___ CHECK SI FLOW:

ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
a) HHSI to cold legs - FLOW INDICATED ☐ • 1-SI-FI-1961 (NQ) ☐ • 1-SI-FI-1962 (NQ) ☐ • 1-SI-FI-1963 (NQ) ☐ • 1-SI-FI-1943 or 1-SI-FI-1943A	☐ a) Manually start pumps and align valves. IF flow NOT established, THEN consult with Shift Supervision to establish another high pressure injection flowpath while continuing with this procedure. ☐ • Alternate SI to cold legs ☐ • Hot leg injection
☐ b) Check CHG pumps - THREE RUNNING	☐ b) GO TO Step 12.e.
☐ c) Reset SI	
☐ d) Stop one CHG pump and put in AUTO	
☐ e) RCS pressure - LESS THAN 185 PSIG	e) IF two LHSI pumps are running, THEN do the following: ☐ 1) Check reset or reset SI. ☐ 2) Stop one LHSI pump and put in AUTO. ☐ 3) GO TO Step 13. ☐ IF one LHSI pump running, THEN GO TO Step 13.
☐ f) LHSI flow - INDICATED	☐ f) Manually start pumps and align valves.

Op-Test No.: Surry 2021-1 Scenario No.: 3 Event No.: 6/7 Page 63 of 87

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 1
REVISION 77	SYSTEM ALIGNMENT VERIFICATION	PAGE 8 of 8

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
13. ___	CHECK TOTAL AFW FLOW - GREATER THAN 350 GPM [450 GPM]	☐ IF SG narrow range level greater than 12% [18%] in any SG, THEN control feed flow to maintain narrow range level AND GO TO Step 14. ☐ IF SG narrow range level less than 12% [18%] in all SGs, THEN manually start pumps AND align valves as necessary. ☐ IF AFW flow greater than 350 GPM [450 GPM] can NOT be established, THEN GO TO 1-FR-H.1, RESPONSE TO LOSS OF SECONDARY HEAT SINK.
14. ___	CHECK AFW MOVs - OPEN	☐ Manually align valves as necessary.
15. ___	INITIATE SI VALVE ALIGNMENT IAW ATTACHMENT 2	
16. ___	INITIATE VENTILATION, AC POWER, AND SFP STATUS CHECKS IAW ATTACHMENT 3	
17. ___	CHECK RCS DILUTION FLOWPATH - ISOLATED AND LOCKED, SEALED, OR OTHERWISE SECURED ☐ • Close and lock, seal, or otherwise secure 1-CH-223	Close and lock, seal, or otherwise secure the following: ☐ • 1-CH-212 ☐ • 1-CH-215 ☐ • 1-CH-218

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE CHECKING SI VALVE ALIGNMENT	ATTACHMENT 2
REVISION 77		PAGE 1 of 2

NOTE: Components previously aligned by SI termination steps, must not be realigned by this Attachment.

1. ___ Check opened or open CHG pump suction from RWST MOVs.
   - ☐ • 1-CH-MOV-1115B
   - ☐ • 1-CH-MOV-1115D

2. ___ Check closed or close CHG pump suction from VCT MOVs.
   - ☐ • 1-CH-MOV-1115C
   - ☐ • 1-CH-MOV-1115E

3. ___ Check running or start at least two CHG pumps. (listed in preferred order)
   - ☐ • 1-CH-P-1C
   - ☐ • 1-CH-P-1B
   - ☐ • 1-CH-P-1A

4. ___ Check opened or open HHSI to cold legs MOVs.
   - ☐ • 1-SI-MOV-1867C
   - ☐ • 1-SI-MOV-1867D

5. ___ Check closed or close CHG line isolation MOVs.
   - ☐ • 1-CH-MOV-1289A
   - ☐ • 1-CH-MOV-1289B

6. ___ Check closed or close Letdown orifice isolation valves.
   - ☐ • 1-CH-HCV-1200A
   - ☐ • 1-CH-HCV-1200B
   - ☐ • 1-CH-HCV-1200C

7. ___ Check opened or open LHSI suction from RWST MOVs.
   - ☐ • 1-SI-MOV-1862A
   - ☐ • 1-SI-MOV-1862B

Op-Test No.: Surry 2021-1 Scenario No.: 3 Event No.: 6/7 Page 65 of 87

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE CHECKING SI VALVE ALIGNMENT	ATTACHMENT 2
REVISION 77		PAGE 2 of 2

8. ___ Check opened or open LHSI to cold legs MOVs.
   - ☐ • 1-SI-MOV-1864A
   - ☐ • 1-SI-MOV-1864B

9. ___ Check running or start at least one LHSI pump.
   - ☐ • 1-SI-P-1A
   - ☐ • 1-SI-P-1B

10. ___ Check High Head SI flow to cold legs indicated.
    - ☐ • 1-SI-FI-1961
    - ☐ • 1-SI-FI-1962
    - ☐ • 1-SI-FI-1963
    - ☐ • 1-SI-FI-1943 or 1-SI-FI-1943A

11. ___ IF flow not indicated, THEN manually start pumps and align valves. IF flow NOT established, THEN consult with Shift Supervision to establish another high pressure injection flow path while continuing with this procedure.
    - ☐ • Alternate SI to Cold legs
    - ☐ • Hot leg injection

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 1 of 6

1. ___ Check or place REFUEL SFTY MODE switches in NORMAL.

2. ___ Check ventilation alignment IAW Tables 1 and 2.

TABLE 1
UNIT #1 VENTILATION PANEL

	MARK NUMBER	EQUIPMENT STATUS
☐	1-VS-F-4A & B	OFF
☐	1-VS-HV-1A & B	OFF
☐	1-VS-F-8A & B	OFF
☐	1-VS-F-9A & B	GREEN
☐	1-VS-F-59	GREEN
☐	1-VS-F-6	OFF
☐	1-VS-F-39	GREEN
☐	1-VS-F-7A & B	GREEN
☐	1-VS-HV-5	GREEN
☐	1-VS-F-56A & B	GREEN
☐	1-VS-F-40A & B	GREEN
☐	1-VS-HV-4	OFF
☐	2-VS-F-40A or B	RED
☐	2-VS-HV-4	OFF

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 2 of 6

TABLE 2
VNTX PANEL

	MARK NUMBER	EXPECTED EQUIPMENT STATUS		RESPONSE NOT OBTAINED
☐	a. AOD-VS-107A & B AOD-VS-108	RED GREEN	☐	a. Place AUX BLDG CENTRAL AREA MODE switch to FILTER.
☐	b. MOD-VS-100A & B AOD-VS-106	RED GREEN	☐	b. • Place MOD-VS-100A to FILTER. • Place MOD-VS-100B to FILTER.
☐	c. MOD-VS-200A & B AOD-VS-206	GREEN RED	☐	c. • Place MOD-VS-200A to UNFILTER. • Place MOD-VS-200B to UNFILTER.
☐	d. AOD-VS-103A & B AOD-VS-104	GREEN GREEN	☐	d. • Place AOD-VS-103A in UNFILTER. • Place AOD-VS-103B in UNFILTER. • Place AOD-VS-104 in FILTER.
☐	e. AOD-VS-101A & B AOD-VS-102	GREEN GREEN	☐	e. Place AOD-VS-101A and 101B in UNFILTER.
☐	f. AOD-VS-111A & B	GREEN	☐	f. Place COMBINE CONTAINMENT EXHAUST in ISOLATE.
☐	g. AOD-VS-110	GREEN	☐	g. Place AOD-VS-109A and 109B in FILTER.
☐	h. AOD-VS-112A & B	GREEN	☐	h. • Place AOD-VS-112A in CLOSE. • Place AOD-VS-112B in CLOSE.
☐	i. MOD-VS-58A & B 1-VS-F-58A & B	RED RED	☐	i. Start 1-VS-F-58A and 1-VS-F-58B.

3. ___ Check filtered exhaust flow: (as read on FI-VS-117A and FI-VS-117B)

- ☐ • Total flow - GREATER THAN 32400 cfm

<u>AND</u>

- ☐ • Flow through each filter bank - LESS THAN 39600 cfm

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	ATTACHMENT 3
REVISION 77		PAGE 3 of 6

4. ___ Check all Station Service Buses - ENERGIZED. IF NOT, THEN initiate 1-AP-10.07, LOSS OF UNIT 1 POWER.

5. ___ Check annunciator VSP-J2 - LIT.

6. ___ Check Unit 1 RSST LTC time delay bypass light - LIT.

7. ___ Check stopped or stop 1-VS-AC-4.

8. ___ Place 1-VS-43-VS103X, MCR ISOLATION switch to the OFF position.

9. ___ Check closed or close MCR isolation dampers.

- ☐ • 1-VS-MOD-103A
- ☐ • 1-VS-MOD-103B
- ☐ • 1-VS-MOD-103C
- ☐ • 1-VS-MOD-103D

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	ATTACHMENT 3
REVISION 77		PAGE 4 of 6

* *

CAUTION:
- Only one Emergency Supply Fan must be started in the following step.
- Chilled Water flow to the in-service Unit 1 MCR AHU must be throttled to at least 15 gpm when the Emergency Supply fan is started.
- Chilled Water flow to the in-service Unit 2 MCR AHU must be throttled to at least 25 gpm when the Emergency Supply fan is started.
- An Emergency Supply Fan must not be started if the filter is wet.

* *

10. Immediately start ONE Emergency Supply Fan IAW the following: (1-VS-F-41 or 2-VS-F-41 preferred)

a. IF 1-VS-F-41, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 1-VS-MOD-104A, CONT RM EMERG SUP MOD.

___ 2. Start 1-VS-F-41.

b. IF 2-VS-F-41, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 2-VS-MOD-204A, CONT RM EMERG SUP MOD.

___ 2. Start 2-VS-F-41.

c. IF 1-VS-F-42, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 1-VS-MOD-104B, CONT RM EMERG SUP MOD.

___ 2. Start 1-VS-F-42.

d. IF 2-VS-F-42, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 2-VS-MOD-204B, CONT RM EMERG SUP MOD.

___ 2. Start 2-VS-F-42.

e. ___ Adjust Chilled Water flow to MCR AHUs IAW Step 10 Caution.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	ATTACHMENT 3
REVISION 77		PAGE 5 of 6

11. ___ Check readings on the following Differential Pressure Indicators - POSITIVE PRESSURE INDICATED.
    - ☐ • PDI-VS-100, D.P.-U1CR/U1TB (Unit 2 Turbine Ventilation Panel)
    - ☐ • PDI-VS-101, D.P.-U1RR/U1TB (Unit 2 Turbine Ventilation Panel)
    - ☐ • PDI-VS-200, D.P.-U2CR/U2TB (Unit 2 Turbine Ventilation Panel)
    - ☐ • PDI-VS-201, D.P.-U2RR/U2TB (Unit 2 Turbine Ventilation Panel)
    - ☐ • 1-VS-PDI-118 (Unit 1 Computer Room)
    - ☐ • 1-VS-PDI-116 (Near Unit 1 Semi-Vital Bus)
    - ☐ • 2-VS-PDI-215 (Unit 2 AC Room)
    - ☐ • 2-VS-PDI-206 (Near Unit 2 Semi-Vital Bus)

12. ___ IF any reading NOT positive, THEN initiate Attachment 6 to secure MCR boundary fans.

13. ___ Check initiated or initiate 0-AP-50.00, OPPOSITE UNIT EMERGENCY.

14. ___ Check the following MCR and ESGR air conditioning equipment operating. IF NOT, THEN start equipment within 1 hour IAW the appropriate subsection of 0-OP-VS-006, CONTROL ROOM AND RELAY ROOM VENTILATION SYSTEM.
    - ☐ • One Control Room chiller
    - ☐ • One Unit 1 Control Room AHU
    - ☐ • One Unit 2 Control Room AHU
    - ☐ • One Unit 1 ESGR AHU
    - ☐ • One Unit 2 ESGR AHU

15. ___ IF both of the following conditions exist, THEN check that Load Shed is activated.
    - ☐ • Unit 2 - SUPPLIED BY RSST
    - ☐ • Unit 2 RCPs - RUNNING

16. ___ IF Load Shed is required and not activated, THEN initiate 0-AP-10.10, LOSS OF AUTO LOAD SHED.

Event Description: Main Steam Break in Turbine Building, Reactor Trip W/ SI, Three Faulted SGs in Safeguards.

Cue: by Evaluator.

NUMBER 1-E-0	ATTACHMENT TITLE AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	ATTACHMENT 3
REVISION 77		PAGE 6 of 6

NOTE:
- SFP checks should be initiated WITHIN ONE TO TWO HOURS of EOP entry.
- Loss of power may render SFP indications and alarms non-functional and require local checks. Power supplies are as follows:
  - TI-FC-103, Unit 1 Semi-Vital Bus
  - TI-FC-203, Unit 2 Semi-Vital Bus
  - 1-FC-LIS-104, Panel 1ABDA1
- Loss of AC Power to the SFP level indicator is indicated if both low and high level alarms are in simultaneously. (0-VSP-C4 and 0-VSP-D4)
- 1-DRP-003, CURVE BOOK, provides a graph for SFP time to 200°F if loss of SFP cooling occurs.

17. ___ Initiate monitoring SFP parameters:
    - ☐ • SFP level - Greater than Cooling Pump suction AND Stable
    - ☐ • SFP temperature - Stable or Lowering
    - ☐ • SFP Cooling Pumps - Either Running
    - ☐ • Component Cooling - Normal
    - ☐ • SFP Radiation - Normal

18. ___ Continue to monitor parameters every one to two hours or until authorized to terminate monitoring by the Station Emergency Manager and/or the Shift Manager.

19. ___ Notify the Station Emergency Manager and/or the Shift Manager of the status and trend of SFP parameters.

20. ___ IF any abnormality or adverse trend is identified, THEN initiate 0-AP-22.02, MALFUNCTION OF SPENT FUEL PIT SYSTEMS.

FOLDOUT PAGES FOR REFERENCED PROCEDURES

NUMBER 1-E-0	CONTINUOUS ACTIONS PAGE	REVISION 77

1. RCP TRIP CRITERIA
   Trip all RCPs if BOTH conditions listed below occur:
   a. Charging Pumps - AT LEAST ONE RUNNING AND FLOWING TO RCS
   b. RCS Subcooling - LESS THAN 30°F [85°F]

2. MINIFLOW RECIRC CRITERIA
   a. CLOSED - When RCS pressure is less than 1275 psig [1475 psig] AND RCP Trip Criteria are met (RCPs OFF).
   b. OPEN - When RCS pressure is greater than 2000 psig.

3. ADVERSE CONTAINMENT CRITERIA
   Use Adverse Containment setpoints if EITHER condition listed below occurs:
   - Containment Pressure - GREATER THAN 20 PSIA
   - Containment Radiation - GREATER THAN 1.0E5 R/HR

4. COLD LEG RECIRCULATION SWITCHOVER CRITERIA
   GO TO 1-ES-1.3, TRANSFER TO COLD LEG RECIRCULATION, if RWST level lowers to less than 20%.

---

1. AMSAC RESET CRITERIA
   AMSAC may be manually reset when level in all three SGs is greater than 13% or six minutes have elapsed since the Reactor trip. When AMSAC is reset, AMSAC ARMED annunciator H-D-1 should clear and affected components may be realigned as needed.

2. TD AFW PUMP SHUTDOWN CRITERIA
   The TD AFW pump may be secured when SG NR level is greater than 22% in at least 2 SGs, AMSAC is reset, and no auto-start signal exists. To secure the pump, the pump SOV control switches must be taken to OPEN-RESET and then to CLOSE.

3. MANUAL SI ALIGNMENT
   If SI fails to automatically align, Attachment 2 may be used for guidance on manual SI valve alignment.

4. * TRANSIENT AFW FLOW CONTROL (IF SI in progress)
   Attachment 7 may be used for guidance on transient AFW flow control.

5. * FAULTED SG ISOLATION AND AFW FLOW CONTROL (IF SI in progress)
   Attachment 8 may be used for guidance on faulted SG(s) isolation and AFW flow control.

6. * RUPTURED SG ISOLATION AND AFW FLOW CONTROL (IF SI in progress)
   Attachment 9 may be used for guidance on ruptured SG(s) isolation and AFW flow control.

7. * LOSS OF RCP SUPPORT CONDITIONS
   Trip RCPs if a loss of a support condition occurs. (for example, loss of CC)

* Preemptive Actions

FOLDOUT PAGES FOR REFERENCED PROCEDURES

NUMBER 1-E-0	CONTINUOUS ACTION STEPS	REVISION 77

1. Check RCS Average Temperature - STABLE AT OR TRENDING TO 547°F. (E-0, Step 6)
2. Monitor RCP Trip and Miniflow Recirc Criteria. (E-0, Step 8)
3. Check SG Narrow Range Level - ANY SG GREATER THAN 12%. (Control feed flow to maintain Narrow Range Level between 22% and 50%) (E-0, Step 25)
4. Monitor LHSI pumps and secure as necessary. (E-0, Step 30)

NOTE: Subsequent SI signals may be reset by reperforming Step 12 of Attachment 1.

5. Monitor CTMT pressure and check CLS initiation as necessary. (Attachment 1, Step 8)
6. Monitor RWST level and check RS initiation as necessary. (Attachment 1, Step 9)
7. Block Low PRZR Pressure SI signal when less than 2000 psig. (Attachment 1, Step 10)
8. Block Low Tave SI signal when less than 543°F. (Attachment 1, Step 11)

FOLDOUT PAGES FOR REFERENCED PROCEDURES

CONTINUOUS ACTIONS PAGE FOR 1-ECA-2.1

1. SI REINITIATION CRITERIA

   Following SI termination or SI flow reduction, manually start SI pumps as necessary if EITHER condition listed below occurs:
   - RCS subcooling based on CETCs - LESS THAN 30°F [85°F]
   - PRZR level - CANNOT BE MAINTAINED GREATER THAN 22% [50%]

2. ADVERSE CONTAINMENT CRITERIA

   Use Adverse Containment setpoints if EITHER condition listed below occurs:
   - Containment Pressure - GREATER THAN 20 PSIA
   - Containment Radiation - GREATER THAN 1.0E5 R/HR

3. E-2 TRANSITION CRITERIA

   GO TO 1-E-2, FAULTED STEAM GENERATOR ISOLATION, if any SG pressure raises at any time, except while performing SI Termination in Steps 13 to 23.

4. COLD LEG RECIRCULATION SWITCHOVER CRITERIA

   GO TO 1-ES-1.3, TRANSFER TO COLD LEG RECIRCULATION, if RWST level lowers to less than 20%.

5. AFW SUPPLY SWITCHOVER CRITERIA (Refer to Attachment 5)

   Transfer to one of the following alternate AFW water supplies if ECST level lowers to less than 20%.
   a. 1-CN-TK-2, using 1-CN-150.
   b. 1-CN-TK-3, using AFW Booster Pumps.
   c. AFW Crosstie.
   d. Firemain.

6. RCP START CRITERIA

   - Following a loss of all seal cooling, affected RCP(s) should NOT be started without prior status evaluation.
   - RCPs should be run in the following order of priority to provide PRZR spray: C, A and B.

SIMULATOR OPERATOR'S GUIDE

Simulator Setup

Initial Conditions:

Recall IC -378 **and implement TRIGGER #30 to activate all passive malfunctions and verify Trigger #30 implemented.**

❑ ❑ ❑ **Enter/Verify the following MALFUNCTIONS:**

Malfunction	Delay	Ramp	Trigger	Value	Final	Delete in	Trigger Type (Auto or Manual)
NI1001 POWER RANGE CHNL N41 FAILURE	5	0	1	0	-1		A
CN1503 Disable CN-P-1C Autostart	0	0	3	FALSE	TRUE		M
CN0101 MAIN CN PUMP CN-P-1A TRIPS: OVR-CURREN	5	0	3	FALSE	TRUE		M
RC1501 PRZR PRESS CONTROLLER FAILURE	5	60	5	0	-1		M
EL2001 LOSS OF 120V AC VITAL BUS I	5	0	7	FALSE	TRUE	2	M
EL2002 LOSS OF 120V AC VITAL BUS IA	5	0	7	FALSE	TRUE	2	M
V2KA8 K-A-8 UPS SYSTEM 1A TROUBLE	2	0	7	ON	OFF		M
MS0101 'A' MAIN STM LINE RUPTURE AT HEADER	5	180	9	0	20		M
MS02 STM SUP LINE TO STM HDR AFW PP RUPTURES	20	0	9	FALSE	TRUE		M
MS0401 'A' MAIN STM LINE RUPTURE BEFORE TRIP VV	20	600	9	0	2.0		M
MS0402 'B' MAIN STM LINE RUPTURE BEFORE TRIP VV	20	600	9	0	2.0		M
MS0403 'C' MAIN STM LINE RUPTURE BEFORE TRIP VV	20	600	9	0	2.0		M
FP0301 FPS FACP07 ALARM HORN FAILURE	0	0	30	FALSE	TRUE		M
FP0302 FPS PC SPEAKER FAILURE	0	0	30	FALSE	TRUE		M
CH59 Disable CH-MOV-381 AUTO Closure	0	0	30	FALSE	TRUE		M
VS2002 DISABLE VS-MOD-103B AUTO CLOSE	0	0	30	FALSE	TRUE		M
FW48 DISABLE AFWP3A AUTO START	0	0	30	FALSE	TRUE		M

SIMULATOR OPERATOR'S GUIDE

FW49 DISABLE AFWP3B AUTO START	0	0	30	FALSE	TRUE		M

❑ ❑ ❑ **Enter/Verify the following EVENT TRIGGERS:**

TRIGGER	TYPE	DESCRIPTION
1	Manual	N41 Fails LOW
3	Manual	"A" CN Pump Trip on Overcurrent/"C" CN Pump Fail to Auto Start
5	Manual	1-RC-PT-1444 Fail High
7	Manual	Momentary loss of Vital Bus I
9	Manual	Steam Break in Turbine Building, followed by TDAFW Pump Steam Supply Pipe Break In SFGDS
30	Manual	FP0301 FPS FACP07 ALARM HORN FAILURE
30	Manual	FP0302 FPS PC SPEAKER FAILURE
30	Manual	CH59 Disable CH-MOV-381 AUTO Closure
30	Manual	VS2002 DISABLE VS-MOD-103B AUTO CLOSE
30	Manual	FW48/49 DISABLE FW-P-3A/3B AUTO START

SIMULATOR OPERATOR'S GUIDE

Verify the following control room setup:

- ❑ ❑ ❑ Place the simulator in RUN and verify normal 100% power operation indications.
- ❑ ❑ ❑ Verify All pink magnets collected from previous scenarios.
- ❑ ❑ ❑ Verify vertical board PCS monitor on ALARM SCREEN.
- ❑ ❑ ❑ Reset ICCMs.
- ❑ ❑ ❑ Verify all calcalc points are displayed on PCS: U9103, U9104, U9105V.
- ❑ ❑ ❑ Verify Component Switch Flags; 1-VS-F-58A and 1-VS-F-58B switches (AUTO AFTER STOP).
- ❑ ❑ ❑ Verify Brass Caps properly placed (Hi-Hi CLS, MSTVs, CH-MOV-1350, CW and SW MOVs, CTMT Hogger suction, CNDSR Vacuum breaker).
- ❑ ❑ ❑ Radiation Monitors all clear.
- ❑ ❑ ❑ Verify SG PORVs set for 1035 psig.
- ❑ ❑ ❑ Verify "D" bank rod height at 229 steps and Bank Overlap Counter at 612.
- ❑ ❑ ❑ Advance Charts.
- ❑ ❑ ❑ Place blue magnets above switches 1-MS-MOV-100A/B/C/D.
- ❑ ❑ ❑ Verify Containment Instrument Air Compressors are on Inside Suction (all RMs reset).
- ❑ ❑ ❑ Verify SYNC keys in proper place.
- ❑ ❑ ❑ Verify MOL reactivity plans and benchboard Reactivity Placard is current.
- ❑ ❑ ❑ Reset Blender Integrators for Boric Acid to 100 and PG to 1000.
- ❑ ❑ ❑ Verify Stop Watches are available for RO and BOP.
- ❑ ❑ ❑ Verify Simulator "Session In Progress" light is turned ON.
- ❑ ❑ ❑ Verify no persons are logged onto network computer to ensure no procedures displayed.

SIMULATOR OPERATOR'S GUIDE

❑ ❑ ❑ Verify PCS time matches Sim time.

❑ ❑ ❑ Spot check all ARPs are clean, **verify** the following Procedures are available in the procedure drawers.

❑ E-0	❑ E-2	❑ ECA-2.1	❑ 0-AP-53.00
❑ 1-OP-CH-020	❑ 1-AP-4.00	❑ 1-AP-21.00	❑ 1-AP-31.00
❑ 1-FR-H.1	❑ 1-OP-TM-005	❑ 1-OPT-RP-001	❑ 1-AP-10.01
❑ 1-OPT-RX-001		❑ 0-OP-ZZ-002	

❑ **Verify Reactivity Placard is current.**

❑ Verify ALL PINK MAGNETS are accounted for.

❑ Reset Blender Integrators for Boric Acid to 100 and PG 1000.

ARPs to verify clean:			
Event 2	Event 3	Event 4	Event 5
1G-E4 1G-H1	1K-D4	1C-G8	1E-A2 1E-B2 1E-F6 1E-F7 1F-E7

SIMULATOR OPERATOR'S GUIDE

Brief

This simulator performance scenario is performed in the EVALUATION MODE. You should not direct questions to the evaluators. Otherwise, you should perform as if you were in the MCR.

Your ability to maintain a log is not being graded, but maintaining a rough log is recommended to help during briefs.

If you need to communicate with the Unit 2 operator, verbally state, "Unit 2" and an instructor will locate to the Unit 2 area and respond to you as quickly as possible.

In the unlikely event that the simulator fails such that illogical indications result, the session will be terminated. In other words, respond to what you see. If there is a problem with the simulation, the session will be terminated or adjusted as appropriate based on the specific problem.

Assign operating positions.

Ask for and answer questions.

SIMULATOR OPERATOR'S GUIDE

OPERATING PLAN:

Unit 1 is at 100% power with RCS boron concentration of 795 ppm.

During the last shift, 1-SD-P-1B, "B" High Pressure Drain Pump has started to degrade based on elevated vibration levels. The Team will ramp the unit to 84% based on 1-OP-TM-005 to ~84% power. All systems and crossties are operable with the following exception:

- Unit 1 and 2 Containment Temperature to the MCR Fire Panel are non-functional. In accordance with TRM Section 3.3.1, Fire Detection Instrumentation, Condition B, Smoke Detectors, and Condition C, Heat Detectors, are in effect. Containment air temperatures monitored once/hour, and restore to Functional status in 14 days. OC-18 for Containment Temperature Monitoring being performed by Unit 2 BOP for both Units.

Unit #2 is at 100% power with all systems and crossties operable.

Shift orders are to commence a Ramp to 84% power in accordance with 1-OP-TM-005, Unit Ramping Operations, using the Ramp Plan provided, upon relieving the watch. The SM has directed a 0.5%/min ramp rate to be used for the ramp. Performance of 1-OP-TM-005 has been authorized and has been PSA analyzed for current plant conditions. Another operator will operate the MSRs IAW 1-OP-TM-007, MSR Operation During or Following power reductions. The next shift will perform the Heater Drain pump swap and subsequent ramp up to 100%.

The last shift borated and diluted as necessary for the ramp to 74.5% power. Previous to the power reduction, shifts had been performing two 30 gallon dilutions per shift.

When the team has accepted the shift, proceed to the Session Conduct Section.

SIMULATOR OPERATOR'S GUIDE

EVENT 1 Ramp down in power from 100% to 84% IAW 1-OP-TM-005, Unit Ramping Operations

The Team will pre-brief the Unit Ramp prior to entering the Simulator. The Team will be provided a Copy of 1-OP-TM-005, Unit Ramping Operations, signed off to Section 5.1 for the power reduction. Following the pre-brief, the Team will enter the Simulator and walk down the control boards. When the Team and the Evaluators are ready, the Simulator will be placed in run.

Shift Manager:

- **If contacted**, acknowledge start of Ramp to 84%.
- **If asked:** I&C is standing by to adjust IRPIs as necessary.

I&C:

- **If contacted**: Standing by to adjust IRPIs as necessary.

System Operator/MOC

- **If contacted**: acknowledge Surry Unit 1 starting ramp to 84% at normal rate.

Field Operators:

- **If contacted as Unit 1 Turbine Building**: monitoring Lube oil temperatures during ramp.
- **If contacted as Polishing Building Operator**: There are 6 Beds in service; D/P ~27 psig.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 2 **PR Channel N-41 Fail Low**

When cued by examiner, implement **Trigger #1**.

Operations Supervisor/Management:

- **If contacted**, acknowledge N-41 failure.
- **If contacted,** will notify I&C of the failure, will notify the OMOC.
- **When notified**: acknowledge but do not imply agreement with Tech Spec requirements as identified by the SRO.
- **If contacted,** will take responsibility for writing the CR.
- **If asked:** will notify Reactor Engineering of need to perform flux map.
- **If asked:** SM will confer with the OMOC concerning continuing the ramp.

STA:

- **If contacted**, acknowledge Tech Spec requirements for the failure, but do not imply agreement with requirements identified by the SRO.
- **If the team has a transient brief:** The STA will have no input for the brief.
- **If asked:** will notify Reactor Engineering of need to perform flux map.

Maintenance/Work Week Coordinator:

- **If contacted**, will acknowledge instrumentation failure and commence investigations and/or efforts to place the channel in trip.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 3 **1-CN-P-1A trip/Failure of 1-CN-P-1C to auto start**

When cued by examiner, implement **Trigger #3**.

CT-1: The BOP must start the standby Condensate pump prior to SG level dropping low enough to cause an auto or manual reactor trip.

Operations Supervisor/Management:

- **If contacted**, Acknowledge failure.
- **If contacted:** Take responsibility for submitting CR.
- **If contacted:** Will notify Maintenance and OMOC of the failure.

Maintenance/ Work Week Coordinator:

If contacted, will acknowledge the failure, contact Maintenance to commence investigation.

STA:

- **If contacted**, Acknowledge the failure
- **If the team has a transient brief:** Will have no input for a transient brief.

Field Operators:

When contacted to check status of CN Pumps: Wait three (3) minutes and report 1-CN-P-1C conditions normal after start; 1-CN-P-1A exhibits no obvious cause for the trip.

When contacted to check status of 1-EP-BKR-15B4: Wait 3 minutes and report breaker 15A4 has timed overcurrent drop on "A" phase.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 4 Master PRZR Pressure Controller, 1-RC-PC-144J Fails Low.

When cued by examiner, implement **Trigger #5**.

Operations Supervisor/Management:

- **If contacted**, acknowledge the failure of Pressurizer Control transmitter.
- **If asked:** will contact I&C and OMOC of the failure.
- **If contacted:** acknowledge Tech Specs requirement related to the failure, but do not imply agreement.
- **If contacted:** will take responsibility for submitting CR.
- **If asked:** SM will confer with the OMOC concerning continuing the ramp with Pressurizer Pressure control in manual.

STA:

- **If contacted**, acknowledge the failure of Pressurizer Control transmitter.
- **If contacted**: acknowledge Tech Specs requirement related to the failure, but do not imply agreement.
- **If the team has a transient brief:** The STA will have no input for the brief.

Maintenance/ Work Week Coordinator:

- **If contacted**, will acknowledge the failure, contact I&C to commence investigation of the failed channel.

Role-play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 5 Momentary loss of Vital Bus I

When cued by examiner, implement **Trigger #7**.

Operations Supervisor/Management:

- **If contacted**, acknowledge the failure of Vital Bus I.
- **If contacted,** will notify I&C of the failure, will notify the OMOC.
- **If contacted**: will take responsibility for submitting CR.

STA:

- **If contacted**, acknowledge the failure.
- **If the team has a transient brief:** The STA will have no input for the brief.

I&C:

- **If requested**: will prepare for placing the channel in trip.

Maintenance/ Work Week Coordinator:

- **If contacted**, will the notify I&C of the channel failure, place the channel in trip, and initiate investigation of the failure.

Field Operator

- **If contacted to investigate,** Report back after 3 minutes that you spoke with a security guard who thinks he may have bumped up agains UPS 1B-1. The Static switch is carrying VBII, no other problems noted.

Role-play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENTS 6 & 7 Steam Header Break in TB, 3 Faulted SG in SFGDs.

When cued by examiner, implement **Trigger #9**.

CT-2: Restore at least one MDAFW pump prior to SG WR level lowering to FR-H.1 Feed and Bleed criteria (12%). Failing to do this would significantly complicate the scenario by challenging heat sink.

CT-3: Lower AFW flowrate to 60 gpm to each SG if RCS cooldown rate is > 100°F/hour to prevent entry into FR-P.1. Failing to do this could cause an entry into FR-P.1 which is not needed.

Operations Supervisor/Management:

- **If contacted:** Acknowledge Reactor Trip and SI; agree to notify the OMOC.

STA:

- **If the team has a transient brief:** The STA will have no input for the brief.
- **When Team has throttled to < 350 gpm:** Notify SRO of Red Path on Heat Sink Status Tree.
- **If asked:** Annunciator 1E-F3 (Hi Steam Flow SI) came in and cleared quickly.

Unit Two:

- **If asked**, RWST cross-ties on Unit 2 are closed.
- **If asked,** Simulate manually opening Unit 2 RWST cross-tie valves.
- **If asked,** External MCR D/P indicators indicate the same as indicated pressure on Unit 2 Vent Panel.
- **If requested**, Chilled Water flows have been adjusted per caution prior to Step 10 of E-0, Attachment 3.
- **If contacted,** Unit Two has implemented AP-50.00, and all conditions on U2 are normal.
- **When:** BOP reaches Page 6 of E-0, Attachment 3, you will take responsibility for the Attachment at this point.
- **If asked:** Unit 1 main steam and condenser A/E radiation is normal.

Field Operators: (Wait 4 minutes from direction to check Safeguards and report of conditions.)

SIMULATOR OPERATOR'S GUIDE

- **If contacted**, SFGDs steam side is inaccessible; steam is blowing out of the steam side louvers.

Role play as other individuals as needed.

Scenario Termination based on Evaluator Cue, SI Re-initiation, and Cooldown rate has been controlled.

Facility: Surry Power Station   Scenario No.: 4   Op-Test No.: 2021-301

Examiners: ____________________   Operators: ____________________

Initial Conditions: Unit 1 at 5% power, with plant startup in progress; BOL. Unit 2 at 100% power. All systems and crossties are operable with the following exceptions:

- Unit 1 startup is in progress per 1-GOP-1.8 and 1-OP-TM-001.
- Containment Smoke and heat detectors are non-functional due local fire panel failure (2 days ago). TRM Section 3.3.1, Fire Detection Instrumentation, Condition B, Smoke Detectors, and Condition C, Heat Detectors is in effect. Containment air temperatures monitored once/hour, and restore to Functional status in 14 days.

Turnover: The Crew will be provided a copy of 1-GOP-1.8 and 1-OP-TM-001 and a ramp plan to place Unit 1 online.

Event No.	Event Type*	Event Description
1 N	N BOP R SRO/RO	Place Unit 1 online IAW 1-GOP-1.8/1-OP-TM-001.
2 N	I-BOP/SRO TS-SRO	1-CC-RM-105 fails with failure of vent valve auto closure. ARP 0-RM-L5/M5.
3 N	C-RO/SRO	Normal Charging Flow Controller 1-CH-FC-1122C fails high. 0-AP-53.00.
4 N	C-BOP/SRO	Trip of running EH pump with failure of standby pump auto start. ARP TS-D2. **(CT-1)**
5	C-RO/SRO TS-SRO	“A” CH SW pump trip with failure of “B” CH SW pump auto start. ARP 1D-G5. **(CT-2)**
6 N	C-RO/SRO	Dropped Rod. 0-AP-1.00, 1-E-0, 1-ES-0.1.
7	M-ALL	SBLOCA, with auto start failure of both LHSI pumps. 1-AP-16.00, 1-E-0. **(CT-3)**
8	M-ALL	LBLOCA, with “A” and “B” CS pump auto start failure, failure of CS Discharge MOVs to auto open. “A” CS pump lockout. 1-FR-Z.1, 1-E-0. **(CT-4)**

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

LIST OF CRITICAL TASKS

CT #	EVENT	DESCRIPTION	MET (✓)
CT-1	4,	Start standby EH fluid pump prior to turbine control valves failing closed. (~8 1/2 minutes, 6 minutes from the first Annunciator, with no operator action). Failure to respond to this event will result in an unnecessary turbine/reactor trip.	
CT-2	5,	Start standby CH SW pump prior to exceeding 185°F CH pump bearing temperature. (5 minutes with no operator action). Because of the failure of the standby CH SW pump to auto start, CH pump bearing temperatures will rise to the point of pump damage within 5 minutes. Failure of the Team to manually start the standby CH SW pump will result in exceeding the bearing temperatures stated in 1-AP-8.00 for requiring pump swap and engineering evaluation. This will result in reduced Safety Injection equipment during the subsequent LOCA response.	
CT-3	7,	Start at least one LHSI pump prior to exiting 1-E-0 to restore function. Failure to do this, prior to exiting 1-E-0, will create a challenge to Core Cooling during the subsequent LBLOCA.	
CT-4	8,	Establish “B” train of Containment Spray flow within 15 minutes of Containment Pressure reaching 23 psia to prevent unnecessary EAL escalation. Because of the failure of the Containment Spray pumps to start, there is a loss of that function. Failure to establish one train of CS Pump flow within 15 minutes will result in a potential loss of the Containment barrier (per the EAL Matrices). That, paired with the Loss of RCS barrier, will require escalation from an Alert to a Site Area Emergency.	

Event 1: Place Unit On-Line and Ramp Up in Power. (R – RO/SRO, N- BOP)

The Team will pre-brief 1-GOP-1.8, Unit Startup, HSD to Max Allowable Power (step 5.6.13), and 1-OP-TM-001 (step 5.7), Turbine-Generator Startup to 20% - 25% Turbine Power prior to Simulator entry. A reactivity plan will be provided for the Team use during the pre-brief and in the Simulator for the Ramp up in power. The Team will place the Unit on-line and commence a ramp up in power. Per OP-AA-100, Attachment 2, 5.5.3, **a surrogate operator will be responsible for feed water control until the FRVs are ready to be placed in AUTO and the Bypass valves are closed**; the BOP will then assume SG level control.

Verifiable Action(s):

1) RO: Manipulate rod control and CVCS Blender to control Tave and ΔFlux during the power escalation.
2) BOP: Manipulate Generator output breakers.
3) BOP: Manually control SG NR level, following relief of surrogate.

Event 2: 1-CC-RI-105, CC RM, fail high without associated auto action. (I – BOP/SRO, TS – SRO)

After the Team has raised power, stable control of SG NR level with FRVs in auto has been achieved, and the Evaluation Team is ready, the malfunction is initiated. This failure causes 1-CC-RI-105 Alert and High alarms to actuate with the failure of HCV-CC-100, CC Surge TK VNT Isol VV, to auto close. The BOP will respond to the RM alarm and take action IAW with RM Annunciator Response Procedure.

Verifiable Action(s):
1) BOP: Close HCV-CC-100, CC Surge Tank vent valve.

Technical Specifications (1):

1) **Tech Spec 3.13.E,** Whenever the component cooling water radiation monitor is inoperable, the surge tank vent valve shall remain closed. (This Tech Spec also satisfies Tech Spec Table 3.7-5.)

Event 3: Charging flow controller 1-CH-FT-1122C Fail High. *(C – RO/SRO)*

When the Evaluation Team is ready, the malfunction will be actuated. The malfunction will cause The Charging flow transmitter to Fail High. This will cause charging flow to lower, resulting in Letdown perturbations based on reduced cooling in the Regen Heat Exchanger. Also, Pressurizer level will lower. The RO is expected to diagnose the failure based on alarms and indications received and take manual control of CH flow.

Verifiable Action(s):

1) RO: Take manual control of CH flow.
2) RO: Control Charging flow within the designated PRZR Level band.

Event 4: Running EH pump trips, standby EH pump fails to auto start. *(C – BOP/SRO)*

This failure causes the running EH pump to trip with the backup pump failing to auto trip. Approximately 2 minutes after the EH pump trip, Annunciator TS-D2 will come in for Low EH fluid pressure. The BOP will perform the ARP, diagnose the failure based on alarms and EH pump status, and start 1-EH-P-MP2.

Verifiable Action(s):

1) BOP: Start 1-EH-P-MP2.

Critical Task(s)

CT-1: Start standby EH fluid pump prior to automatic OR manual reactor/turbine trip. (~8 1/2 minutes, 6 minutes from the first Annunciator, with no operator action). Failure to respond to this event will result in turbine control valves failing closed and an unnecessary turbine/reactor trip.

Event 5: Trip of the running CH pump SW pump, with failure of the redundant pump to auto start. (C – RO/SRO, TS - SRO)

This failure causes the running CH pump SW pump (1-SW-P-10A) to trip, and the redundant pump fails to auto start on low pressure. The Team should respond by implementing ARP 1D-G5, SW OR CC PPS DISCH TO CHG PUMPS LO PRESS, start 1-SW-P-10B, and verify CH Pump SW flow restored.

Verifiable Action(s):

1) RO: Start 1-SW-P-10B.

Technical Specifications (1):

1) **Tech Spec 3.0.1,** Place the Unit in HSD in 6 hours, CSD in the following 30 hours, in effect.

Technical Requirements Manual (1):

1) **TRM 3.7.9, Appendix R Alternate Shutdown Equipment and MRule(a)(4) Fire Risk Equipment, Table 3.7.9-1, 1-SW-P-10A.** With 1-SW-P-10A nonfunctional:
-A.2, Implement App R hourly fire watch in Unit 1 ESR, Unit 1 and 2 Turbine Buildings Basement North Wall, MER 3 within 14 days.
-A.3, Restore instrument to functional status within 60 days.

Critical Task(s):

CT-2: Start standby CH SW pump prior to exceeding 185°F CH pump bearing temperature. (5 minutes with no operator action). Because of the failure of the standby CH SW pump to auto start, CH pump bearing temperatures will rise to the point of pump damage within 5 minutes. Failure of the Team to manually start the standby CH SW pump will result in exceeding the bearing temperatures stated in 1-AP-8.00 for requiring pump swap and engineering evaluation. This will result in reduced Safety Injection equipment during the subsequent LOCA response.

Event #6: Dropped Control Rod. (C – RO/SRO)

This Event will cause a lowering rector power, lowering RCS temperature and pressure, and result in annunciator 1G-H2, RPI Rod Bottom < 20 Steps. With reactor power below 25%, 0-AP-1.00 will direct 1-E-0 entry. That team may take conservative action and go to 1-E-0 directly. The team will transition to 1-ES-0.1 to stabilize the unit at HSD.

Verifiable Action(s):

1) RO: Perform immediate action steps of 1-E-0.
2) BOP: Throttle AFW flow to all S/Gs.

Event #7: SBLOCA with failure of LHSI pumps to auto start. (M – ALL)

The RO will diagnose the RCS leakage due to the alarms and indications received, and perform the Immediate Actions of 1-AP-16.00. When leakage is determined to be greater than the capacity of a single CH pump, The RO will manually initiate Safety Injection and return to 1-E-0. The BOP will start at least one LHSI pump IAW 1-E-0 Attachments 1 and 2.

Verifiable Action(s):

1) RO: Manually initiates Safety Injection and re-performs immediate action steps of 1-E-0.
2) BOP: Manually starts at least one LHSI pump.

Critical Task(s):

CT-3: Start at least one LHSI pump before transition to 1-FR-C.1 is required. Because of the failure of the LHSI pumps to auto start, there is a total loss of available high volume RCS makeup. Failure to do this in a timely manner will create a challenge to Core Cooling during the subsequent LBLOCA.

Event #8: LBLOCA with no running Containment Spray pumps. (M – All)

This Event will cause a sudden drop in RCS pressure, multiple Containment radiation alarms, and a rise in Containment pressure. Hi CLS and Hi Hi CLS will actuate, but the “A” CS pump breaker will lockout, the “B” CS pump will fail to auto start, and the CS Pump discharge MOVs will fail to auto open. Orange path criteria will be met for Containment and the Team will transition to 1-FR-Z.1. The Team is expected to align CS flow using the “B” CS pump and return to 1-E-1.

Verifiable Action(s):

1) RO: Start “B” Containment Spray (CS) pump.
2) RO: Open “B” CS Pump Discharge MOVs.
3) RO: Stop all RCPs.
4) BOP: Close CH pump miniflow Recirc MOVs.

Critical Task(s)

CT-4: Establish “B” train of Containment Spray flow within 15 minutes of Containment Pressure reaching 23 psia to prevent unnecessary EAL escalation. Because of the failure of the Containment Spray pumps to start, there is a loss of that function. Failure to establish one train of CS Pump flow within 15 minutes will result in a potential loss of the Containment barrier (per the EAL Matrices). That, paired with the Loss of RCS barrier, will require escalation from an Alert to a Site Area Emergency.

The Scenario is terminated when the Team restores Containment Spray or Evaluator discretion.

Scenario Recapitulation
Total Malfunctions: 7
Abnormal Events: 5, ARP 1-RM-L5/-M5, 0-AP-53.00, ARP TS-D2, ARP 1D-G5, 0-AP-1.00.
Major Transients: 2
EOPs Entered: 2 (E-0, ES-0.1, E-1)
EOP Contingencies: 1 (FR-Z.1)

Initial Conditions: Unit 1 at 5% power, with plant startup in progress; BOL. Unit 2 at 100% power. All systems and crossties are operable with the following exceptions:
Equipment Status/ Procedures/ Alignments/ Data Sheets/ etc.: o Unit 1 startup is in progress per 1-GOP-1.8 and 1-OP-TM-001. o Containment Smoke and heat detectors are non-functional due local fire panel failure (2 days ago). TRM Section 3.3.1, Fire Detection Instrumentation, Condition B, Smoke Detectors, and Condition C, Heat Detectors is in effect. Containment air temperatures monitored once/hour, and restore to Functional status in 14 days.
Turnover The Team will pre-brief placing unit 1 online in accordance with 1-GOP-1.8 and 1-OP-TM-001 and a ramp plan prior to Simulator entry, and commence following turnover. The performance of this procedure has been analyzed based on the current plant configurations and the PSA indicates green.

Scenario Objectives:

A. Given Station Operating Procedures and an approved ramp plan, place Unit 1 online from 5% power.

B. Given a failure of Component Cooling Radiation Monitoring, respond in accordance with ARPs 0-RM-L5 and –M5.

C. Given a failure of the Normal Charging Flow Controller, respond in accordance with 0-AP-53.00, Loss of Vital Instrumentation / Controls.

D. Given a loss of the running EH pump with auto start failure of the standby pump, respond in accordance with ARP TS-D2.

E. Given a loss of the running Charging SW pump with auto start failure of the standby pump, respond in accordance with ARP 1D-G5.

F. Given a dropped rod below 25% reactor power, respond in accordance with 0-AP-1.00, Rod Control Malfunction, and 1-E-0, Reactor Trip or Safety Injection.

G. Given a small break loss of Reactor Coolant, respond in accordance with 1-AP-16.00, excessive RCS leakage, and 1-E-0, Reactor Trip or Safety Injection.

H. Given a large break loss of Reactor Coolant with a loss of both Containment Spray pumps, respond in accordance with 1-FR-Z.1, Response to Containment High Pressure.

SHIFT TURNOVER INFORMATION

OPERATING PLAN:

The initial conditions have Unit 1 at 5% power with RCS boron concentration of 1420 ppm.

Unit startup is in progress, with power being held at 5% for turnover.

All systems and crossties are operable with the following exception:

- Containment Smoke and heat detectors are non-functional due local fire panel failure (2 days ago). TRM Section 3.3.1, Fire Detection Instrumentation, Condition B, Smoke Detectors, and Condition C, Heat Detectors is in effect. Containment air temperatures monitored once/hour, and restore to Functional status in 14 days.

Unit #2 is at 100% power with all systems and crossties operable.

Shift orders are to place unit 1 online in accordance with 1-GOP-1.8 (starting at step 5.6.13), 1-OP-TM-001 and a ramp plan upon relieving the watch. From there, continue the power escalation to 20-25% turbine power. Performance of these startup procedures have been authorized and have been PSA analyzed for current plant conditions.

The last shift performed dilutions as necessary to support unit startup, with PG currently in the blender piping.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 1 Page 10 of 92

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
	Team	**1-GOP-1.8** Team will pre-brief Initial Conditions, Precautions and Limitations, and procedure prior to entering simulator.
	RO BOP BOP BOP	**1-GOP-1.8** **NOTE:** *1-OP-CH-021 (*Alternate Dilution Using Blender*) procedure steps are contained at the end of this section.* 5.6.13 <u>IF</u> the Steam Dumps are in Auto in Steam Pressure Mode, <u>THEN</u> do the following. Otherwise, enter N/A. a. **Raise Reactor power to approximately 6% -10% by withdrawing the Control Rods and/or using chemical shim.** b. Check that the Steam Dumps come open to maintain Steam Header pressure at approximately 1005 psig. 5.6.14 Check that condenser pressure will be equal to or less than 3.5 inches of Hg pressure (or greater than 26.5 inches of Hg ABS vacuum) before synchronization. 5.6.15 Notify the System Operator and Energy Supply (MOC) that the unit is coming on line. 5.6.16 Check that at least five Polishing beds are in service. *CP operator will report 5 polishers in service.*
	SRO	**1-GOP-1.8** Note prior to Step 5.6.17: • Hotwell temperature should be greater than 70°F before synchronization. This recommended temperature is based on a North Anna Reactor trip caused by low feedwater temperature.
	SRO	**1-GOP-1.8** 5.6.17 Synchronize the Generator with the bus in accordance with 1-OP-TM-001, Subsection 5.7, Synchronizing and Loading the Turbine to 5 percent Rated Load in the OPER AUTO Mode. **NOTE:** *The team will now go to 1-OP-TM-001 (Subsection 5.7). All previous subsections will be completed. 1-OP-TM-001 actions are at the end of this section.*

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
	 RO SRO SRO	1-GOP-1.8 5.6.18 AFTER the generator breakers are closed, THEN verify annunciator 1K-B1, GEN BKR AUX REL FAIL TURB TRIP CKT, is NOT LIT. 5.6.19 Notify the System Operator and Energy Supply (MOC) that the unit is on the line and log the on-line time in the Unit 1 Narrative Log. 5.6.20 IF the VOLTAGE REGULATOR is NOT in automatic control, THEN notify Supervisor - System Operations at (804)-801-3165.
	 SRO SRO SRO	1-GOP-1.8 CAUTION prior to Step 5.6.21: • To provide for a positive channel check indication, steam flow must be verified on all six channels of SG STEAM FLOW PROTECT before 23 percent reactor power is exceeded. NOTES prior to Step 5.6.21: • Power level rises should be monitored closely and rods adjusted to maintain Tave close to Tref. Ramp rate will be a function of Steam Generator Level Control. • Chemistry should be notified when power level changes are equal to or greater than 15 percent/hr. • The Turbine should be operated in IMP IN while ramping is in progress. If desired, the turbine may be placed in IMP OUT at approximately 90 to 91 percent power. If the power rise is stopped during the ramp to 100%, IMP OUT may be used to assist in stabilizing the Turbine. 5.6.21 Continue in 1-OP-TM-001, Subsection 5.8, Power Escalation to 20% - 25% Turbine Power, while continuing to perform this procedure.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 1 Page 12 of 92

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
		1-GOP-1.8
	SRO	**CAUTION** prior to Step 5.6.22: • To prevent a Reactor Trip, Step 5.6.22 must be repeated if Reactor Power has decreased below 10 percent and PERM STATUS LIGHTs B1 and C1 are NOT LIT.
	RO	5.6.22 WHEN reactor power rises above 10 percent power, THEN perform the following.
	RO	a. Check that the following Trip Status Lights are LIT. 1. Trip Status Light E1, NIS PWR RGE P-10 CH-1 2. Trip Status Light F1, NIS PWR RGE P-10 CH-2 3. Trip Status Light G1, NIS PWR RGE P-10 CH-3 4. Trip Status Light H1, NIS PWR RGE P-10 CH-4
	RO	b. Check that the Perm Status Light A3, P-10 NIS PWR RGE > 10%, is LIT.
	RO	c. Check that the Perm Status Light B2, P-7 NIS PWR RGE AND TURB PWR < 10%, is NOT LIT.

Event Description: Place unit online.

Cue: When team ready.

		1-GOP-1.8 Step 5.6.22 (Continued)
	RO	d. Block the Intermediate Range Trip by performing the following. **1. Depress 1/N 38A TRA, INT RNG TRIP - BLOCK, pushbutton.** **2. Depress 1/N 38B TRB, INT RNG TRIP - BLOCK, pushbutton.** 3. Check Perm Status Light B1, NIS INT RNG RX TRIP AND ROD STOP BLOCKED, is LIT.
	UNIT 2	*If asked, perform IV for Step 5.6.22.d.3.*
	RO	e. Block the Power Range Low Trip by performing the following. **1. Depress 1/N 47A TRA, PWR RNG (LO SETPT) TRIP - BLOCK, pushbutton.** **2. Depress 1/N 47B TRB, PWR RNG (LO SETPT) TRIP - BLOCK, pushbutton.** 3. Check Perm Status Light C1, NIS PWR RNG LO SP TRIP - BLOCKED, is LIT
	UNIT 2	*If asked, perform IV for Step 5.6.22.d.3.*
	BOP	5.6.23 Perform the following substeps at the described Turbine Power. a. WHEN turbine power rises through 10 percent, THEN check that the following Trip Status Lights are LIT. 1. Trip Status Light E3, TURB PWR > 10% CH-3 2. Trip Status Light F3, TURB PWR > 10% CH-4 b. WHEN turbine power rises through 15 percent, THEN check Perm Status Light K1, P-2 AUTO ROD CONTROL BLOCKED TURB PWR < 15%, is NOT LIT.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 1

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
		1-GOP-1.8
	SRO	**NOTE** prior to Step 5.6.24: • When Steam Dumps close, a reduction in RCS temperature should be anticipated and compensatory actions taken.
	RO/BOP	5.6.24 IF Steam Dumps in Auto, THEN verify the Steam Dumps modulate closed as Turbine Power is raised. 5.6.25 IF the Steam Header Pressure controller in Manual, THEN as Turbine power level continues to rise, reduce the STM DUMP VVS DEMAND signal to zero while maintaining Reactor power constant. Enter N/A if controller in Auto.
	BOP	**NOTE** prior to Step 5.6.24: • The Valve Position Limiter meter on the Benchboard and PCS point Y2014A should be used to monitor the Valve Position Limiter setpoint. 5.6.26 Maintain Turbine Valve Position Limiter approximately 5% above Governor Valve demand. **NOTES** prior to step 5.6.27: • Steam Flow / Feed Flow indications do not have to be matched to be considered stable. • All three MFRVs should be placed in Auto at the same time to ease the transition to Auto feed control.
	SURRO-GATE	*Allow the BOP to perform 5.6.27 Substeps b. and c.*
	BOP	5.6.27 WHEN Feedwater temperature is greater than 260°F (PCS points T0418A, T0438A, T0458A) with stable Steam Flow / Feed Flow, THEN perform the following: a. Check that the MFRVs are closed. **b. Place the MFRVs in Auto.** **c. WHEN MFRV demand exceeds approximately 9%, THEN slowly close the MFRV Bypass HCVs as the MFRVs come open.**
	SURRO-GATE	*When MFRVs in AUTO and Bypass HCVs closed, exit the OATC area.*
		NOTE: When the Steam Dumps are fully closed, Tave will lower as Turbine power is raised.
	RO/BOP	5.6.28 IF the Steam Header Pressure controller is in Auto, THEN as Turbine power level is raised, perform the following. Enter N/A if controller in Manual. a. Check that the Steam Dumps modulate closed. b. WHEN the Steam Dumps are closed, THEN place the Steam Header Pressure controller in Manual.

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
		1-GOP-1.8
	RO/BOP	5.6.29 IF the Steam Header Pressure controller is in Manual, THEN as Turbine power level continues to rise, reduce the STM DUMP VVS DEMAND signal to zero while maintaining Reactor power constant. Enter N/A if controller was operated in Auto.
	RO/BOP	5.6.30 Place the STM DUMP MODE SEL switch in the TAVG position as follows. a. Check STM HDR pressure controller demand at zero. b. Place STM DUMP CNTRL switch to OFF/RESET. c. Place STM DUMP MODE SEL switch to RESET and spring return to TAVG. d. Check annunciator 1H-D7, STM DUMP PERM, is NOT LIT. e. Place STM DUMP CNTRL switch to ON.
		END OF GOP ACTIONS – 1-OP-TM-001 ACTIONS BEGIN NEXT PAGE.

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
	BOP BOP	**1-OP-TM-001** **5.7 Synchronizing and Loading the Turbine to 5% Rated Load in the OPER AUTO Mode** **NOTES** prior to Step 5.7.1: • Shift Supervision may authorize entry or exit from this subsection at any step or substep based upon existing plant conditions. N/A must be entered for the specific steps or substeps in the subsection that were not performed as a result of the authorized exit or entry. • Hotwell temperature should be greater than 70°F before synchronization. This recommended temperature is based on a North Anna Reactor trip caused by low feedwater temperature. 5.7.1 Check that the Hotwell temperature is greater than 70°F. IF Hotwell temperature is NOT greater than 70°F, THEN evaluate the effects of synchronization with temperature less than 70°F
	SRO BOP BOP	**1-OP-TM-001** **CAUTION** prior to Step 5.7.2: • During Turbine startup and operation at less than 10% electrical load, Condenser vacuum, as read on MCR Condenser Vacuum Recorders CN-PR-101A and CN-PR-101B, should be maintained as high as possible and greater than 26.5 in. Hg to prevent Turbine blade flutter. During shutdown, Condenser vacuum should be maintained as high as possible, and greater than 26.5 in. Hg until the Turbine rotor is on the Turning Gear. 5.7.2 Check that the Turbine vacuum indicated on MCR Condenser Vacuum Recorders CN-PR-101A and CN-PR-101B is greater than 26.5 inches of Hg Vacuum. 5.7.3 Check that the pumps and fans for the three Main Transformers are in operation. *Field operator will report pumps and fans in service*

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
	BOP BOP SRO	**1-OP-TM-001** 5.7.4 Check that UNIT NO. 1 LOAD MEGAWATTS chart recorder is ON. **NOTE** prior to Step 5.7.5: • The Valve Position Limiter meter on the Benchboard and PCS point Y2014A should be used to monitor the Valve Position Limiter setpoint. 5.7.5 Check or depress the VV POSTN LIMITER raise button until the VV POSTN LIMIT indicator registers 30% VALVE POSITION. 5.7.6 Check that the applicable GOP has been completed up to synchronization, and that the Startup Team is ready to synchronize the generator with the bus.
	BOP BOP	1-OP-TM-001 **NOTE** prior to Step 5.7.7: • Shift Supervision may adjust the ramp rate to aid in unit stabilization. 5.7.7 Verify or place the LOAD RATE % PER MIN thumbwheel to position 1. (1%/MIN)

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
	SRO	**CAUTIONS** prior to step 5.7.8: • The Sync Switch should not be turned to the AUTO position as the AUTO SYNC function is inoperative. • To prevent breaker disagreement, the Generator output breaker control switch should be held in CLOSE until the red light is LIT or the breaker indicates tripped.
	BOP	5.7.8 Synchronize the Generator with the bus using OCB-G102, GEN OUTPUT BKR, by performing the following substeps. IF the Generator will be synchronized using OCB-G1T240, THEN enter N/A AND GO TO Step 5.7.9. a. Insert the Sync Key into CS-G102, GEN OUTPUT BKR SYNC SWITCH. b. Turn CS-G102 to MAN. c. Raise the SETTER to 1805 rpm and press the GO button. d. Check that voltage is indicated on the INCOMING and RUNNING voltmeters. **NOTE:** Slow in the fast direction is one clockwise rotation in 20 or more seconds. e. Check a slow rotation of the synchroscope in the fast direction. (clockwise) IF NOT, THEN raise or lower the SETTER as required and press the GO Button.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 1 Page 19 of 92

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
		1-OP-TM-001 *5.7.8 (Continued)* **NOTE**: INCOMING and RUNNING voltages should be within 2 volts.
	BOP	f. **Equalize the INCOMING voltage with the RUNNING voltage using the EXCITATION LEVEL control switch.**
		CAUTION: If Generator output is not indicated at the time of synchronization and no operator action is taken, an anti-motoring trip will occur **NOTE**: With the Synchroscope running as close to a 20-second cycle as possible, very little load will be placed on the generator. **NOTE**: Reflexes should be mentally checked with respect to the Synchroscope needle speed so that the Generator Breaker is closed at 12:00 o'clock. g. **<u>WHEN</u> the Synchroscope is at (approximately) 2 minutes to 12:00 o'clock, <u>THEN</u> close OCB-G102, Generator Output Breaker.** **NOTE**: Approximately 15 to 20 seconds may elapse before the Setter indication rises above zero. h. Check that the following indications are NOT LIT. • Permissive Status Light E-3 GEN NO. 1 MOTORING INITIATED • Annunciator 1J-D7, GEN MOTORING TURB LO ΔP i. <u>IF</u> the Generator is motoring, <u>THEN</u> immediately raise the setter to 5% and depress the GO pushbutton. (The ramp rate may be raised as necessary to clear the motoring alarms. When the alarms are clear, the Turbine ramp rate may be lowered or halted as desired.)

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 1 Page 20 of 92

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
		1-OP-TM-001 *5.7.8 (continued):* j. **Turn CS-G102, GEN OUTPUT BKR SYNC SWITCH, to OFF.** k. **Insert the Sync Key into CS-G1T240, GEN OUTPUT BKR SYNC SWITCH.** l. **Turn CS-G1T240 to MAN.** m. **Check that the synchroscope needle stopped at approximately the 12:00 o'clock position.** n. Check that the INCOMING and RUNNING voltages are within 2 volts. o. **Close OCB-G1T240.** p. **Turn CS-G1T240 to OFF and remove the Sync Key.**
	SRO/BOP	**1-OP-TM-001** 5.7.9 Synchronize the Generator with the bus using OCB-G1T240, GEN OUTPUT BKR, by performing the following substeps. <u>IF</u> the Generator was synchronized using OCB-G102, <u>THEN</u> enter N/A AND GO TO Step 5.7.10

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 1 Page 21 of 92

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
	SRO/BOP	**1-OP-TM-001** **CAUTION** prior to Step 5.7.10: • During Power Escalation, the VV POSTN LIMIT should be maintained as close as reasonably possible just above the actual governor valve position for the desired power level. This method of operation will prevent a Turbine Governor Valve(s) from failing to an open position due to an electronic or hydraulic failure thereby causing an excessive load on the Unit or causing the Unit to exceed licensed power limits. **NOTES** prior to Step 5.7.10: • The VV POSTN LIMIT setpoint should be raised proportionally as the Turbine load is raised. The Turbine Governor Valves should not be run up against the Limiter. • The Turbine should not be continuously operated on the VV POSTN LIMIT. • If Steam Dumps are open and controlling in Auto, raising limiter setting to remove turbine from the limiter will trade steam to dumps for steam to turbine. • The Valve Position Limiter meter on the Benchboard and PCS point Y2014A should be used to monitor the Valve Position Limiter setpoint.
	BOP/SRO	5.7.10 IF the VALVE POS LIMIT light is LIT, THEN do the following: a. IF Steam Dumps are open and controlling in Auto, THEN slowly raise limiter setting to remove Turbine from limiter. b. IF steam dumps are not open, OR not in Auto, THEN do the following: 1. Stop the ramp. 2. Lower Unit load until the VALVE POS LIMIT light is NOT LIT. 3. Adjust the VV POS LIMIT setpoint as required. 4. Resume ramp.
	BOP	5.7.11 Verify that the SPEED light is NOT LIT and the LOAD light is LIT.
	BOP	5.7.12 RETURN TO appropriate startup GOP to continue the Unit Startup. **THE team will return to GOP-1.8 (momentarily).**

Event Description: Place unit online.

Cue: When team ready.

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Action or Behavior</th></tr>
<tr><td></td><td>SRO</td><td>1-OP-TM-001

CAUTIONS prior to Step 5.8.1:
• Constant communication between the Reactor Operators on the S/G Level Controls, the Control Rods, Steam Dumps, and the Turbine must be maintained to prevent temperature or level transients.
• Rapid Loading of the Turbine - Generator may cause a Steam Generator High Level Trip.

NOTES prior to Step 5.8.1:
• Shift Supervision may authorize entry or exit from this subsection at any step or substep based upon existing plant conditions. N/A must be entered for the specific steps or substeps in the subsection that were not performed as a result of the authorized exit or entry.
• Ramping the Turbine at 1%/min until the Steam Dumps are closed will aid in the transition to auto feed control. Once the Steam Dumps are closed the normal ramp rate is Position 6.
• In the OPER AUTO mode, Turbine loading may be stopped by depressing the HOLD pushbutton and may be restarted by depressing the GO pushbutton.</td></tr>
<tr><td></td><td>SRO/BOP</td><td>1-OP-TM-001

5.8.1 With the OPER AUTO mode selected, set the desired load in the SETTER and depress the GO pushbutton.

5.8.2 Maintain the System Voltage on the 230 KV BUS VOLT meter as requested by the System Operator.

5.8.3 <u>WHEN</u> Turbine power rises above 10%, <u>THEN</u> check PCS alarm Y2060D, Exh Hood Sprays OFF, is received.

5.8.4 <u>WHEN</u> IMPULSE CHAMBER PRESSURE (Turbine Power) passes through 30 percent <u>OR</u> when the startup has stabilized, <u>THEN</u> check or depress the IMP IN pushbutton <u>AND</u> check that the IMP IN light is LIT and the IMP OUT light is NOT LIT. Enter N/A if Turbine control will remain in IMP OUT.

Evaluator's Note: No further actions are expected for this event.</td></tr>
<tr><td></td><td></td><td>END EVENT 1</td></tr>
</table>

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
	RO	**1-OP-CH-021,** Alternate Dilution Using Blender 5.1 Alternate Dilution **NOTE:** This subsection will be used for the first alternate dilution of the shift. Attachment 1 will be used as a guide for further alternate dilutions for the remainder of the shift. **NOTE:** If unit on Excess Letdown, 1-OP-CH-007 should be used. 5.1.1 Determine the required integrator setpoint by performing the following: _________________ gal (-) ______________= _______ Integrator setpoint (Desired Dilution) (anticipated additional flow, dependent on flowrate)
	UNIT 2	*If asked, perform IV for Step 5.1.1.* 5.1.2 Notify Shift Supervision of impending Alternate Dilution. 5.1.3 Notify STA of impending Alternate Dilution. 5.1.4 Place the MAKE-UP MODE CNTRL switch in the STOP position. 5.1.5 Adjust both of the following controllers for the flow rate and total gallons of Primary Grade water for the dilution. IF the PG FLOW CNTRL controller setpoint has previously been set, THEN N/A Substep 5.1.5.a. a. 1-CH-FC-1114A, PG FLOW CNTRL ______ GPM (IAW Attachment 2) b. Record number of gallons of PG to be added from Step 5.1.1 and enter into 1-CH-YIC-1114A, PRI WATER SUP BATCH INTEGRATOR (GAL) as follows: 1. Depress PRESET A Button (Controller will read the last value entered into the controller; reads in gallons.) 2. To clear PRESET A, depress the CLR Button. Enter N/A if not required. 3. Enter desired PRESET A value. Enter N/A if not required. 4. Depress ENT Button

Event Description: Place unit online.

Cue: When team ready.

Time	Position	Applicant's Action or Behavior
	RO	1-OP-CH-021, Alternate Dilution Using Blender 5.1.6 Place the MAKE-UP MODE SEL switch in the ALT DIL position. 5.1.7 IF it is desired to direct the dilution water to the charging pump suction only, THEN place 1-CH-FCV-1114B, BLENDER TO VCT, in the CLOSE position. Otherwise, enter N/A. 5.1.8 Place the MAKE-UP MODE CNTRL switch in the START position. 5.1.9 Check all of the following conditions. a. 1-CH-FCV-1113A, BORIC ACID TO BLENDER, is closed. b. 1-CH-FCV-1113B, BLENDER TO CHG PUMP, is open. c. 1-CH-FCV-1114A, PGW TO BLENDER, is controlling in AUTO. d. 1-CH-FCV-1114B, BLENDER TO VCT, is open. IF Step 5.1.7 was performed, THEN enter N/A. 5.1.10 IF it is desired to stop the Dilution before the selected amount, THEN place the MAKE-UP MODE CNTRL switch in the STOP position. IF the PRI WATER SUP BATCH INTEGRATOR (GAL) is used to stop the flow, THEN enter N/A for this step. 5.1.11 WHEN the desired amount of makeup has been reached, THEN check both of the following valves closed. • 1-CH-FCV-1113B • 1-CH-FCV-1114B
	RO	5.1.12 Check or place 1-CH-FCV-1114B in AUTO. 5.1.13 Check or place the following controllers in Automatic. • 1-CH-FC-1113A, BA FLOW CNTRL • 1-CH-FC-1114A, PG FLOW CNTRL 5.1.14 Place the MAKE-UP MODE SEL switch in the AUTO position. 5.1.15 Place the MAKE-UP MODE CNTRL switch in the START position. 5.1.14 Notify Shift Supervision of Blender status. **(Reference 2.4.1)** ***Additional Alternate Dilutions will be performed using 1-OP-CH-021, Attachment 1 (Next Page).***

Event Description: Place unit online.

Cue: When team ready.

DOMINION ENERGY
Surry Power Station

1-OP-CH-021
Revision 23
Page 9 of 11

(Page 1 of 2)

Attachment 1
REPEATED ALTERNATE DILUTIONS

NOTE: This attachment will be used for repeated Dilutions after the initial Subsection 5.1 has been filled out for the shift.

Procedure Steps:	Gal/Initial (1)	Gal/Initial (2)	Gal/Initial (3)
	Perf.	Perf.	Perf.
1.1 Notify Shift Supervision of impending Alternate Dilution. **(Reference 2.4.1)**			
1.2 Notify STA of impending Alternate Dilution.			
1.3 Place the MAKE-UP MODE CNTRL switch in the STOP position.			
1.4 Check set or set PG flow controller for the dilution.			
1.5 Record the number of gallons of PG to be entered into the PG Integrator.	/	/	/
1.6 Depress PRESET A Button on 1-CH-YIC-1114A.			
1.7 To clear PRESET A, depress the CLR Button on 1-CH-YIC-1114A. Enter N/A if not required.			
1.8 Enter desired PRESET A value from Step 1.5 on 1-CH-YIC-1114A. Enter N/A if not required.			
1.9 Depress ENT Button on 1-CH-YIC-1114A.			
1.10 Place the MAKE-UP MODE SEL switch in the ALT DIL position.			
1.11 IF it is desired to direct the dilution water to the charging pump suction only, THEN place 1-CH-FCV-1114B, BLENDER TO VCT, in the CLOSE position. Otherwise, enter N/A.			
1.12 Place the MAKE-UP MODE CNTRL switch in the START position.			
1.13 Check proper valve positions.			
1.14 WHEN the desired amount of makeup has been reached, THEN check proper valve positions.			
1.15 Check or place 1-CH-FCV-1114B in AUTO.			
1.16 Check or place BA flow controller in AUTOMATIC.			
1.17 Check or place PG flow controller in AUTOMATIC.			
1.18 Place the MAKE-UP MODE SEL switch in the AUTO position.			
1.19 Place the MAKE-UP MODE CNTRL switch in the START position.			
1.20 Notify Shift Supervision of Blender status. **(Reference 2.4.1)**			

Event Description: CC RM Fail upscale with failure of HCV-CC-100 to auto close.

Cue: After MFRVs in AUTO and Bypass HCVs closed.

Time	Position	Applicant's Action or Behavior
	BOP	Diagnoses failure of 1-RM-CC-105 with the following indications/alarms: Alarms: • 0-RM-L5 CC HX A/B OUT ALERT/FAILURE • 0-RM-M5 1-CC-RI-105 HIGH Indications: 1-CC-RI-105 indicates all "EEEEEEs." 1-CC-RI-105, HIGH, WARN and RANGE lights LIT. **NOTE**: RM-M5 Guidance located at end of this section, starting at page 28.
	BOP SRO	0-RM-L5 **NOTES** Prior to Step 1: • If a monitor fails, the automatic functions associated with that monitor must be checked or performed. • When HP has surveyed the area and declared radiation levels normal, the components that were realigned due to monitor failure may be returned to normal and activities in the affected area may continue. • Tech Spec 3.13.C requires that HCV-CC-100 remain closed if either CC radiation monitor is inoperable.
	BOP	0-RM-L5 1. CHECK ALARM - READING ON MONITOR GREATER THAN OR EQUAL TO ALERT SETPOINT OR RADIATION LEVEL HAS TRENDED UP • 1-CC-RI-105, HDR A • 1-RM-RR-150C, Pen 1 BOP will identify that the meter indicates "EEEEEEEs" and a steeply rising trend. Goes to RNO.
	BOP	0-RM-L5, Step 1 RNO a) IF all EEEEEs indicated on display, THEN GO TO 0-OPT-RM-001, Radiation Monitoring Equipment Check.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 2 Page 27 of 92

Event Description: CC RM Fail upscale with failure of HCV-CC-100 to auto close.

Cue: After MFRVs in AUTO and Bypass HCVs closed.

Time	Position	Applicant's Action or Behavior
		0-OPT-RM-001 Precautions and Limitations 4.1 Each process radiation monitor paper advance uses about 5 hours worth of paper. Unnecessary paper advances will cause the roll to run out prematurely. 4.2 Check Sources for the Victoreen digital radiation monitors operate as follows. • For digital PROCESS monitors - The Check Source is exposed to the detector by depressing and holding the CHECK SOURCE pushbutton. • For digital AREA monitors - A Check Source signal is inserted into the detector circuit by depressing and releasing the CHECK SOURCE pushbutton. The Check Source signal is removed when the CHECK SOURCE pushbutton is depressed and released a second time or after approximately three minutes. The digital AREA monitors do not have a radioactive Check Source. 4.3 Subsections not required to be performed can be discarded.
	BOP	0-OPT-RM-001 6.1 Work Preparation 6.1.1 IF a radiation monitor is out of service, THEN enter OOS in applicable spaces of Attachments. NOTE: • A failed Digital Rate Meter is indicated by "EEEEEs" in the digital display window, and the FAIL Alarm light LIT. • If the Radiation Monitor has associated automatic actions, those actions will occur when the monitor fails. 6.1.2 IF this procedure is being performed due to failure of a Digital Radiation Monitor with all EEEEEs displayed, THEN perform the following. a. IF Radiation Monitor has associated automatic actions, THEN check or perform actions as necessary. Otherwise, enter N/A. *BOP may use RM-L5 or RM-M5 guidance for completion of the verification of Auto Actions.* **Places 1-HCV-CC-100 in OFF**. Directs Unit 2 operator to place SOV-CC-200 in close.
	UNIT 2	Reports that SOV-CC-200 has been placed in CLOSE.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 2 Page 28 of 92

Event Description: CC RM Fail upscale with failure of HCV-CC-100 to auto close.

Cue: After MFRVs in AUTO and Bypass HCVs closed.

Time	Position	Applicant's Action or Behavior
	BOP	0-OPT-RM-001 b. On the front panel of rate meter, depress the ON/OFF push button, and check the meter is OFF. **BOP places On/Off switch in Off**. c. WHEN 30 seconds have elapsed, THEN perform Step 6.1.2.d. d. On the front panel of rate meter, depress the ON/OFF push button, and check the meter is ON. **Places RM in On, Meter immediately goes to all "EEEEE's" with the HIGH, WARN and RANGE lights Lit.** Notifies SRO RM has failed and I&C assistance is required.
	SRO	**SRO will consult Tech Specs, section 3.13.C** and identify that whenever the component cooling water radiation monitor is inoperable, the surge tank vent valve shall remain closed. May also review Technical Specification Table 3.7-5, which will refer the SRO to Technical Specification 3.13.
	SRO STA	The team will hold a transient brief. During the brief the failure of the CC RM and Vent Valve will be discussed. The RO/BOP will report Annunciators received related to the event, and Critical Parameters affected. *STA will have no input for the brief.*
	SRO	Will notify the Shift Manager of the failure and request I&C assistance.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 2

Event Description: CC RM Fail upscale with failure of HCV-CC-100 to auto close.

Cue: After MFRVs in AUTO and Bypass HCVs closed.

Time	Position	Applicant's Action or Behavior
	BOP	RM-M5 ***Note**: Candidate may refer to this ARP initially in response to the High Alarm.* **NOTE** before step 1: • If a monitor fails, the automatic functions associated with that monitor should be verified or performed. • When HP has surveyed the area and declared radiation levels normal, the components that were realigned due to monitor failure may be returned to normal and activities in the affected area may continue. • **Tech Spec 3.13.C requires that HCV-CC-100 remain closed if either CC radiation monitor is inoperable.** 1. CHECK ALARM - READING ON MONITOR GREATER THAN OR EQUAL TO HIGH SETPOINT • 1-CC-RI-105, HDR A • 1-RM-RI-150C, Pen 1 Identifies Monitor reading is greater than High Alarm.
	BOP UNIT 2	RM-M5 2. CHECK CC HEAD TANK VENT VALVE - CLOSED a) Place HCV-CC-100 in OFF (Unit 1) **Places HCV-CC-100 in Off.** b) Place SOV-CC-200 in CLOSE (Unit 2) Directs Unit 2 operator to place SOV-CC-200 in close. Reports that SOV-CC-200 has been placed in CLOSE.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 2 Page 30 of 92

Event Description: CC RM Fail upscale with failure of HCV-CC-100 to auto close.

Cue: After MFRVs in AUTO and Bypass HCVs closed.

Time	Position	Applicant's Action or Behavior
	 BOP	RM-M5 **NOTE** before step 3: The following components are the most likely sources of inleakage to the CC System: • RCP Thermal Barrier • NRHX • Primary Sample coolers • Excess Letdown HX • HRSS coolers • RHR HX • SFP coolers • RHR Pump Seal coolers 3. MONITOR CC HEAD TANK LEVEL AND CC TEMP FOR INCREASING LEAKAGE TO CC SYSTEM
	 BOP BOP	RM-M5 4. NOTIFY HP TO DO THE FOLLOWING: • Check area evacuated as necessary • Control access as necessary • Investigate cause • Determine need for setpoint change Notifies HP.
	 BOP	RM-M5 5. PERFORM ( )-OPT-RC-10.0, REACTOR COOLANT LEAKAGE OR ( )-AP-16.00, EXCESSIVE RCS LEAKAGE, AS NECESSARY Notifies RO/SRO to perform 1-OPT-RC-10.0, as necessary. Determines 1-AP-16.00 is not necessary.
	 BOP	RM-M5 6. DETERMINE LEAKAGE SOURCE BY SAMPLING AS NECESSARY Notifies SRO concerning Step.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 2 Page 31 of 92

Event Description: CC RM Fail upscale with failure of HCV-CC-100 to auto close.

Cue: After MFRVs in AUTO and Bypass HCVs closed.

Time	Position	Applicant's Action or Behavior
	BOP	RM-M5 7. ISOLATE LEAKAGE Notifies SRO of need to isolate leakage if discovered by sampling. No isolation is required.
	BOP	RM-M5 8 PROVIDE NOTIFICATIONS AS NECESSARY: • Shift Supervision • OMOC • STA • Health Physics • Instrumentation Department Informs SRO of required notifications.
		END EVENT 2

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 3

Event Description: Normal Charging Flow Controller Fails High (1-CH-FC-1112C).

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	RO	Charging Line Flow Controller 1-CH-FC-1122 Fails High. Diagnose the failure based on the following alarms and indications: • 1-CH-FC-1122C indicates maximum demand. • Charging Line Flow, 1-CH-FI-1122A shows step drop to 0 gpm. • Annunciator 1D-E5, CHG PP TO REGEN HX HI-LO FLOW • Pressurizer Level lowers slowly on all Level channels. • Pressurizer Pressure lowers slowly on all channels. • VCT Level rising slowly.
	SRO	Enters 0-AP-53.00, Loss of Vital Instrumentation / Controls.
	RO	Performs immediate actions of 0-AP-53.00, Loss of Vital Instrumentation / Controls: [1] CHECK REDUNDANT INSTRUMENT CHANNEL(S) INDICATION - NORMAL Checks Pressurizer Level Protection Channels 1, 2 and 3 are NORMAL. [2] PLACE AFFECTED CONTROL(S)/COMPONENT(S) IN MANUAL CONTROL AND STABILIZE PARAMETER USING REDUNDANT INDICATION **Places 1-CH-FCV-1122 in manual and raises charging flow.** **Critical Task (CT-1):** Establish manual control of Pressurizer Level prior to Letdown isolation. Reports 0-AP-53.00 Immediate Actions are complete.

Event Description: Normal Charging Flow Controller Fails High (1-CH-FC-1112C).

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	SRO STA	Conduct a Brief using the Briefing Placard and obtains Critical Parameter information from the RO and BOP. The SRO will update the Shift Manager during AP-progression. SRO will provide a band for control of PRZR level with CH flow in MANUAL. *STA will have no input for the brief.*
	RO	0-AP-53.00 3. VERIFY REACTOR POWER – LESS THAN OR EQUAL TO 100% RO will identify that reactor power is less than 100% using PCS Display of Core Thermal Power.
	SRO	0-AP-53.00 Caution prior to step 4: • If Reactor power has been affected by a secondary transient, Turbine adjustment may be needed to control Tave. Notes Prior to Step 4: • Step 4 failures are listed in order of performance priority. Only the failed instrument/control and associated step number should be read aloud. • When the affected instrument/controller malfunction(s) has been addressed by this procedure, recovery actions should continue at Step 11.
	SRO RO	0-AP-53.00 *4. DETERMINE THE FAILED INSTRUMENT / CONTROL AND GO TO APPROPRIATE STEP OR PROCEDURE: Identifies that 1-CH-FC-1112C is not on the list at Step 4. Based on the second Note at Step 4, recovery actions should continue at Step 11. NOTE: *The team may perform Step 9 based on Charging Flow impact on Pressurizer Level Control. Step 9 is included on the next page.*

Event Description: Normal Charging Flow Controller Fails High (1-CH-FC-1112C).

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
		Step 9, AP-53.00
	SRO	9 a) CHECK PRZR LEVEL CONTROL CHANNELS – NORMAL
	RO	Responds "NO, 1-RC-FC-1122C Abnormal."
	SRO	9 a) RNO 1) Place either of the following in MANUAL: • 1-CH-FC-1122C, CHG FLOW CNTRL, OR • 1-CH-LC-1459G, PRZR LEVEL CNTRL
	RO	Responds "Yes, 1-CH-FC-1122C is in MANUAL"
	SRO	9 a) RNO 2) Control PRZR Level at Program Level.
	RO	Responds "Maintain PRZR Level at program ± band set by SRO"
	SRO	9 a) RNO 3) Move PRZR Level – CH SEL switch to Defeat the failed channel.
	RO/BOP	Responds "There is no failed channel."
	SRO	9 a) RNO 4) Check or place recorder 1-RC-LR-1459 on an operable channel.
	BOP	Responds 1-RC-LR-1459 is on an operable channel.
	SRO	9a) RNO 5) Refer to Tech Specs 3.1.A.5, Table 3.7-1 Item 9, and Table 3.7-6, Item 13. • 3.1.A.5 (If Pzr heaters deenergized): This LCO is met. • Table 3.7-1, item 9: This LCO is met. • TS Table 3.7-6, Item 13: This LCO is met.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 3

Event Description: Normal Charging Flow Controller Fails High (1-CH-FC-1112C).

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	 SRO	0-AP-53.00 9. a) RNO 6) Refer to Attachment 3. SRO hands Attachment 3, Pressurizer Level Control diagram to RO/BOP for review. **Note:** *Attachment 3 is at the end of this section.*
	 SRO RO SRO RO SRO RO SRO RO	0-AP-53.00 9. b) Check Pressurizer Heaters - Energized. Checks Required Pressurizer Heaters energized, and reports that Pressurizer heaters are energized. 9. c) Check Letdown – IN SERVICE. Reports Letdown in service. 9. d) Check PRZR level control – IN AUTOMATIC. Reports pressurizer level control in MANUAL. 9. d) RNO Do the following as required: 1) Check PRZR level restored to program. 2) Unsaturate ( )-CH-LC-( )459G, PRZR LEVEL CNTRL, as required. 3) Return ( )-CH-FCV-( )122 to AUTOMATIC by checking or placing the following in AUTOMATIC: • ( )-CH-FCV-( )122, CHG FLOW CNTRL • ( )-CH-LC-( )459G, PRZR LEVEL CNTRL. Notifies SRO that Charging flow control cannot be returned to AUTOMATIC; maintains manual control.
	 SRO SRO RO/BOP	0-AP-53.00 Recalls NOTE 2 Prior to Step 4 and goes to Step 11 of AP-53.00. 11. Check Calorimetric – Functional IAW 1-OPT-RX-001, Attachment 4. **Performs Attachment 4, and reports Calorimetric is functional.**

Event Description: Normal Charging Flow Controller Fails High (1-CH-FC-1112C).

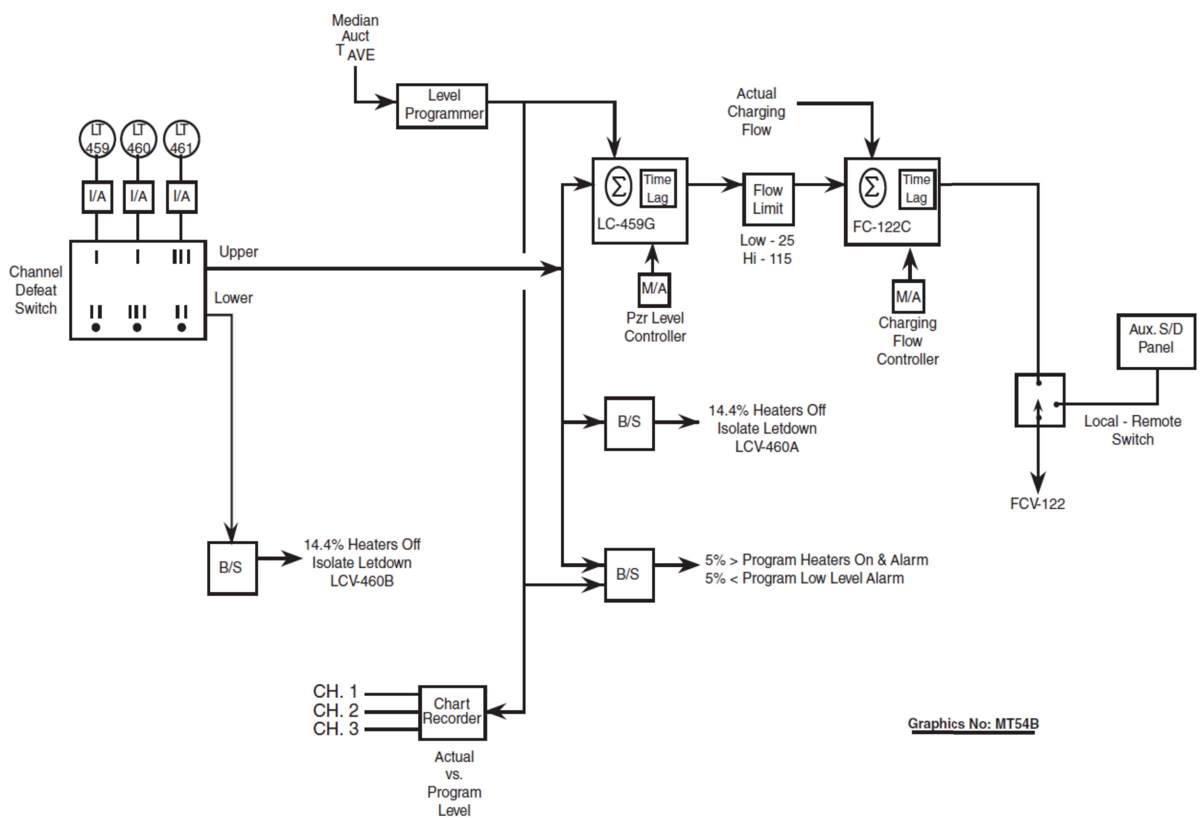
Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	SRO STA	0-AP-53.00 12. REVIEW THE FOLLOWING: • Tech Spec 3.7 • VPAP 2802 Notifications and Reports • TRM • Reg Guide 1.97 • EP-AA-303, Equipment Important to Emergency Response. Directs STA to review all documents listed. *STA reports that "all documents have been reviewed and discussed with the Shift Manager."*
	SRO	0-AP-53.00 13. CHECK ADDITIONAL INSTRUMENT / CONTROLLER MALFUNCTION - EXISTS The team will identify that no new additional failures exist (i.e., all failures have already been addressed), proceed to the RNO section, and this will direct the team to Step 15.
	SRO	0-AP-53.00 15. PROVIDE NOTIFICATIONS AS NECESSARY: • Shift Supervision • OMOC • STA (PRA determination) • I&C
		END EVENT #3

Event Description: Normal Charging Flow Controller Fails High (1-CH-FC-1112C).

Cue: Examiner cue.

NUMBER 0-AP-53.00	ATTACHMENT TITLE PRESSURIZER LEVEL CONTROL	ATTACHMENT 3
REVISION 24		PAGE 1 of 1



PZR LEVEL CONTROL

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 4 Page 38 of 92

Event Description: Trip of running EH pump with failure of Stby to Auto Start. (1-TS-D2)

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
	BOP	Diagnose loss of the running EH pump by one or more of the following conditions: • 1-EH-P-MP1 green light indication. • PCS Status Change, Y2067D EHC FLUID PMP BKR. • Annunciator 1-TS-D2 LIT, EH FLUID LO PRESS (approx. 3 min) **NOTE**: *The SRO may hold a focus brief and start the standby EH pump prior to reading ARP TS-D2.*
	SRO	1-TS-D2 Briefs the loss of the running EH pump and directs team to performance of 1-TS-D2, EH FLUID LO PRESS.
	BOP	1-TS-D2 NOTE: The EH fluid lo pressure alarm is set to actuate at 1550 psig. Actuation between 1500-1600 psig is acceptable. 1. CHECK STANDBY EH PUMP-AUTO STARTED • MP1 • MP2 **BOP starts 1-EH-P-MP2.** **CT-2: Start the standby EH Fluid Pump prior to automatic OR manual Reactor/Turbine trip.**
	BOP	1-TS-D2 2. LOCALLY CHECK EH SYSTEM – LEAKAGE INDICATED. Contacts Field Operator to determine if there is any EH leakage.
	BOP	1-TS-D2 3. ATTEMPT TO RETURN EH PRESSURE TO NORMAL. a) Check annunciator 1-TS-D1 – NOT LIT b) Locally identify and isolate leakage c) Start the standby EH pump and stop the running EH pump as necessary to isolate leakage. d) Initiate refilling of the EH reservoir as necessary. e) Check EH pressure – RETURNED TO NORMAL f) Submit a Condition Report g) GO TO Step 5

Event Description: Trip of running EH pump with failure of Stby to Auto Start. (1-TS-D2)

Cue: By Examiner.

	BOP	BOP reports that annunciator 1-TS-D1 is NOT LIT. Field operator reports that there is no indicated leakage and all conditions are normal.
		END EVENT 4

Event Description: "A" CH SW pump overload trip, with auto start failure of "B" CH SW pump.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
		1-SW-P-10B overload trip / 1-SW-P-10A fail to auto start
	RO	Diagnose the failure based on the following alarms and indications: Annunciator 1D-G5, SW OR CC PPS DISCH TO CHG PPS LO PRESS. 1-SW-P-10B NOT running.
	SRO	Direct performance of ARP 1D-G5
	RO	**NOTE**: *The SRO may hold a focus brief and start the standby CH SW pump prior to reading ARP 1D-G5.* **RO starts 1-SW-P-10A.** **NOTE**: *SRO may direct the BOP to perform 0-AP-12.00, Service Water System Abnormal Conditions. 0-AP-12.00 actions located at end of this section.*
		1D-G5 Annunciator Response Procedure
	BOP	1. CHECK CHG PUMP CC <u>OR</u> SW PP(S) - TESTING IN PROGRESS
	RO	Reports No, testing not in progress.
	BOP	Step 1 RNO: GO TO Step 3.
		1D-G5 Annunciator Response Procedure
		Note before Step 3: The standby CH Pump SW Pump will auto-start at 8 psig.
	BOP	3. CHECK STANDBY CHG PUMP CC PP OR SW PP - AUTO STARTED
	RO	Report No, 1-SW-P-10A not running.
	BOP	Step 3 RNO DO the following:
		a) Check running or start one CHG Pump CC and/or SW PP.
	RO	**Starts 1-SW-P-10A.**
		Critical Task (CT-3): Start standby CH SW pump prior to exceeding 185F CH pump bearing temperature. (5 minutes with no operator action)
	BOP	b) Locally check CHG Pump CC and SW PPs.
	RO/BOP	Dispatches an Operator to check the CH Pump CC and SW pumps.
	BOP	c) Monitor CHG Pump CC and SW flows on PCS (ERFCS if not removed): 1-CC-P-2A, F1CC003A 1-CC-P-2B, F1CC004A 1-SW-P-10A, F1SW007A 1-SW-P-10B, F1SW008A
	RO/BOP	Monitors parameters using the PCS

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 5 Page 41 of 92

Event Description: "A" CH SW pump overload trip, with auto start failure of "B" CH SW pump.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
	 BOP RO BOP	1D-G5 Annunciator Response Procedure 3.d) IF CHG Pump CC and SW PPs are operating normally, THEN do the following: Reports Yes, Pumps are operating properly. 1) Submit a Condition Report. 2) Increase surveillance of CHG Pump CC and SW PPs. 3) Increase surveillance of CHG Pump temperature using PCS Digital Trend #1. 4) GO TO Step 13.
	 BOP	1D-G5 Annunciator Response Procedure 13. PROVIDE NOTIFICATIONS: • OMOC • STA • System Engineering Notifies SRO of required notifications.
	 SRO SRO SRO	Reviews Tech Specs: **T.S. 3.0.1 is in effect**, because the requirements of Tech Spec 3.3.B.3 (also 3.2.C.1) are not met. Place the unit in HSD in 6 hours, and CSD in the next 30 hours. Reviews TRM: **TRM 3.7.9, TRM 3.7.9.A.2** (MRule – No, App 'R' – yes), Implement App R fire watch in the area(s) associated with the **nonfunctional equipment in** Table 3.7.9-1 in accordance with TRM Section 5.2 within 14 days and restore the equipment to functional status in 60 days. Notifies Shift Manager of T.S.3.0.1 in effect. **NOTE:** *Informs the SRO that they will call the OMOC and will update the team on the course of action to be taken. The Shift Manager will not call back.*
		NOTE: This is the end of the event using ARP 1D-G5. The next pages contain steps in 0-AP-12.00, Service Water Abnormal Conditions, in the event the team uses that procedure instead.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 5 Page 42 of 92

Event Description: "A" CH SW pump overload trip, with auto start failure of "B" CH SW pump.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
	 SRO RO	0-AP-12.00 Note: A copy of this procedure is located in MER 3. Direct performance of ARP 1D-G5 1. CHECK MER 3 OR 4 EQUIPMENT - AFFECTED • Charging Pump Service Water Pumps • MER 3 Chillers Identifies Charging Pump SW pumps affected, Goes to Step 2.
	 SRO RO	0-AP-12.00 2. Check Charging Pump SW Pumps Affected. Continues to Step 3.
	 SRO	0-AP-12.00 CAUTION: Charging pumps should be secured if bearing temperatures reach 185°F. NOTE: • Preparations should be made to shift charging pumps if bearing temperatures exceed 180°F. • The system engineer should be notified as soon as possible if charging pump bearing temperatures exceed 180°F.
	 SRO BOP	0-AP-12.00 3. CHECK CHG PUMP TEMPERATURES - LESS THAN 180°F Checks CH Pump temperatures using PCS.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 5 Page 43 of 92

Event Description: "A" CH SW pump overload trip, with auto start failure of "B" CH SW pump.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
		0-AP-12.00
	SRO	Note: A vacuum condition in the SW header(s) is indicated by abnormal conditions on multiple SW header loads.
		4. CHECK SW PARAMETERS – NORMAL a) MER 3 b) MER 4
	BOP	Directs Service Building Operator to check status of MER 3 and 4 SW parameters using 0-AP-12.00, Pages 3 and 4.
		Field operators will report Unit 1 Charging SW Pumps are not running and discharge pressures are not greater than 15 psig.
	SRO	Goes to Step 4 RNO.
		0-AP-12.00
	SRO	Step 4 RNO.
		IF a vacumm condition exists in the SW header(s), THEN do the following.
	RO	Reports no vacuum condition exists.
	SRO	IF SW header(s) NOT in a vacuum, THEN perform the following: a) Check running or Start standby CHG pump SW pump(s).
	RO	**Starts 1-SW-P-10B**
		END EVENT #5

Event Description: Dropped Rod below 25% reactor Power.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
		Diagnose the failure using the following: Alarm: 1G-H2, RPI ROD BOTTOM < 20 STEPS Indications: SBB G-9 CERPI indicates 0 steps. Any Rod On Bottom light lit Rod-to-Rod Deviation light lit. Tave and NI levels lowering **NOTE**: *The team will likely trip the reactor and go to 1-E-0, based on the dropped rod at low power. If so, 1-E-0 instructions begin at page 45.* **Critical Task (CT-2):** Trip the reactor prior to RCS average temperature lowering below 538°F.
	SRO	0-AP-1.00 Enters 0-AP-1.00 (Rod Control System Malfunction).
	SRO	CAUTION prior to Step 1: • If Tave decreases below 541 °F, ( )-E-0, Reactor Trip or Safety Injection, must be implemented.
	RO	[1] CHECK FOR EITHER OF THE FOLLOWING: • Continuous rod withdrawal • Continuous rod insertion Reports no rod motion and Immediate actions of 0-AP-1.00 are complete.
	SRO STA	Conduct a Brief using the Briefing Placard and obtains Critical Parameter information from the RO and BOP. The SRO will update the Shift Manager during AP progression. *STA will have no input for the brief.*

Event Description: Dropped Rod below 25% reactor Power.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
	 SRO RO	0-AP-1.00 (0-AP-1.00 Step 1 RNO directs going to Step 6) 6. CHECK IF ANY ROD DROPPED: • **Annunciator ( )G-H2, RPI ROD BOTTOM ≤ 20 STEPS - LIT** OR • Annunciator ( )G-H1, NIS DROPPED ROD FLUX DECREASE ≥ 5% PER 2 SEC - LIT OR • **Rod Bottom Lights - ANY LIT** OR • **Any Rod On Bottom light - LIT** OR • Indication of a partially dropped rod in the core Reports multiple indications of a dropped rod in the core.
	 SRO RO	0-AP-1.00 7. CHECK REACTOR STATUS PRIOR TO FAILURE – CRITICAL Reports yes, reactor critical.
	 SRO RO	0-AP-1.00 8. CHECK ONLY ONE ROD AFFECTED Reports yes, only one rod affected.
	 SRO RO SRO	0-AP-1.00 9. CHECK REACTOR POWER – GREATER THAN 25% Reports NO, reactor power is less than 25%. Goes to RNO: Trip Reactor and GO TO ( )-E-0, REACTOR TRIP OR SAFETY INJECTION. **Directs RO to perform immediate actions of 1-E-0.**

Event Description: Dropped Rod below 25% reactor Power.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
	RO	1-E-0 – Reactor Trip or Safety Injection [1] CHECK REACTOR TRIP: a) Manually trip reactor **Pushes the reactor trip push buttons.** b) Check the following: • All Rods On Bottom light – LIT • Reactor trip and bypass breakers – OPEN • Neutron flux - LOWERING
	RO RO	1-E-0 – Reactor Trip or Safety Injection [2] CHECK TURBINE TRIP: a) Manually trip the turbine **Pushes both turbine trip push buttons.** b) Check all turbine stop valves - CLOSED c) Isolate reheaters by closing MSR steam supply SOV • 1-MS-SOV-104 d) Check generator output breakers – OPEN (Time Delayed)
	RO	1-E-0 – Reactor Trip or Safety Injection [3] CHECK BOTH AC EMERGENCY BUSES - ENERGIZED

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 6 Page 47 of 92

Event Description: Dropped Rod below 25% reactor Power.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
		1-E-0 – Reactor Trip or Safety Injection
	RO	[4] CHECK IF SI INITIATED: a) Check if SI is actuated: • LHSI pumps – RUNNING • SI annunciators – LIT • A-F-3 SI INITIATED – TRAIN A • A-F-4 SI INITIATED – TRAIN B RO will determine that SI has not occurred and perform step 4a RNO actions:
	RO	4a RNO Check if SI is required or imminent as indicated by any of the following: • Low PRZR pressure • High CTMT pressure • High steamline differential pressure • High steam flow with low Tave or low line pressure IF SI is required, THEN GO TO Step 4b. IF SI is not required, GO TO ES-0.1. *Determines that SI is NOT imminent. Does Not Manually initiate SI.*
	SRO	Transitions to 1-ES-0.1

Event Description: Dropped Rod below 25% reactor Power.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
		1-ES-0.1
	SRO	*After the immediate actions of 1-E-0 are reported as complete, the SRO will check off immediate action steps in his copy of 1-E-0. After the immediate actions are verified, the team will conduct a brief.*
	STA	*The STA will state that he has no input.*
	SRO	**NOTE:** If this procedure is being entered from 1-E-0, REACTOR TRIP OR SAFETY INJECTION, following a tube leak of less than 150 gpm, 1-AP-24.01, LARGE STEAM GENERATOR TUBE LEAK, should be used for guidance instead of this procedure.
		* 1.CHECK RCS TEMPERATURE CONTROL a) Check RCPS - ANY RUNNING
	RO	Reports all RCPs running
	SRO	b) Monitor RCS Average Temperature 1) STABLE AT 547°F OR 2) TRENDING TO 547°F
	RO	Reports RCS Tave at 547 °F and stable
	SRO	Assigns BOP to perform Attachment 5, Transient AFW Control.
		NOTE: 1-ES-0.1 CAP and Attachment 5 are included at the end of this section.

Event Description: Dropped Rod below 25% reactor Power.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
		1-ES-0.1
	SRO	2. CHECK FW STATUS: a) Check RCS Average temperatures – L:ESS THAN 554°F
	RO	Reports Tave less than 554°F
	SRO	b) Check Feed REG valves – CLOSED
	RO/BOP	Reports MFRVs are closed
	SRO	c) Close SG FW isolation MOVs • 1-FW-MOV-154A • 1-FW-MOV-154B • 1-FW-MOV-154C
	RO/BOP	**Closes 1-FW-MOV-154A/B/C**
	SRO	*NOTE: Once 1-FW-MOV-154C is closed the SBLOCA will automatically trigger in.*
		d) Check AFW pumps – RUNNING • Motor Driven AFW pumps • TD AFW pump
	RO/BOP	Reports, NO, TD AFW pump is not running (auto-start failure)
	SRO	Goes to Step 2.d) RNO.
		1-ES-0.1
	SRO	Step 2d RNO: IF AFW pump(s) required, THEN do the following: 1) Start MD AFW pumps.
	RO	Reports MD AFW pumps are running.
	SRO	2) Open TD AFW pump steam supply valves: • 1-MS-SOV-102A • 1-MS-SOV-102B
	RO/BOP	**Places control switches for 1-MS-SOV-102A and -102B in OPEN.**
	SRO	3) GO TO Step 2e
		END EVENT #6

Event Description: Dropped Rod below 25% reactor Power.

Cue: By Examiner.

CONTINUOUS ACTIONS PAGE FOR 1-ES-0.1

1. SI INITIATION CRITERIA

   Initiate SI and GO TO 1-E-0, REACTOR TRIP OR SAFETY INJECTION, if EITHER condition listed below occurs, OR is imminent.

   - RCS subcooling based on CETCs - LESS THAN 30°F
   - Any automatic SI setpoint is exceeded:
     - Low PRZR pressure
     - High CTMT pressure
     - High steamline differential pressure
     - High steamline flow with low Tave or low line pressure

2. AFW SUPPLY SWITCHOVER CRITERIA (Refer to Attachment 4)

   Transfer to one of the following alternate AFW water supplies if ECST level lowers to less than 20%.

   a. 1-CN-TK-2, using 1-CN-150.

   b. 1-CN-TK-3, using AFW Booster Pumps.

   c. AFW Crosstie.

   d. Firemain.

3. AMSAC RESET CRITERIA

   AMSAC may be manually reset when level in all three SGs is greater than 13% or six minutes have elapsed since the Reactor trip. When AMSAC is reset, annunciator H-D-1 should clear and affected components may be realigned as needed.

4. TD AFW PUMP SHUTDOWN CRITERIA

   The TD AFW pump may be secured when SG NR level is greater than 22%, AMSAC is reset, and no auto-start signal exists. To secure the pump, the pump SOV control switches must be taken to OPEN-RESET and then to CLOSE.

5. TRANSIENT AFW FLOW CONTROL

   Refer to Attachment 5 for guidance on transient AFW flow control.

Event Description: Dropped Rod below 25% reactor Power.

Cue: By Examiner.

NUMBER 1-ES-0.1	ATTACHMENT TITLE TRANSIENT AFW FLOW CONTROL	ATTACHMENT 5
REVISION 55		PAGE 1 of 1

1. ___ Check running or start AFW Pumps, as necessary.
   - ☐ • 1-FW-P-3A
   - ☐ • 1-FW-P-3B
   - ☐ • 1-FW-P-2

2. ___ Maintain minimum AFW flow of 540 gpm with RCP(s) in service until one SG Narrow Range level is greater than 12%.

3. ___ Maintain minimum AFW flow of 350 gpm with NO RCPs running, until one SG Narrow Range level is greater than 12%.

NOTE: AFW to idle loop(s) (RCP secured), should be throttled to prevent depressurization of the SG and subsequent Header / Line SI. AFW flow between approximately 60 gpm and 100 gpm should be adequate to prevent a Header / Line SI.

4. ___ WHEN minimum heat sink has been verified, THEN AFW MOVs should be controlled to maintain intact SG Narrow Range levels between 22% and 50% by throttling AFW Isolation MOVs:
   - ☐ • SG A, 1-FW-MOV-151E and 1-FW-MOV-151F
   - ☐ • SG B, 1-FW-MOV-151C and 1-FW-MOV-151D
   - ☐ • SG C, 1-FW-MOV-151A and 1-FW-MOV-151B

5. Isolate AFW header with deenergized Emergency Bus MOVs by closing the following header isolation valves:

___ Emergency Bus H deenergized:	☐ 1-FW-141	☐ 1-FW-156	☐ 1-FW-171
___ Emergency Bus J deenergized:	☐ 1-FW-140	☐ 1-FW-155	☐ 1-FW-170

Event Description: Small Break LOCA with failure of Low Head SI pumps to auto start.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	Team	Diagnoses excessive RCS leakage by the following: Alarms: 1C-B8, PRZR LO PRESS 1B-A3, CTMT SUMP HI LVL 1-RM-Q8, CTMT GAS ALERT/FAILURE Indications: Containment sump level rising Lowering RCS Pressure PRZR Level decreasing Team may go back to E-O based on ES-0.1 CAP.
	SRO	Directs RO to re-perform Immediate Actions of AP-16.00.
	RO	1-AP-16.00 Notes before step 1: • If SI Accumulators are isolated, 1-AP-16.01, SHUTDOWN LOCA, should be used for guidance. • RCS average temperature has a direct impact on pressurizer level. [1] MAINTAIN PRZR LEVEL: • Isolate Letdown • Control Charging flow **Closes 1-CH-LCV-1460A and 1-CH-LCV-1460B.** **Raises Charging flow using 1-CH-FCV-1122 to control PRZR level.**

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 53 of 92

Event Description: Small Break LOCA with failure of Low Head SI pumps to auto start.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	SRO STA	1-AP-16.00 The team will hold a short transient brief, commensurate with the event. *STA will have no input for the brief.* *NOTE: As soon as team determines leak is in excess of Charging flow, the SRO will direct team goes back to E-0 and manually initiates SI.*
	SRO RO SRO	1-AP-16.00 2. VERIFY THE FOLLOWING PARAMETERS – STABLE OR INCREASING • PRZR Level • PRZR Pressure • RCS Subcooling Identifies Pressurizer level and pressure are still lowering. Goes to Step 2 RNO. Directs the Immediate Actions of 1-E-0. **NOTE**: *SRO may direct RO to manually safety inject at this point due to degrading plant parameters. SRO may direct RO to Manually initiate SI at Step 4 of 1-E-0.*

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 54 of 92

Event Description: Small Break LOCA with failure of Low Head SI pumps to auto start.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	RO	1-E-0, Reactor Trip or Safety Injection (high level steps only for Steps 1 – 3) [1] CHECK REACTOR TRIP:
	RO	[2] CHECK TURBINE TRIP:
	RO	[3] CHECK BOTH AC EMERGENCY BUSES - ENERGIZED
	RO RO SRO STA	1-E-0 [4] CHECK IF SI INITIATED: a) Check if SI is actuated: • LHSI pumps – RUNNING • SI annunciators – LIT • A-F-3 SI INITIATED – TRAIN A • A-F-4 SI INITIATED – TRAIN B b) **Manually initiate SI** **The RO will manually initiate SI at step 4 by pushing both SI pushbuttons.** Reports Immediate actions of 1-E-0 are complete, with High Head SI flow to the core. SI is initiated. No LHSI pumps are running. After the immediate actions of 1-E-0 are reported as complete, the SRO will check off immediate action steps in his copy of 1-E-0. After the immediate actions are verified, the team will conduct a commensurate brief. *STA will have no input for the brief.*

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 55 of 92

Event Description: Small Break LOCA with failure of Low Head SI pumps to auto start.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	SRO	1-E-0 5. INITIATE ATTACHMENT 1. **Directs RO to perform Attachment 2 of 1-E-0. Directs BOP to perform Attachments 1 and 3 of 1-E-0**. **NOTE:** *Attachment 1, 2, and 3 located at the end of this section. Also acceptable for SRO to direct BOP to perform all Attachments because HHSI is operating.*
	SRO	1-E-0 CAUTION: 1-MS-15 may need to be closed to stop RCS cooldown and 1-MS-17 opened to supply AS to GS. *6. CHECK RCS AVERAGE TEMPERATURE • STABLE AT 547°F OR • TRENDING TO 547°F
	RO	Reports no, RCS temperature is lowering (and provide current temperature).
	SRO	Goes to Step 6 RNO (if RCS temperature is less than 547°F and lowering): <u>IF</u> temperature less than 547°F AND lowering, <u>THEN</u> do the following: a) Stop dumping steam.
	RO	Reports Yes, Steam Dumps are closed.
	SRO	b) <u>IF</u> cooldown continues, <u>THEN</u> control total feed flow. Maintain total feed flow greater than 350 gpm [450 gpm] until narrow range level greater than 12% [18%] in at least one SG.
	RO	Identify RCS Tave Lowering.
	SRO	Direct RO to throttle AFW to each SG to ~120 gpm.
	RO	Throttle AFW to the SGs to ~120 gpm per SG and report when complete.
	SRO	c) <u>IF</u> RCS cooldown is occurring, <u>THEN</u> close 1-MS-15 <u>AND</u> open 1-MS-17 to align AS to GS.
	RO	d) <u>IF</u> Cooldown continues, <u>THEN</u> close MSTVs. Reports they will monitor RCS temperature for cooldown.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 56 of 92

Event Description: Small Break LOCA with failure of Low Head SI pumps to auto start.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
		1-E-0
	SRO	7. CHECK PRZR PORVs AND SPRAY VALVES:
		a) PRZR PORVs – CLOSED
	RO	Reports Yes, PRZR PORVs closed.
	SRO	b) PRZR spray controls Demand at Zero OR Controlling pressure
	RO	Reports Yes, Demand at zero.
	SRO	c) PORV block valves - AT LEAST ONE OPEN
	RO	Reports Yes, both block valves open.
		1-E-0 Step 8
		NOTE Prior to Step 8: Seal injection flow should be maintained to all RCPs.
	SRO	*8. CHECK RCP TRIP AND MINIFLOW RECIRC CRITERIA:
		a) Charging Pumps - AT LEAST ONE RUNNING AND FLOWING TO RCS
	RO	Reports Yes, 3 running and flowing to the RCS. May report 2 running depending upon BOP speed of progression through E-0, Attachment 1.
	SRO	b) RCS subcooling - LESS THAN 30°F [85°F]
	RO	Reports No, RCS subcooling is (value greater than 30°F).
	SRO	Goes to Step 8.b) RNO:
		8.b) RNO: GO TO Step 9
		Goes to Step 9.

Event Description: Small Break LOCA with failure of Low Head SI pumps to auto start.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	SRO RO	1-E-0 9. CHECK IF SGs ARE NOT FAULTED: • Check pressures in all SGs a) STABLE OR INCREASING AND b) GREATER THAN 100 PSIG Will observe either stable SG pressures, or a slightly lowering trend on SG pressures (attributed to the RCS cooldown). The team will not transition to 1-E-2.
	SRO RO	1-E-0 10. CHECK IF SG TUBES ARE NOT RUPTURED: • Condenser air ejector radiation – NORMAL • SG blowdown radiation – NORMAL • SG MS radiation – NORMAL • TD AFW pump exhaust radiation – NORMAL • SG NR Level - NOT INCREASING IN AN UNCONTROLLED MANNER Observes all parameters are normal.
	SRO RO SRO	1-E-0 11 CHECK RCS - INTACT INSIDE CTMT • CTMT radiation - NORMAL • CTMT pressure - NORMAL • CTMT RS sump level – NORMAL Reports Containment pressure, sump level, and/or radiation NOT normal. Goes to Step 11 RNO. Goes to 1-E-1, Loss of Reactor or Secondary Coolant. **NOTE:** *The next event (Large Break LOCA) will be inserted after the SRO makes the transition to 1-E-1, during the 1-E-1 transient brief.*
		END EVENT #7

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	BOP	**ATTACHMENT 1 OF E-0** 1. CHECK FW ISOLATION: • Feed pump discharge MOVs – CLOSED • 1-FW-MOV-150A • 1-FW-MOV-150B • MFW pumps – TRIPPED • Feed REG valves – CLOSED • SG FW bypass flow valves – DEMAND AT ZERO • SG blowdown TVs – CLOSED
	BOP	ATTACHMENT 1 OF E-0 2. CHECK CTMT ISOLATION PHASE I: • Phase I TVs – CLOSED • 1-CH-MOV-1381 – CLOSED • 1-SV-TV-102A – CLOSED • PAM isolation valves – CLOSED • 1-DA-TV-103A • 1-DA-TV-103B
	BOP	ATTACHMENT 1 OF E-0 3. CHECK AFW PUMPS RUNNING: a) MD AFW pumps – RUNNING (Time Delayed) b) TD AFW pump - RUNNING IF NECESSARY

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	BOP	**Attachment 1 of E-0** 4. CHECK SI PUMPS RUNNING: • CHG pumps – RUNNING • LHSI pumps – RUNNING **Starts both LHSI pumps**, if not previously started in Attachment 2. **Critical Task (CT-3):** Start at least one LHSI pump prior to required transition to 1-FR-C.1.
	BOP	5. CHECK CHG PUMP AUXILIARIES: • CHG pump CC pump – RUNNING • CHG pump SW pump - RUNNING
	BOP	6. CHECK INTAKE CANAL: • Level - GREATER THAN 24 FT • Level - BEING MAINTAINED BY CIRC WATER PUMPS
	BOP	7. CHECK IF MAIN STEAMLINES SHOULD BE ISOLATED: a) Check if ANY of the following annunciators - HAVE BEEN LIT • E-F-10 (High Steam Flow SI) • B-C-4 (Hi Hi CLS Train A) • B-C-5 (Hi Hi CLS Train B) Identifies annunciators not lit, annunciator E-H-10 also not lit, and goes to step 8.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	BOP	Attachment 1 of E-0 *8 CHECK IF CS REQUIRED: a) CTMT pressure – HAS EXCEEDED 23 PSIA 8, a) RNO Do the following: 1) IF CTMT pressure has exceeded 17.7 psia, THEN check or align the following valves: Identifies CTMT pressure is elevated, but still below 17.7 psia. 2) GO TO Step 10.
	BOP	Attachment 1 of E-0 *10. BLOCK LOW PRZR PRESS SI SIGNAL: a) Check PRZR pressure – LESS THAN 2000 psig b) **Turn both LO PRZR PRESS & STM HDR/LINE ΔP switches to block** c) Verify Permissive Status light C-2 - LIT BOP may block the low pressurizer pressure SI signal depending on current RCS pressure.
	BOP	Attachment 1 of E-0 *11. BLOCK LOW TAVE SI SIGNAL: Step may not be performed at this time (if Tave is greater than 543°F). a) Check RCS Tave - LESS THAN 543°F b) **Turn both HI STM FLOW & LO TAVG OR LP switches to block** c) Verify Permissive Status light F-1 - LIT

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 61 of 92

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	BOP	Attachment 1 of E-0 **NOTE:** • CHG pumps should be run in the following order of priority: C, B, A. • Subsequent SI signals may be reset by re-performing Step 12. 12. CHECK SI FLOW: a) HHSI to cold legs - FLOW INDICATED • 1-SI-FI-1961 (NQ) • 1-SI-FI-1962 (NQ) • 1-SI-FI-1963 (NQ) • 1-SI-FI-1943 or 1-SI-FI-1943A b) Check CHG pumps - THREE RUNNING c) Reset SI. d) Stop one CHG pump and out in AUTO **Stops one CHG pump and leaves control switch in AUTO.** e) RCS pressure - LESS THAN 185 PSIG RNO: e) IF two LHSI pumps are running, THEN do the following: 1) Check reset or reset SI. 2) Stop one LHSI pump and put in AUTO. 3) GO TO Step 13 **Resets SI.** **Stops one LHSI pump and leaves control switch in AUTO.** Goes to Step 13.
	BOP	Attachment 1 of E-0 13. CHECK TOTAL AFW FLOW - GREATER THAN 350 GPM [450 GPM]
	BOP	Attachment 1 of E-0 14. CHECK AFW MOVs - OPEN BOP will identify that all AFW MOVS are not open.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 62 of 92

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	BOP	Attachment 1 of E-0 15. INITIATE SI VALVE ALIGNMENT IAW ATTACHMENT 2 **NOTE:** *See attached copy of Attachment 2. (following this attachment)* **NOTE:** *Depending on SRO prioritization, this attachment may already be completed by The RO.*
	BOP Unit 2	16. INITIATE VENTILATION, AC POWER, AND SFP STATUS CHECKS IAW ATTACHMENT 3 **NOTE:** *See attached copy of Attachment 2.* *Unit 2 Operator will state that Unit 2 is at 100% power (if asked)* *Unit 2 will also accept responsibility to complete Attachment 3 if asked after differential pressure indications are requested.*
	BOP Unit 2	17. CHECK RCS DILUTION FLOWPATH - ISOLATED AND LOCKED, SEALED, OR OTHERWISE SECURED • Close and lock, seal, or otherwise secure 1-CH-223 *May contact the Desk (WCC) SRO to Close and lock, seal, or otherwise secure 1-CH-223.* *Unit 2 will also accept responsibility to complete Attachment 3 if asked after differential pressure indications are requested.*

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 63 of 92

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	RO	**ATTACHMENT 2 of 1-E-0** **NOTE:** Components previously aligned by SI termination steps, must not be realigned by this Attachment.
	RO	ATTACHMENT 2 of 1-E-0 1. Check opened or open CHG pump suction from RWST MOVs. • 1-CH-MOV-1115B • 1-CH-MOV-1115D
	RO	ATTACHMENT 2 of 1-E-0 2. Check closed or close CHG pump suction from VCT MOVs. • 1-CH-MOV-1115C • 1-CH-MOV-1115E
	RO	ATTACHMENT 2 of 1-E-0 3. Check running or start at least two CHG pumps. (listed in preferred order) • 1-CH-P-1C • 1-CH-P-1B • 1-CH-P-1A
	RO	ATTACHMENT 2 of 1-E-0 4. Check opened or open HHSI to cold legs MOVs. • 1-SI-MOV-1867C • 1-SI-MOV-1867D
	RO	ATTACHMENT 2 of 1-E-0 5 Check closed or close CHG line isolation MOVs. • 1-CH-MOV-1289A • 1-CH-MOV-1289B

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

Time	Position	Applicant's Action or Behavior
	RO	ATTACHMENT 2 of 1-E-0 6. Check closed or close Letdown orifice isolation valves. • 1-CH-HCV-1200A • 1-CH-HCV-1200B • 1-CH-HCV-1200C
	RO	ATTACHMENT 2 of 1-E-0 7. Check opened or open LHSI suction from RWST MOVs. • 1-SI-MOV-1862A • 1-SI-MOV-1862B
	RO	ATTACHMENT 2 of 1-E-0 8. Check opened or open LHSI to cold legs MOVs. • 1-SI-MOV-1864A • 1-SI-MOV-1864B
	RO	ATTACHMENT 2 of 1-E-0 9. Check running or start at least one LHSI pump. • **1-SI-P-1A** • **1-SI-P-1B** **Starts both LHSI pumps, if not already started in Attachment 1.**
	RO	ATTACHMENT 2 of 1-E-0 10. Check High Head SI flow to cold legs indicated. • 1-SI-FI-1961 • 1-SI-FI-1962 • 1-SI-FI-1963 • 1-SI-FI-1943 or 1-SI-FI-1943A

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

		ATTACHMENT 2 of 1-E-0
	RO	11. IF flow not indicated, THEN manually start pumps and align valves. IF flow NOT established, THEN consult with Shift Supervision to establish another high pressure injection flow path while continuing with this procedure. • Alternate SI to Cold legs • Hot leg injection Enters “N/A” for this step.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 66 of 92

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 1 of 6

1. ___ Check or place REFUEL SFTY MODE switches in NORMAL.

2. ___ Check ventilation alignment IAW Tables 1 and 2.

TABLE 1
UNIT #1 VENTILATION PANEL

	MARK NUMBER	EQUIPMENT STATUS
☐	1-VS-F-4A & B	OFF
☐	1-VS-HV-1A & B	OFF
☐	1-VS-F-8A & B	OFF
☐	1-VS-F-9A & B	GREEN
☐	1-VS-F-59	GREEN
☐	1-VS-F-6	OFF
☐	1-VS-F-39	GREEN
☐	1-VS-F-7A & B	GREEN
☐	1-VS-HV-5	GREEN
☐	1-VS-F-56A & B	GREEN
☐	1-VS-F-40A & B	GREEN
☐	1-VS-HV-4	OFF
☐	2-VS-F-40A or B	RED
☐	2-VS-HV-4	OFF

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 2 of 6

TABLE 2
VNTX PANEL

MARK NUMBER	EXPECTED EQUIPMENT STATUS	RESPONSE NOT OBTAINED
☐ a. AOD-VS-107A & B AOD-VS-108	RED GREEN	☐ a.Place AUX BLDG CENTRAL AREA MODE switch to FILTER.
☐ b. MOD-VS-100A & B AOD-VS-106	RED GREEN	☐ b. • Place MOD-VS-100A to FILTER. • Place MOD-VS-100B to FILTER.
☐ c. MOD-VS-200A & B AOD-VS-206	GREEN RED	☐ c. • Place MOD-VS-200A to UNFILTER. • Place MOD-VS-200B to UNFILTER.
☐ d. AOD-VS-103A & B AOD-VS-104	GREEN GREEN	☐ d. • Place AOD-VS-103A in UNFILTER. • Place AOD-VS-103B in UNFILTER. • Place AOD-VS-104 in FILTER.
☐ e. AOD-VS-101A & B AOD-VS-102	GREEN GREEN	☐ e.Place AOD-VS-101A and 101B in UNFILTER.
☐ f. AOD-VS-111A & B	GREEN	☐ f.Place COMBINE CONTAINMENT EXHAUST in ISOLATE.
☐ g. AOD-VS-110	GREEN	☐ g.Place AOD-VS-109A and 109B in FILTER.
☐ h. AOD-VS-112A & B	GREEN	☐ h. • Place AOD-VS-112A in CLOSE. • Place AOD-VS-112B in CLOSE.
☐ i. MOD-VS-58A & B 1-VS-F-58A & B	RED RED	☐ i.Start 1-VS-F-58A and 1-VS-F-58B.

3. ___ Check filtered exhaust flow: (as read on FI-VS-117A and FI-VS-117B)

- ☐ • Total flow - GREATER THAN 32400 cfm

AND

- ☐ • Flow through each filter bank - LESS THAN 39600 cfm

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 68 of 92

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 3 of 6

4. ___ Check all Station Service Buses - ENERGIZED. IF NOT, THEN initiate 1-AP-10.07, LOSS OF UNIT 1 POWER.

5. ___ Check annunciator VSP-J2 - LIT.

6. ___ Check Unit 1 RSST LTC time delay bypass light - LIT.

7. ___ Check stopped or stop 1-VS-AC-4.

8. ___ Place 1-VS-43-VS103X, MCR ISOLATION switch to the OFF position.

9. ___ Check closed or close MCR isolation dampers.

   - ☐ 1-VS-MOD-103A
   - ☐ 1-VS-MOD-103B
   - ☐ 1-VS-MOD-103C
   - ☐ 1-VS-MOD-103D

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 69 of 92

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 4 of 6

* *

CAUTION:
- Only one Emergency Supply Fan must be started in the following step.
- Chilled Water flow to the in-service Unit 1 MCR AHU must be throttled to at least 15 gpm when the Emergency Supply fan is started.
- Chilled Water flow to the in-service Unit 2 MCR AHU must be throttled to at least 25 gpm when the Emergency Supply fan is started.
- An Emergency Supply Fan must not be started if the filter is wet.

* *

10. Immediately start ONE Emergency Supply Fan IAW the following: (1-VS-F-41 or 2-VS-F-41 preferred)

a. IF 1-VS-F-41, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 1-VS-MOD-104A, CONT RM EMERG SUP MOD.

___ 2. Start 1-VS-F-41.

b. IF 2-VS-F-41, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 2-VS-MOD-204A, CONT RM EMERG SUP MOD.

___ 2. Start 2-VS-F-41.

c. IF 1-VS-F-42, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 1-VS-MOD-104B, CONT RM EMERG SUP MOD.

___ 2. Start 1-VS-F-42.

d. IF 2-VS-F-42, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 2-VS-MOD-204B, CONT RM EMERG SUP MOD.

___ 2. Start 2-VS-F-42.

e. ___ Adjust Chilled Water flow to MCR AHUs IAW Step 10 Caution.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 5 of 6

11. ___ Check readings on the following Differential Pressure Indicators - POSITIVE PRESSURE INDICATED.

- ☐ • PDI-VS-100, D.P.-U1CR/U1TB (Unit 2 Turbine Ventilation Panel)
- ☐ • PDI-VS-101, D.P.-U1RR/U1TB (Unit 2 Turbine Ventilation Panel)
- ☐ • PDI-VS-200, D.P.-U2CR/U2TB (Unit 2 Turbine Ventilation Panel)
- ☐ • PDI-VS-201, D.P.-U2RR/U2TB (Unit 2 Turbine Ventilation Panel)
- ☐ • 1-VS-PDI-118 (Unit 1 Computer Room)
- ☐ • 1-VS-PDI-116 (Near Unit 1 Semi-Vital Bus)
- ☐ • 2-VS-PDI-215 (Unit 2 AC Room)
- ☐ • 2-VS-PDI-206 (Near Unit 2 Semi-Vital Bus)

12. ___ IF any reading NOT positive, THEN initiate Attachment 6 to secure MCR boundary fans.

13. ___ Check initiated or initiate 0-AP-50.00, OPPOSITE UNIT EMERGENCY.

14. ___ Check the following MCR and ESGR air conditioning equipment operating. IF NOT, THEN start equipment within 1 hour IAW the appropriate subsection of 0-OP-VS-006, CONTROL ROOM AND RELAY ROOM VENTILATION SYSTEM.

- ☐ • One Control Room chiller
- ☐ • One Unit 1 Control Room AHU
- ☐ • One Unit 2 Control Room AHU
- ☐ • One Unit 1 ESGR AHU
- ☐ • One Unit 2 ESGR AHU

15. ___ IF both of the following conditions exist, THEN check that Load Shed is activated.

- ☐ • Unit 2 - SUPPLIED BY RSST
- ☐ • Unit 2 RCPs - RUNNING

16. ___ IF Load Shed is required and not activated, THEN initiate 0-AP-10.10, LOSS OF AUTO LOAD SHED.

Op-Test No.: Surry 2021-1 Scenario No.: 4 Event No.: 7 Page 71 of 92

Event Description: Small Break LOCA: E-0 ATTACHMENTS 1-3.

Cue: Examiner cue.

NUMBER 1-E-0	ATTACHMENT TITLE AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	ATTACHMENT 3
REVISION 77		PAGE 6 of 6

NOTE:
- SFP checks should be initiated WITHIN ONE TO TWO HOURS of EOP entry.
- Loss of power may render SFP indications and alarms non-functional and require local checks. Power supplies are as follows:
  - TI-FC-103, Unit 1 Semi-Vital Bus
  - TI-FC-203, Unit 2 Semi-Vital Bus
  - 1-FC-LIS-104, Panel 1ABDA1
- Loss of AC Power to the SFP level indicator is indicated if both low and high level alarms are in simultaneously. (0-VSP-C4 and 0-VSP-D4)
- 1-DRP-003, CURVE BOOK, provides a graph for SFP time to 200°F if loss of SFP cooling occurs.

17. ___ Initiate monitoring SFP parameters:

- ☐ • SFP level - Greater than Cooling Pump suction AND Stable
- ☐ • SFP temperature - Stable or Lowering
- ☐ • SFP Cooling Pumps - Either Running
- ☐ • Component Cooling - Normal
- ☐ • SFP Radiation - Normal

18. ___ Continue to monitor parameters every one to two hours or until authorized to terminate monitoring by the Station Emergency Manager and/or the Shift Manager.

19. ___ Notify the Station Emergency Manager and/or the Shift Manager of the status and trend of SFP parameters.

20. ___ IF any abnormality or adverse trend is identified, THEN initiate 0-AP-22.02, MALFUNCTION OF SPENT FUEL PIT SYSTEMS.

Op-Test No.: Surry 2015-1 Scenario No.: 4 Event No.: 8 Page 72 of 92

Event Description: Large Break LOCA with failure of Containment Spray actuation.

Cue: Examiner cue, after 1-E-0 Attachments 1 and 2.

Time	Position	Applicant's Action or Behavior
	SRO STA	1-E-1 The team will conduct a transient brief. During the brief, the Large Break LOCA will begin. At that time, the SRO will truncate the brief and continue in 1-E-1. *STA will have no input for the brief.*
	Team STA	Diagnoses Large Break LOCA by the following: Alarms: Multiple Hi and Hi-Hi CLS alarms Multiple Containment Radiation alarms Indications: Containment pressure rising Rapidly lowering RCS Pressure *Reports an ORANGE path for Containment when the team identifies CS not in service, or after Step 1 of 1-E-1 is complete, whichever is sooner.* **NOTE:** *1-FR-Z.1 begins on the next page of this guide.*
	SRO RO SRO RO SRO RO	1-E-1 **NOTE:** *It is expected that the team has addressed RCP Trip and CH miniflow Recirc criteria by the time this step is reached.* 1. CHECK RCP TRIP AND MINIFLOW RECIRC CRITERIA: a) Charging Pumps - AT LEAST ONE RUNNING AND FLOWING TO RCS Reports Yes, 3 running and flowing to the RCS. b) RCS subcooling - LESS THAN 30°F [85°F] Reports RCS subcooling is less than 30°F [85°F]. c) Stop all RCPs d) RCS pressure - LESS THAN 1275 psig [1475 PSIG] e) Close CHG pump miniflow recirc valves: • 1-CH-MOV-1275A • 1-CH-MOV-1275B • 1-CH-MOV-1275C Reports RCPs are stopped and CHG pump Mini-flow recirc valves closed.

Event Description: Large Break LOCA with failure of Containment Spray actuation.

Cue: Examiner cue, after 1-E-0 Attachments 1 and 2.

Time	Position	Applicant's Action or Behavior
	SRO	1-FR-Z.1, Response to Containment High Pressure Acknowledges recommendation by STA and transitions to 1-FR-Z.1.
	SRO RO SRO RO SRO RO SRO RO SRO RO	1-FR-Z.1 CAUTION before step 1: If 1-ECA-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION, is in effect, containment spray systems should be operated as directed by 1-ECA-1.1, instead of Step 1 below. 1 CHECK IF CS REQUIRED: a) Check CTMT pressure - HAS INCREASED TO GREATER THAN 23 PSIA b) Check CS pumps – RUNNING Reports no CS pumps running. Goes to Step 1 b) RNO. RNO b) IF RWST level greater than 3%, THEN start CS pumps. IF any CS pump can NOT be started, THEN monitor OSRS pumps for cavitation. **Starts 1-CS-P-1A / 1B. Determines that 1-CS-P-1A trips immediately on overcurrent.** • IF cavitation is indicated, THEN put affected OSRS pump in PTL Reports no cavitation indicated. c) Check CS system valves - OPEN • 1-CS-MOV-100A • 1-CS-MOV-100B • 1-CS-MOV-101A and B • 1-CS-MOV-101C and D • 1-CS-MOV-102A and B Reports No, 1-CS-MOV-101A/B/C/D are closed. Goes to Step 1 c) RNO. c) RNO Manually align CS valves. **Manually opens 1-CS-MOV-101A/B/C/D.** **Critical Task (CT-4):** Start at least one CS pump prior to exiting 1-FR-Z.1 to restore function. (Starting "B" CS Pump and opening either 1-CS-MOV-101C or 1-CS-MOV-101D satisfies this CT)

Event Description: Large Break LOCA with failure of Containment Spray actuation.

Cue: Examiner cue, after 1-E-0 Attachments 1 and 2.

	SRO RO	d) Stop all RCPs Reports yes, RCPs are stopped. **NOTE:** *After completion of Step 1, the Examiner may terminate the scenario.*
	 SRO RO	1-FR-Z.1 2. CHECK SW FLOW TO RS HXs - GREATER THAN 4750 GPM a) Check the following valves – OPEN • 1-SW-MOV-103A, B, C, and D • 1-SW-MOV-104A, B, C, and D • 1-SW-MOV-105A, B, C, and D Reports all listed MOVs are open.
	 SRO RO SRO	1-FR-Z.1 3. CHECK RS SYSTEMS: a) Check RWST level -LESS THAN 60% Reports RWST level is greater than 60%. Goes to 3.a) RNO. a) Do the following: 1) Monitor RWST level. 2) <u>WHEN</u> RWST level is less than 60%, <u>THEN</u> perform Steps 3b and 3c. Goes to Step 4.
	 SRO RO/BOP	1-FR-Z.1 4. CHECK INTAKE CANAL LEVEL – GREATER THAN 24 FT Reports Intake Canal Level greater than 24 feet.

Event Description: Large Break LOCA with failure of Containment Spray actuation.

Cue: Examiner cue, after 1-E-0 Attachments 1 and 2.

	SRO	1-FR-Z.1 5. CHECK CTMT ISOLATION VALVES - CLOSED IAW ATTACHMENT 1 Directs BOP to perform Attachment 1.
	SRO	1-FR-Z.1 6. CHECK MSTVs – CLOSED Reports yes, MSTVs are closed.
	SRO BOP SRO	1-FR-Z.1 Cautions before step 7: • At least one SG must be maintained available for RCS cooldown. • If all SGs are faulted, at least 60 gpm [100 gpm] feed flow should be maintained to each SG. 7. CHECK IF FEED FLOW SHOULD BE ISOLATED TO ANY SG(s): a) Check pressures in all SGs: • ANY SG PRESSURE DECREASING IN AN UNCONTROLLED MANNER OR • ANY SG COMPLETELY DEPRESSURIZED Reports SGs NOT Faulted. Goes to Step 8.
		1-FR-Z.1 8 CHECK SERVICE WATER AVAILABLE: a) Check Intake Canal level – BEING MAINTAINED BY CIRC WATER PUMPS Reports current Intake Canal Level, being maintained by CW pumps. b) RETURN TO procedure and step in effect Returns to 1-E-1.
		End Event 8 END of Scenario

SIMULATOR OPERATOR'S GUIDE

Simulator Scenario Checklist

- ❑ Perform Simulator Turnover Pre-session, <u>and</u> Post-session Checklist <u>prior</u> to the first Scenario of the day.
- ❑ Perform Simulator Turnover Post-session Checklist <u>after</u> the last Scenario of the day.

<u>**Perform/Verify Simulator Setup**</u>:

❑ ❑ ❑ Recall IC -379 (5%) **and verify Trigger #30 implemented.**

OR

Recall Base 5% IC, Open Schedule file for Scenario 6. Run Schedule file, and i**mplement Trigger 30.**

❑ ❑ ❑ Verify the NI-NR-A and B Chart recorders are on 1 min/div speed.

❑ ❑ ❑ Verify the SF/FF recorders are on narrow range, and Tave/Tref recorder is on wide range.

❑ ❑ ❑ Verify PRZR LVL-CH SEL positioned to CH3/CH2 (Position 3).

❑ ❑ ❑ Verify 1-EH-P-MP1 is red-flagged, and 1-EH-P-MP2 is green-flagged.

SIMULATOR OPERATOR'S GUIDE

❑ ❑ ❑ **Enter/Verify the following MALFUNCTIONS:**

Malfunction	Delay	Ramp	Trigger	Value	Final	Trigger Type (Auto or Manual)
RM1109 PROCESS RAD MONITOR RI-CC-105 FAILURE	5	10	1	3450	6e+06	MANUAL
CC07 DISABLE CC-HCV-100 AUTO CLOSURE	0	0	1	FALSE	TRUE	MANUAL
CH28 CHG LINE FLOW CONTROLLER FC-1122A FAILS	5	30	3	0	+2.0	MANUAL
TU1802 EH FLUID PUMP 2 FAILS TO AUTO START	0	0	5	FALSE	TRUE	MANUAL
TU1001 LOSS OF FLUID PUMP 1	5	0	5	FALSE	TRUE	MANUAL
SW1202 Disable SW-P-10B Auto Start	0	0	7	FALSE	TRUE	MANUAL
SW0401 OVERLOAD TRIP OF PUMP SW-P-10A	5	0	7	FALSE	TRUE	MANUAL
RD1214 DROPPED RCCA, G-9, SHUT DOWN BANK B	5	0	9	FALSE	TRUE	MANUAL
SI4001 DISABLE LHSI PUMP SI-P-1A AUTO START	0	0	11	FALSE	TRUE	AUTO
SI4002 DISABLE LHSI PUMP SI-P-1B AUTO START	0	0	11	FALSE	TRUE	AUTO
RC04 RCS LEAK NONISOLABLE (0-1200 GPM)	5	60	11	0	35	AUTO
RC0101 RCS COLD LEG A PIPE RUPTURE	5	120	13	0	50	MANUAL
CS1601 DISABLE CSP1A AUTO START	0	0	13	FALSE	TRUE	MANUAL
CS1602 DISABLE CSP1B AUTO START	0	0	13	FALSE	TRUE	MANUAL
CS12 DISABLE CSMOV101A AUTO OPEN	0	0	13	FALSE	TRUE	MANUAL
CS13 DISABLE CSMOV101B AUTO OPEN	0	0	13	FALSE	TRUE	MANUAL
CS14 DISABLE CSMOV101C AUTO OPEN	0	0	13	FALSE	TRUE	MANUAL
CS15 DISABLE CSMOV101D AUTO OPEN	0	0	13	FALSE	TRUE	MANUAL
CS0801 CS-P-1A BKR 14H5 OVERCURRENT TRIP	5	0	15	FALSE	TRUE	AUTO
FP0301 FPS FACP07 ALARM HORN FAILURE	0	0	30	FALSE	TRUE	MANUAL
FP0302 FPS PC SPEAKER FAILURE	0	0	30	FALSE	TRUE	MANUAL

SIMULATOR OPERATOR'S GUIDE

❑ ❑ ❑ **Enter/Verify the following EVENT TRIGGERS:**

Event ID	Event code	Command
11	Fwmov154c <= 0.02	Sets Trigger 11
15	CVP000>23	Sets Trigger 15

TRIGGER	TYPE	DESCRIPTION
1	MAN	Fails CC-RM-105 high.
3	MAN	Fails Normal Charging Flow Controller high.
5	MAN	Trips running EH pump and defeats auto start of standby pump.
7	MAN	Trips running Charging SW pump and defeats auto start of standby pump.
9	MAN	Drops control rod G-9.
11	AUTO	Small Break LOCA and defeats auto start of both LSHI pumps when 1-FW-MOC-154C is closed.
13	MAN	Large Break LOCA and defeats auto start of "B" CS pump and all CS discharge MOVs. .
15	AUTO	Lockout of 1-CS-P-1A 5 seconds after Containment Pressure exceeds 23 psia
30	MAN ACTIVE	FP0301 FPS FACP07 ALARM HORN FAILURE FP0302 FPS PC SPEAKER FAILURE

SIMULATOR OPERATOR'S GUIDE

Verify the following control room setup:

❑ ❑ ❑ Place the simulator in RUN and verify normal 5% power operation indications.

❑ ❑ ❑ Verify Red Magnets on the following components:

❑ ❑ ❑ Verify All pink magnets collected from previous scenarios.

❑ ❑ ❑ Verify vertical board PCS monitor on ALARM SCREEN.

❑ ❑ ❑ Reset ICCMs.

❑ ❑ ❑ Verify all calcalc points are displayed on PCS: None.

❑ ❑ ❑ Verify Component Switch Flags; 1-VS-F-58A and 1-VS-F-58B switches (AUTO AFTER STOP).

❑ ❑ ❑ Verify Brass Caps properly placed (Hi-Hi CLS, MSTVs, CH-MOV-1350, CW and SW MOVs, CTMT Hogger suction, CNDSR Vacuum breaker).

❑ ❑ ❑ Radiation Monitors all clear.

❑ ❑ ❑ Verify SG PORVs set for 1035 psig.

❑ ❑ ❑ Verify "D" bank rod height at 145 steps and Bank Overlap Counter at 529.

❑ ❑ ❑ Advance Charts.

❑ ❑ ❑ Verify Containment Instrument Air Compressors are on Inside Suction (all RMs reset).

❑ ❑ ❑ Verify SYNC keys in proper place.

❑ ❑ ❑ Verify BOL reactivity plans and benchboard Reactivity Placard is current.

❑ ❑ ❑ Reset Blender Integrators for Boric Acid to 100 and PG to 1000.

❑ ❑ ❑ Verify Stop Watches are available for RO and BOP.

❑ ❑ ❑ Verify Simulator "Session In Progress" light is turned ON.

❑ ❑ ❑ Verify no persons are logged onto network computer to ensure no procedures displayed.

❑ ❑ ❑ Verify PCS time matches Sim time.

SIMULATOR OPERATOR'S GUIDE

❑ ❑ ❑ Spot check all ARPs are clean, **verify** the following ARPs are clean.

0-RM-L5	1D-G5		
0-RM-M5			
1D-E5	1G-H2		
	TS-D2		

❑ ❑ ❑ Verify CLEAN copies of the following procedures are in place.

CSFSTs	0-AP-53.00	0-AP-1.00	1-AP-16.00
1-E-0	1-ES-0.1	1-E-1	1-FR-Z.1
1-OP-ZZ-002	1-OPT-RX-001	1-OP-CH-007	

SIMULATOR CREW BRIEF

This simulator performance scenario is performed in the EVALUATION MODE. You should not direct questions to the evaluators. Otherwise, you should perform as if you were in the MCR.

Your ability to maintain a log is not being graded, but maintaining a rough log is recommended to help during briefs.

If you need to communicate with the Unit 2 operator, verbally state, “Unit 2” and an instructor will locate to the Unit 2 area and respond to you as quickly as possible.

In the unlikely event that the simulator fails such that illogical indications result, the session will be terminated. In other words, respond to what you see. If there is a problem with the simulation, the session will be terminated or adjusted as appropriate based on the specific problem.

Assign operating positions.

	TEAM 1	**TEAM 2**	**TEAM 3**
SRO			
RO			
BOP			

Ask for and answer questions.

SIMULATOR CREW TURNOVER

Conduct shift turnover:

Unit 1 at 5% power with RCS boron concentration of 1420 ppm.

A unit startup is in progress IAW 1-GOP-1.8, Unit Startup, HSD to Max Allowable Power, and 1-OP-TM-001, Turbine – Generator Startup to 20% - 25% Turbine Power.

All systems and crossties are operable with the following exception:

- Containment Smoke and heat detectors are non-functional due to local fire panel failure. TRM Section 3.3.1, Fire Detection Instrumentation, Condition B, Smoke Detectors, and Condition C, Heat Detectors is in effect. Containment air temperatures monitored once/hour, and restore to Functional status in 14 days. The Extra RO will perform these checks.

Unit #2 is at 100% power with all systems and crossties operable

.

Shift orders are to continue the unit startup and place Unit 1 online. From there, power escalation will continue to 25% power IAW 1-GOP-1.8 (starting at Step 5.6.13.) and 1-OP-TM-001. Performance of this procedure has been authorized and has been PSA analyzed for current plant conditions.

The last shift operated the control rods and blender per the reactivity plan provided.

SIMULATOR OPERATOR'S GUIDE

Pre Session Checks:

Safety Injection Section (Magnets)	CW/SW Section	RCS Section	CVCS
SI-MOV-1865A □ R □ G	Brass Caps	Tcold Loop Stop Pos (R – O)	Core Life Plaque □
SI-MOV-1865B □ R □ G	SW MOVs	□ A □ B □ C	Ramp Plan Book □
SI-MOV-1865C □ R □ G	□ 103A □ 103B □ 103C □ 103D	Loop Bypass Valves (G – C)	OP-RX-010 Book □
SI-MOV-1869A □ R □ G		□ A □ B □ C	PG Int Set 1000 □
SI-MOV-1869B □ R □ G	CW MOVs	Thot Loop Stop Pos (R - O)	BA Int Set 100 □
SI-MOV-1890A □ R □ G □ T/O	□ 106A □ 106B □ 106C □ 106D	□ A □ B □ C	
SI-MOV-1890B □ R □ G □ T/O			Tavg/Tref Rec. □
SI-MOV-1890C □ R □ G □ T/O	CW Inlet Throttle Plaques (10%)	SFP PPs Pwr □Norm □ Alt	NI-NR-B □
Brass Cap □ CLS TR A □ CLS TR B	□ 100A □ 100B □ 100C □ 100D	PZR Level Recorder □	Group Step Ctrs □
			CERPIs □
	CTMT Hogger Suction Cap □		CH-MOV-1350 □
Main Steam/Feedwater	**Electrical/VSP**	**PCS**	**RM/WD/BR**
SG PORVs Set □	Synch Key □	PCS Main Screen	RM-112 □ A □ B □ C
MSTV Caps □ A □ B □ C	SVB Power □ H □ J	U9103 □	RM-113 □ A □ B □ C
SF/FF Rec Scale □	LO System Switches □	U9104 □	Comm RM Pwr □ 1J □ 2J
Cond Vac Bkr Cap □	VS-F-58A Pwr □ H □ J □ Grn Flag	U9105V □	Synch Key □
	VS-F-58B Pwr □ H □ J □ Grn Flag	Alarm Screen (List) □	

Post Session Checks:

PCS Screens (Cleared/Display) □ RO □ BOP □ SM □ STA □ PCs Logged OFF (including Booth) □ Phone cleared
□ Recall IC-1 □ Restore NI-NR, SF/FF, and Tave/Tref Chart recorder settings □ Advance Charts □ Procedures Changed □ Red Light □
Binders Stored □ Trash Picked Up/Emptied □ Vacuum Req'd?
□ Pink Magnets in Drawer □ BB and VB Scenario Magnets removed □ E-Mail to SSG Required □ DVD Finalized □ EAL Charts
□ Note Pads □ Manning Sheets □ Sticky Tabs (SRO/SM/ARPs) □ Markers (ARPs) □ Personnel/Comms Tracking Sheets (Booth)
□ Floor timers reset/In place □ Booth timers reset/In place □ Printers ready/have paper

SIMULATOR OPERATOR'S GUIDE

EVENT 1 Place unit online

When the team and Examiner ready, place the Simulator in RUN.

30 minutes prior to the beginning of the scenario, provide the team with a copy of 1-GOP-1.8, 1-OP-TM-001, 1-OP-CH-021 and an approved ramp plan.

System Operator and Energy Supply (MOC):

If contacted, acknowledge the unit is coming online. Acknowledge when the unit is placed online.

Operations Supervisor/Management/Work Week Coordinator:

If contacted, acknowledge the unit is coming online.

Surrogate RO (Feed Control):

Provide feed control until the team is ready to place all MFRVs are placed in AUTO and the bypass HCVs are fully closed. Allow the BOP to place the MFRVs in AUTO. Once all Bypass HCVs are closed, relieve yourself of the duty and leave the unit 1 control board area.

Shift Technical Advisor:

If asked to support monitoring while placing the unit online; acknowledge the request, but do not provide any information about the unit.

Field operator:

If dispatched, report all Main Transformer pumps and fans are in operation.

If contacted as CP, report that 5 polishers are in service.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 2 **1-CC-RM-105 failure**

When cued by examiner, implement **Trigger 1**.

Shift Manager:

- **If contacted**, will acknowledge the failure of 1-CC-RM-105 and will also acknowledge any TS LCOs.
- **If asked,** will contact the OMOC.
- **If asked,** will take responsibility for contacting I&C department.
- **If asked,** will take responsibility for writing the CR.

STA:

- **If contacted**, will acknowledge the failure of 1-CC-RM-105 and will also acknowledge any TS LCOs.
- **If asked,** the STA will report that all documents have been reviewed and discussed with the Shift Manager.
- **If the team has a transient brief:** The STA will state that he has nothing to add.

Maintenance/Work Week Coordinator:

- **If contacted**, will acknowledge instrumentation failure and commence investigations.

Health Physics:

- **If contacted**, will acknowledge the failure of 1-CC-RM-105.
- **If asked,** will take responsibility for conducting local surveys.

Unit 2 Operator:

- **If asked,** will report they have placed SOV-CC-200 in CLOSE.
- **If asked,** will take responsibility for performing 1-OPT-RC-10.0.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 3 **Charging Flow Controller fails high.**

When cued by examiner, implement **Trigger 3**.

BOOTH NOTE: Ensure Blender is not operating when malfunction is entered.

Operations Supervisor/Management:

- **If contacted**, will acknowledge the failure of the Charging Flow Controller and also acknowledge entry into 0-AP-53.00.
- **If contacted,** will contact the OMOC.
- **If contacted,** will take responsibility for writing the CR.

STA:

- **If contacted**, will acknowledge the failure of the Charging Flow Controller.
- **If asked,** the STA will report that all documents have been reviewed and discussed with the Shift Manager.
- **If contacted,** will take responsibility for writing the CR.
- **If the team has a transient brief:** The STA will state that he has nothing to add.

Unit 2:

- If **0-BR-D2, OVHD GAS COMPR STBY START** alarms (Due to VCT backing up), perform actions of ARP 0-BR-D2.

Maintenance/Work Week Coordinator:

If contacted, will acknowledge the Charging Flow Controller failure and commence investigations.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 4 **EH pump trip, standby EH pump fails to auto start.**

When cued by examiner, implement **Trigger 5**.

Operations Supervisor/Management:

- **If contacted**, will acknowledge the failure of 1-EH-P-MP1 and MP-2 to auto-start.
- **If asked,** will contact the OMOC.
- **If contacted,** will take responsibility for writing the CR.

STA:

- **If contacted**, will acknowledge the failure of 1-EH-P-MP1 and MP-2 to auto-start.
- **If asked,** the STA will report that all documents have been reviewed and discussed with the Shift Manager.
- **If contacted,** will take responsibility for writing the CR.
- **If the team has a transient brief:** The STA will state that he has nothing to add.

Maintenance/Work Week Coordinator:

If contacted, will acknowledge EH pump failure and commence investigations.

Field Operators: (Wait three minutes between direction to perform local action/status check and report.)

- **If contacted**, 1-EH-P-MP1 will have no local indications for cause of the trip.
- **If contacted,** to investigate breaker MCC 1A1-2-7C (1-EH-P-MP1), report the breaker is in the ON position.
- **If contacted**, 1-EH-P-MP2 post start checks are sat.

Unit 2 Operator:

- **If contacted**, will acknowledge the failure of 1-EH-P-MP1 and MP-2 to auto-start. Also acknowledge when 1-EH-P-MP-2 is running.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 5 **'A' CH SW pump trip, failure of 'B' CH SW pump to auto start.**

When cued by examiner, implement **Trigger 7**.

Operations Supervisor/Management:

- **If contacted**, will acknowledge the failure of CH CC and will also acknowledge any TS LCOs.
- **If contacted,** will contact the OMOC.
- **If contacted,** will take responsibility for writing the CR.

STA:

- **If contacted**, will acknowledge the failure of CH CC.
- **If asked,** the STA will report that all documents have been reviewed and discussed with the Shift Manager.
- **If contacted,** will take responsibility for writing the CR.
- **If the team has a transient brief:** The STA will state that he has nothing to add.

Field Operators: (Wait three minutes between direction to perform local action/status check and report.)

- **If contacted**, report CH SW parameters consistent with the number of CH SW pumps running.
- **If contacted**, 1-SW-P-10A will have no local indications for cause of the trip.
- **When contacted,** to investigate breaker MCC 1H1-1-1D (1-SW-P-10A), report the breaker is in the ON position.
- **If contacted**, 1-SW-P-10B post start checks are sat.

Maintenance/Work Week Coordinator:

If contacted, will acknowledge the CH SW pump failure and commence investigations.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 6 **Dropped Rod below 25% reactor power**

When cued by examiner, implement **Trigger 9**.

Critical Task (CT-2): Trip the reactor prior to RCS average temperature lowering below 538°F.

Operations Supervisor/Management:

- **If contacted**, will acknowledge the dropped rod and will also acknowledge any TS LCOs and entry into 0-AP-1.00 / 1-E-0 (as notified).
- **If contacted,** will contact the OMOC.
- **If asked,** will take responsibility for contacting I&C department.
- **If contacted,** will take responsibility for writing the CR.

STA:

- **If contacted**, will acknowledge the dropped rod and will also acknowledge any TS LCOs and entry into 0-AP-1.00 / 1-E-0 (as notified).
- **If asked,** the STA will report that all documents have been reviewed and discussed with the Shift Manager.
- **If contacted,** will take responsibility for writing the CR.
- **If the team has a transient brief:** The STA will state that he has nothing to add.

Maintenance/Work Week Coordinator:

- **If contacted**, will acknowledge the dropped rod and commence investigations.

Unit 2 Operator:

- **If asked,** will perform 0-AP-50.00.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 7 **Small Break LOCA with failure of LHSI pumps to auto start**

When 1-FW-MOV-154C is manually closed by the team, **Trigger 11** will automatically insert.

Critical Task (CT-3): Start at least one LHSI pump prior to requiring transition to 1-FR-C.1.

Operations Supervisor/Management:

- **If contacted**, will acknowledge the small break LOCA and entry into 1-E-0.
- **If contacted,** will acknowledge the need to evaluate EPIPs. (Will not discuss EALs with the team.)
- **If contacted,** will take responsibility for writing the CR.

STA:

- **If contacted**, will acknowledge the small break LOCA and entry into 1-E-0.
- **If contacted,** will acknowledge the need to evaluate EPIPs. (Will not discuss EALs with the team.)
- **If contacted,** will take responsibility for writing the CR.
- **If the team has a transient brief:** The STA will state that he has nothing to add.

Maintenance/Work Week Coordinator:

- **If contacted**, will acknowledge failure of LHSI pumps to auto start and will commence investigation.

Unit 2 Operator:

- **If contacted**, will acknowledge the Safety Injection initiation on unit 1.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 8 **Large Break LOCA with failure of CS pumps and valves to automatically align**

When cued by examiner, implement **Trigger 13**.

Booth Note: To ensure team enters FR-Z.1 insert trigger AFTER operator has completed Attachment 1 and Attachment 2 of E-0 and team is performing E-1 Step 1.

Critical Task (CT-4): Start at least one CS pump prior to exiting 1-FR-Z.1 to restore function.

Operations Supervisor/Management:

- **If contacted**, will acknowledge the large break LOCA, loss of Containment Spray function and entry into 1-E-1 / 1-FR-Z.1 (as notified).
- **If contacted,** will acknowledge the need to evaluate EPIPs. (Will not discuss EALs with the team.)
- **If contacted,** will take responsibility for writing the CR.

STA:

- ***When the team identifies the loss of Containment Spray function (or after Step 1 of 1-E-1 is complete (whichever is sooner), report an ORANGE path to 1-FR-Z.1 using the CSFSTs.***
- **If contacted**, will acknowledge the large break LOCA, loss of Containment Spray function and entry into 1-E-1 / 1-FR-Z.1 (as notified).
- **If contacted,** will acknowledge the need to evaluate EPIPs. (Will not discuss EALs with the team.)
- **If contacted,** will take responsibility for writing the CR.
- **If the team has a transient brief:** The STA will state that he has nothing to add.

Maintenance/Work Week Coordinator:

- **If contacted**, will acknowledge failure of CS pumps to auto start and align, and will commence investigation.

Unit 2 Operator:

- **If contacted**, will acknowledge the CLS Hi-Hi initiation on unit 1.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

The scenario will end upon completing step 1 of 1-FR-Z.1, or at the lead examiners discretion.

Facility: Surry Power Station   Scenario No.: 5   Op-Test No.: 2021-301

Examiners: ______________________   Operators: ______________________

Initial Conditions: Unit 1 and 2 at 100% power; MOL. All systems and crossties are operable with the following exceptions:

- AAC DG is tagged out for maintenance, per VPAP-2802, Notifications and Reports, Section 6.30.1, a review of Reportability is required if the AAC DG is out of service greater than 14 days.

Turnover: The Team will pre-brief conduct of PT-18.6I, PZR Block Valve Stroke Test

Event No.	Event Type*	Event Description
1	N RO/SRO TS SRO	Test cycle Pressurizer PORV, Block Valve breaker will trip when re-opened. (1-PT-18.6I)
2	I RO/SRO TS SRO	PRZR Level Transmitter fails low. 0-AP-53.00
3	C BOP/SRO	"B" Main Feed Reg Valve Controller fails low. 0-AP-53.00 **(CT-1)**
4	C BOP/SRO	SG "C" PORV fails open. 1-AP-38.00.
5	R RO/SRO N BOP	Isophase Bus Duct Hi Temp, requiring ramp to 90% power. ARP 1G-E5, 0-AP-23.00.
6	C RO/SRO C BOP	Steam Generator Tube Leak "B" SG at approximately 20 gpm. 1-AP-16.00, 1-AP-24.00. Auto actions of Air Ejector Hi RM do not function, requiring manual alignment. **(CT-2)**
7	M ALL	SGTL "B" SG escalates to SGTR. 1-E-0, 1-E-3 **(CT-3)**
8	M ALL	PRZR PORV 1-RC-PCV-1455C will not open when switch placed in "open" position. 1-ECA-3.3.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

CT #	EVENT	DESCRIPTION	MET (✓)
CT-1	3, B SG MFRV Controller Fails Low	Stabilize B SG Level prior to prevent automatic OR manual Reactor Trip. With no operator action, a Reactor trip will occur in approximately 2 minutes.	
CT-2	6, SGTL	Manually align A/E discharge to containment IAW A/E RM ARP prior to SGTR. Failing to accomplish this will cause a rad release that could threaten the health and safety of the public.	
CT-3	7, SGTR	Isolate feedwater flow into the ruptured S/G before S/G 'B' NR reaches 100%. Failing to isolate Feedwater into the ruptured S/G will cause the S/G to fill faster. Once NR level reaches 100% there is no accurate method for determining S/G level due to the inaccuracy of the WR S/G levels. Once a S/G is fully flooded the hydrodynamic loading on the S/G, MS lines, and other components may exceed their allowable stress rating, possibly causing the S/G to fail catastrophically. Note: With no operator action it is estimated that SG C will fill to 100% in approximately 40 minutes from the time the SG is ruptured.	

***Event 1: PT-18.6 I, PZR Block Valve Stroke Test*.** (N- RO/SRO)

The Team will pre-brief this evolution prior to entering the Simulator. Upon entry of the Team to the Simulator, the Scenario brief will be given, Questions answered, and the Team allowed ~ 5 minutes to become acclimated to the Simulator Environment.
When the BOP closes 1-RC-MOV-1535, 1-RC-PCV-1456 block valve, and attempts to re-open 1-RC-MOV-1535, a series of triggers actuate to trip the power supply breaker to 1-RC-MOV 1535.

Verifiable Action(s):

1) BOP will close 1-RC-MOV-1535 and time the stroke.
2) RO/BOP will place the 1-RC-MOV-1456 PORV control switch in the "close" position following Tech Spec review.

Technical Specifications:

The SRO will review Tech Specs (3.1.A.6.d) and determine a one (1) hour clock exists to place 1-RC-PCV-1456 in manual (switch to close); and a 72 hour clock to return the block valve to an OPERABLE status, or be in HSD in 6 hours and RCS temperature <350°F within the next 6 hours.

This Event sets up entry into ECA-3.3, SGTR without Pressure Control; Major Event later in the Scenario.

***Event 2: PRZR level Upper Channel Fails Low (-.2 DEG) PRZR level on selected Upper Channel fails to ~25%*.** (I – RO, TS – SRO). ARP 1C-D8, PRZR LO Level.

The RO will diagnose the failure based on CH to Regen HX Hi/Low flow alarm (Annunciator 1D-E5) or identification of CH flow increasing and PZR level Channel III decreasing.

Verifiable Actions(s):

1) The RO will place CH flow in Manual and control PRZR level at setpoint IAW AP-53.00, Loss of Vital Instrumentation/Controls.
2) BOP will select an operable channel on the pressurizer level recorder.
3) The RO will defeat the failed channel IAW AP-53.00, and return CH flow to automatic when normal PRZR level restored.

Technical Specifications (1):

1) **TS 3.7, Table 3.7-1, item 9** (Pressurizer High Water Level), Operator Action 7. With the number of OPERABLE Channels less than the Total number of channels; place the failed channel in trip in 72 hours, allowable to bypass the channel for up to 12 hours for surveillance, if requirements not met reduce power to less than P-7 (10%) within the next 6 hours.

TRM Actions (1):

1) **TRM section 3.3.2, Table 3.3.2-1**, Pressurizer Level Channel 1-RC-LI-1461. Condition A applies, Implement a Fire Watch in cable vault and tunnel and the emergency switchgear room of the affected Unit (Unit 1) IAW TRM Section 5.2 (Hourly), within 14 days and restore the failed channel in 60 days.

Event 3: B SG Main Feed Reg Valve Controller Fails Low. *(C – BOP/SRO)*

BOP will diagnose the failure based upon alarms and indications received and take the Immediate Actions of 0-AP-53.00. The Team will implement 0-AP-53.00, Loss of Vital Instrumentation/Controls. The BOP will manually control "B" SG NR level for the remainder of the scenario.

Verifiable Action(s):

1) BOP will place the "B" FRV in manual and verify proper response.
2) BOP will maintain "B" SG level at program band.

Event #4: SG 'C' PORV fails open. (C – BOP/SRO)

The BOP will diagnose the failure based upon PCS alarms and indication received. The Team will initiate 1-AP-38.00, Main Steam System Control Malfunction.

Verifiable Actions:

1) BOP: Place the "C" SG PORV in Manual and lower output to close the PORV.

Event 5: ISOPHASE BUS DUCT HI TEMP REQUIRING 10% Power Reduction. (R – RO, R – SRO, N – BOP)

The SRO will lead a Team Brief where the reactivity plan will be discussed to reduce reactor power in 10% increments to lower isophase bus duct temp to less than 239 deg. F. The RO and SRO will be credited with a Reactivity Manipulation and the BOP with a Normal Evolution.

Verifiable Action(s):

1) RO: Manipulate control rods to control delta flux and/or Tave.
2) RO: Manipulate CVCS controls to Emergency Borate.
3) RO: Manipulate CVCS control to establish a normal boration to assist in Tave control.
4) BOP: Manipulate Turbine Controls to establish power reduction.

***Event #6: Steam Generator Tube Leak "B" Steam Generator.* Failure of Auto actions of A/E RM.** (C – RO/SRO, C – BOP)

When the Evaluation Team is satisfied with the Reactivity manipulation, the event will be triggered. A SGTL of approximately 20 gpm will initiate requiring the RO to perform ARP 1A-A3, N-16 HIGH, which will direct evaluation of 1-AP-16.00 based on the observable change in RCS inventory trends. The actions of 1-AP-16.00 to quantify the leakrate. The A/E RM will go into High alarm due to the primary to secondary leakage; the BOP will manually align A/E discharge to containment IAW A/E RM ARP.

Verifiable Actions:

1) RO will isolate LD flow and place charging flow in manual to quantify leakrate.
2) BOP will respond to failure of auto actions on A/E RM High alarm by swapping A/E discharge to containment.

Event #7: SGTR in "B" SG, approximately 600 gpm. (M – ALL)

When the evaluation Team is ready, a SGTR in the "B" SG will be implemented. The RO will re-assess RCS leakage in response to alarms and indications received. The RO will determine that RCS leakage exceeds the capacity of a single CH pump, and the Team will return to E-0 and manually initiate SI.

The SRO will perform a commensurate brief and continue with E-0. While the RO and SRO continue with E-0, the BOP will be directed to perform E-0 Attachments 1 through 3. BOP Failures in E-0 Attachments; 1-SI-P-1B not start, 1-CH-HCV-1200 A/B not close, VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100A/B not close.

Verifiable Actions:

1) RO: Increase CH flow in manual per Immediate Action Steps of 1-AP-16.00, Excessive RCS Leakage to determine if RCS leakage is greater than the capacity of a single CH pump.
2) RO: Re-perform High Level Steps of 1-E-0, and manually Safety Inject on Step 4 of 1-E-0.
3) BOP: Perform actions of Attachments 1 through 3 of 1-E-0. BOP Failures in 1-E-0 Attachments: 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not auto close, 1-VS-MOD-103A not auto close, 1-MS-TV-109 and 1-DA-TV-100A/B will not auto close (Listed as Event 9).

Critical Task:

CT-4: Isolate feedwater flow into the ruptured S/G before S/G 'B' NR reaches 100%. Failing to isolate Feedwater into the ruptured S/G will cause the S/G to fill faster. Once NR level reaches 100% there is no accurate method for determining S/G level due to the inaccuracy of the WR S/G levels. Once a S/G is fully flooded the hydrodynamic loading on the S/G, MS lines, and other components may exceed their allowable stress rating, possibly causing the S/G to fail catastrophically. Note: With no operator action it is estimated that SG C will fill to 100% in approximately 40 minutes from the time the SG is ruptured.

Event #8: SGTR with Loss of Pressure control. (M – All)

The Team continues through the EOP progression 1-E-0 to 1-E-3.

After the Team has completed the rapid cooldown of 1-E-3 and moves to the Depressurization steps, the Team will be presented with the inability to depressurize the RCS (No RCPs – No Spray available), 1 PZR PORV inoperable, and the last Pzr PORV not responding to placing the control switch in Open. This will require the Team to Transition to 1-ECA-3.3, SGTR without Pressure Control.

When 1-ECA-3.3 is entered, it is expected that the ruptured SG level will be > 73% NR leading to Team moving to Step 6, Check If SI Can Be Terminated.

Verifiable Actions:

1) RO: Isolate AFW flow to the Ruptured SG.
2) BOP: Reset SI and secure “A” CH pump and one of the running LHSI pumps. (Discretionary CT – within 30 minutes).
3) RO: Manipulate steam dump controls for rapid cooldown.
4) RO/BOP: Block SI signals when conditions established.
5) RO: Manipulate SI/CVCS control to terminate SI, establish CH flow, and restore letdown flow.

The Scenario is terminated at Lead Evaluator discretion or at Step 17 of 1-ECA-3.3, “Check If CS Should Be Stopped” (CH and LD flow have been re-established).

Scenario Recapitulation
Total Malfunctions: 10
Abnormal Events: 6, 0-AP-53.00 (twice), ARP 1D-C5, 1-AP-38.00, 1-AP-24.00, 1-AP-16.00.
Major Transients: 1
EOPs Entered: 2 (1-E-0, 1-E-3)
EOP Contingencies: 1 (1-ECA-3.3)

Initial Conditions: Unit 1 and 2 Operating at 100%. Turnover: The Team will pre-brief conduct of PT-18.6I, PZR Block Valve Stroke Test
Equipment Status/ Procedures/ Alignments/ Data Sheets/ etc.: ○ AAC DG is tagged out for maintenance, per VPAP-2802, Notifications and Reports, Section 6.29.1, a review of Reportability is required if the AAC DG is out of service greater than 14 days.
Turnover: Team will perform PT-18.6I, PZR Block Valve Stroke Test. The performance of this procedure has been analyzed based on the current plant configurations and the PRA indicates green.

Scenario Objectives:

A. Given a failure of 1-RC-MOV-1535 to re-open during performance of 1-PT-18.6I, PZR Block Valve Stroke Test.

B. Given a pressurizer level channel deviation, respond IAW 0-AP-53.00 to the failure.

C. Given a Low Failure of “B” SG Main Feed Reg Valve Controller, take action IAW 0-AP-53.00 to control SG level.

D. Given a failure of “C” SG PORV, respond IAW 1-AP-38.00.

E. Given degraded Isophase Bus Duct Cooling, respond IAW ARP 1G-E5 and 0-AP-23.00 to reduce power on Unit 1.

F. Given a SG “B” Tube Leak with failure of Air Ejector auto swapover, respond IAW ARPs 1-RM-G8 and 1A-A3.

G. Given a Design Basis SG Tube Rupture, respond IAW 1-E-0, and 1-E-3, Steam Generator Tube Rupture.

H. Given the Failure of 1-RC-PCV-1445C to open to depressurize the RCS, transition to 1-ECA-3.3, Steam Generator Tube Rupture without Pressurizer Pressure Control.

SHIFT TURNOVER INFORMATION

OPERATING PLAN:

The initial conditions have Unit 1 is at 100% power with RCS boron concentration of 760 ppm.

Unit conditions have been stable at approximately 100% power since the last refueling outage.

All systems and crossties are operable with the following exception:

- AAC DG is tagged out for maintenance. Expected to be returned to services in 3 days. Per VPAP-2802, Notifications and Reports, Section 6.29.1, a review of Reportability is required if the AAC DG is out of service greater than 14 days.

Unit #2 is at 100% power with all systems and crossties operable.

Shift orders are, upon relieving the watch, to perform PT-18.6I, PZR Block Valve Stroke Test. Performance of this procedure has been authorized and has been PSA analyzed for current plant conditions.

The last shift performed two 35 gallon dilutions followed by a manual makeup for training.

Op-Test No.: Surry 2021-1 Scenario No.: 5 Event No.: 1 Page 9 of 90

Event Description: Test Cycle Pressurizer Block Valves, Block Valve Trips on re-open, PT-18.6I.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
		1-PT-18.6I
	SRO/BOP	**NOTE** – Team will pre-brief this evolution prior to entering the simulator. Initial Conditions and Precautions and Limitations will be completed before entering the simulator.
	BOP	6.1.1 Check closed or close PRZR PORV 1-RC-PCV-1456.
	BOP	6.1.2 Check key switch for PRZR PORV 1-RC-PCV-1456 OVPRESS Mitigating System is in DISABLE.
	BOP	6.1.3 Check PRZR PORV Block Valve 1-RC-MOV-1535 is open. IF 1-RC-MOV-1535 is closed…
	BOP	**6.1.4 Stroke PRZR PORV Block Valve 1-RC-MOV-1535 through one complete cycle, timing valve movement in each direction**. Time from signal initiation to complete valve travel.
	BOP	Closes 1-RC-MOV-1535 and identifies it fails to reopen.

Event Description: Test Cycle Pressurizer Block Valves, Block Valve Trips on re-open, PT-18.6I.

Cue: By Examiner.

	SRO	**Refer to Technical Specification 3.1.A.6.d for required actions.** With one block valve inoperable, within 1 hour either restore the block valve to operable status or place the associated PORV in manual. In addition, restore the block valve to operable status in the next 72 hours or, be in at least HSD within the next 6 hours and reduce RCS temperature to < 350°F within the following 6 hours.
	BOP	**Places 1-RC-PCV-1456 in “CLOSE”.**
	SRO	Exit 1 hour clock to place 1-RC-PCV-1456 in manual. Start 72 Hour Clock to repair Block Valve.
	SRO	Direct RO/BOP to notify Service Building Operator to check status of 1H1-2S 6A breaker for 1-RC-MOV-1535.
	RO/BOP	Contact Service Building Operator to check status of 1-RC-MOV-1535 Breaker.
	RO/BOP	When notified by field operator that 1H1-2S 6A breaker is tripped, report information to the Team using a Focus Brief.
	SRO	Notify Shift Manager of Block Valve failure and suspension of PT performance. Request Electrical Maintenance support to investigate breaker trip.
	SRO	Perform brief to update Team on Technical Specification requirements. Brief driven by brief card and placards.
		-- END EVENT 1 –

Event Description: PRZR Level Transmitter Fails Low, 0-AP-53.00.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
	RO	Diagnoses failure of 1-RC-LI-1461 with the following indications/alarms: Alarms: • 1C-D8 PRZR LO LEVEL Indications: • CH Flow rises on 1-CH-FI-1122A to ~110 gpm • PRZR Level on 1-RC-LI-1461 lowers to 25% In accordance with the immediate actions of 0-AP-53.00 the RO will take manual control of pressurizer level control by placing 1-CH-FV-1122 in manual and lowering charging flow to maintain program level (per 0-AP-53.00).
	SRO	Enters 0-AP-53.00, Loss of Vital Instrumentation / Controls.
	RO	0-AP-53.00 [1] CHECK REDUNDANT INSTRUMENT CHANNEL(S) INDICATION - NORMAL Checks 1-RC-LI-1459, Pressurizer Level Channel 1, and 1-RC-LI-1460, Pressurizer Level Channel 2 are NORMAL.
	RO	0-AP-53.00 [2] PLACE AFFECTED CONTROL(S)/COMPONENT(S) IN MANUAL CONTROL AND STABILIZE PARAMETER USING REDUNDANT INDICATION **Places 1-CH-FV-1122 in manual and lowers charging flow.**
	SRO STA	Conduct a Brief using the Briefing Placard and obtains Critical Parameter information from the RO and BOP. The SRO will update the Shift Manager during AP-progression. SRO will provide a band for control of PRZR level with CH flow in MANUAL. *The STA will state they have nothing to add to the brief.*
	RO	0-AP-53.00 *3 CHECK REACTOR POWER – LESS THAN OR EQUAL TO 100% Reports Actual Reactor Power and Trend using PCS 30 minute power indication.

Event Description: PRZR Level Transmitter Fails Low, 0-AP-53.00.

Cue: By Examiner.

Time	Position	Applicant's Action or Behavior
	SRO	0-AP-53.00 **CAUTION** Prior to Step 4: If Reactor power has been affected by a secondary transient, Turbine adjustment may be needed to control Tave. **NOTES** prior to Step 4: • Step 4 failures are listed in order of performance priority. Only the failed instrument/control and associated step number should be read aloud. • When the affected instrument/controller malfunction(s) has been addressed by this procedure, recovery actions should continue at Step 11.
	SRO RO	0-AP-53.00 *4 DETERMINE THE FAILED INSTRUMENT / CONTROL AND GO TO APPROPRIATE STEP OR PROCEDURE: • PRZR Level Control, Step 9. *The RO will identify that 1-RC-LI-1461 has failed.*
	SRO RO SRO RO SRO RO SRO RO/BOP SRO BOP SRO	0-AP-53.00 9. CHECK PRZR LEVEL CONTROL CHANNELS – NORMAL a) Check PRZR LVL Instrumentation - NORMAL *Responds "NO, 1-RC-LI-1461 Abnormal."* 9 a) RNO 1) Place either of the following in MANUAL: • 1-CH-FC-1122C, CHG FLOW CNTRL, OR • 1-CH-LC-1459G, PRZR LEVEL CNTRL *Responds "1-CH-FC-1122C is in MANUAL"* 9 a) RNO 2) Control PRZR Level at Program Level. *Responds "Maintain PRZR Level at program ± band set by SRO"* 9 a) RNO 3) Move PRZR LVL – CH SEL switch to defeat the failed channel. **Transfers CH SEL switch to 1 / 2 Position.** 9 a) RNO 4) Check or place recorder 1-RC-LR-1459 on an operable channel. *Checks or adjusts PRZR Level Recorder to 1-RC-LI-1459 or 1-RC-LI-1460.* **9a) RNO 5) Refer to Tech Spec 3.7-1, Item 9.** **TS 3.7, Table 3.7-1, item 9; Operator Action 7.** Number of Operable channels one less than Total number of channels: Place Inoperable channel in trip within 72 hours, allowed to bypass channel for 12 hours

Event Description: PRZR Level Transmitter Fails Low, 0-AP-53.00.

Cue: By Examiner.

	SRO	for surveillance, If conditions not met within allowed time, reduce power to less than P-7 in the next 6 hours. 9 a) RNO 6) Refer to Attachment 3. *SRO hands Attachment 3, Pressurizer Level Control diagram to RO/BOP for review.* **NOTE:** Attachment 3 (one-line diagram) is provided at the end of this section.
	SRO RO SRO RO SRO	0-AP-53.00 9 b) Check Pressurizer Heaters - Energized. *Reports Pressurizer heaters are energized.* 9 c) Check Letdown – IN SERVICE. *Reports Letdown is in service.* 9 d) Check PRZR level control – IN AUTOMATIC. *Reports pressurizer level control in MANUAL.*
	SRO SRO RO/BOP SRO RO/BOP	0-AP-53.00 9 d) RNO 1) Check PRZR level restored to program. 2) Unsaturate 1-CH-LC-1459G, PRZR LEVEL CNTRL, as required. **Places 1-CH-LC-1459G in MANUAL to unsaturated the controller.** 3) Return 1-CH-FCV-1122 to AUTOMATIC by checking or placing the following in AUTOMATIC: • 1- CH-FC-1122C, CHG FLOW CNTRL • 1-CH-LC-1459G, PRZR LEVEL CNTRL **Places 1-CH-FC-1122C and 1-CH-LC-1459G in AUTO.**
	SRO SRO	0-AP-53.00 Recalls NOTE 2 Prior to Step 4 and goes to Step 11 of AP-53.00. 11. CHECK CALORIMETRIC – FUNCTIONAL IAW 1-OPT-RX-001, ATTACHMENT 4 Directs BOP to perform 1-OPT-RX-001, Attachment 4.

Event Description: PRZR Level Transmitter Fails Low, 0-AP-53.00.

Cue: By Examiner.

	RO/BOP	Reports Yes, Calorimetric is Functional IAW 1-OPT-RX-001, Attachment 4. 1-OPT-RX-001, Attachment 4 at end of this section.
	SRO STA	0-AP-53.00 12. REVIEW THE FOLLOWING: • Tech Spec 3.7 • VPAP-2802, NOTIFICATIONS AND REPORTS • TRM SECTION 3.3, INSTRUMENTATION • Reg Guide 1.97 • EP-AA-303, Equipment Important to Emergency Response **TRM section 3.3.2, Table 3.3.2-1, Pressurizer Level Channel 1-RC-LI-1461. Condition A applies,** Implement a Fire Watch in cable vault and tunnel and the emergency switchgear room of the affected Unit (Unit 1) IAW TRM Section 5.2 within 14 days. *If directed to perform reviews required for the failure, STA will report reviews have been completed and results discussed with the Shift Manager.*
	SRO RO/BOP	0-AP-53.00 13. CHECK ADDITIONAL INSTRUMENT / CONTROLLER MALFUNCTION - EXISTS Reports No, no further malfunction exists. *SRO GOES TO Step 15.*
	SRO	0-AP-53.00 15. PROVIDE NOTIFICATIONS AS NECESSARY: • Shift Supervision • OMOC • STA (PRA determination) • I&C SRO consults Shift Manager concerning notification of OMOC of the failure and request for I&C assistance; Notifies STA to add failure to PRA program.
		-- END EVENT 2 –

Event description: “B” SG MFRV Controller Fails Low, 0-AP-53.00.

Cue: By Examiner.

Time	Position	Applicant’s Action or Behavior
	BOP	Diagnoses failure of “B” MFRV Controller with the following: Alarms: • 1H-E6 STM GEN 1B FW >< STM FLOW • 1F-C8 STM GEN 1B CH 3 FW < STM FLOW • 1F-D8 STM GEN 1B CH 4 FW < STM FLOW • 1H-G6 STM GEN 1B LVL ERROR. Indications: • Lowering “B” SG Feed Flow on both CH-3 and CH-4 • Lowering “B” SG Level.
	SRO	Enters 0-AP-53.00 LOSS OF VITAL INSTRUMENTATION / CONTROLS
	BOP	0-AP-53.00 [1] CHECK REDUNDANT INSTRUMENT CHANNEL(S) INDICATION - NORMAL BOP identifies all other “B” SG indications are NORMAL.
	BOP	0-AP-53.00 [2] PLACE AFFECTED CONTROL(S)/COMPONENT(S) IN MANUAL CONTROL AND STABILIZE PARAMETER USING REDUNDANT INDICATION **BOP takes manual control of ‘B’ SG feed reg valve and increases demand (FF > SF) to restore level to program.**
	SRO STA	Conduct a Brief using the Briefing Placard and obtains Critical Parameter information from the RO and BOP. The SRO will update the Shift Manager during AP-progression. SRO will provide a band for control of “B” SG level with “B” FRV in MANUAL. *The STA will state they have nothing to add to the brief.*
	 SRO RO	0-AP-53.00 * VERIFY REACTOR POWER – LESS THAN OR EQUAL TO 100% *Checks Reactor Power < 100% using PCS Calorimetric. Due to restoration of FF on 1B SG, power increase may be noted. As required, the SRO may direct the BOP to initiate Attachment 7. This attachment has a NOTE directing use of Delta-T and PRNIs as power indications due to the secondary transient*

Event description: "B" SG MFRV Controller Fails Low, 0-AP-53.00.

Cue: By Examiner.

	SRO RO/BOP SRO	0-AP-53.00 **CAUTION** Prior to Step 4: If Reactor power has been affected by a secondary transient, Turbine adjustment may be needed to control Tave. **NOTES** prior to Step 4: • Step 4 failures are listed in order of performance priority. Only the failed instrument/control and associated step number should be read aloud. • When the affected instrument/controller malfunction(s) has been addressed by this procedure, recovery actions should continue at Step 11. *4. DETERMINE THE FAILED INSTRUMENT / CONTROL AND GO TO APPROPRIATE STEP OR PROCEDURE: *Identifies 1B SG Feed Flow affected*. Goes to Step 7.
	SRO SRO BOP SRO	0-AP-53.00 **CAUTION** Prior to Step 7: When CALCALC is based on Feedwater, changes in feed flow will affect calorimetric power. Reactor power must be monitored when adjusting feed flow. CHECK STEAM GENERATOR LEVEL CONTROL INSTRUMENTS – NORMAL • Steam Pressure • Steam Flow • Feed Flow • Steam Generator Level Determines SGWLCS instrumentation for 'B' SG is normal. Recalls the second note at Step 4 (When the affected instrument/controller malfunction(s) has been addressed by this procedure, recovery actions should continue at Step 11) Goes to Step 11.

Event description: “B” SG MFRV Controller Fails Low, 0-AP-53.00.

Cue: By Examiner.

	SRO BOP	0-AP-53.00 11. CHECK CALORIMETRIC – FUNCTIONAL IAW 1-OPT-RX-001, ATTACHMENT 4 Directs BOP to perform 1-OPT-RX-001, Attachment 4. Reports Yes, Calorimetric is Functional IAW 1-OPT-RX-001, Attachment 4.
	SRO SRO	0-AP-53.00 12. REVIEW THE FOLLOWING: • Tech Spec 3.7 • VPAP-2802, NOTIFICATIONS AND REPORTS • TRM SECTION 3.3, INSTRUMENTATION • Reg Guide 1.97 • EP-AA-303, Equipment Important to Emergency Response *If directed to perform reviews required for the failure, STA will report reviews have been completed and results discussed with the Shift Manager.*
	SRO RO	0-AP-53.00 13. CHECK ADDITIONAL INSTRUMENT / CONTROLLER MALFUNCTION - EXISTS Reports No, no further malfunction exists. *SRO GOES TO Step 15.*
	SRO	0-AP-53.00 15. PROVIDE NOTIFICATIONS AS NECESSARY: • Shift Supervision • OMOC • STA (PRA determination) • I&C SRO consults Shift Manager concerning notification of OMOC of the failure and request for I&C assistance; Notifies STA to add failure to PRA program.
		END EVENT 3

Event Description: “C” SG PORV spuriously opens, 0-AP-53.00 and 1-AP-38.00.

Cue: By Evaluator

Time	Position	Applicant’s Action or Behavior
	BOP	Diagnoses failure based on the following indications: “C” SG PORV RED open light LIT “C” SG SG PORV Demand ramping to 100% Rising CALCALC trends Multiple PCS alarms related to “C” SG parameters
	 BOP	0-AP-53.00 Perform Immediate Action Steps of 0-AP-53.00: [1] CHECK REDUNDANT INSTRUMENT CHANNEL(S) INDICATION – NORMAL *Identifies “C” SG pressure NORMAL*. [2] PLACE AFFECTED CONTROL(S)/ COMPONENT(S) IN MANUAL CONTROL AND STABILIZE PARAMETER USING REDUNDANT INDICATION **Places “C” SG PORV in Manual, and reduces demand to close the “C” SG PORV.** *Checks “C” SG PORV RED light out and GREEN light LIT.* *Reports Immediate Actions of 0-AP-53.00 complete.*
	 SRO RO BOP STA SRO	0-AP-53.00 Conducts a Transient Brief Summarizes Event and queries RO and BOP for Annunciators received and Critical Parameters. RO reports PCS alarms and CALCALC trend received. BOP reports SG parameters. STA will have no input for the Brief. SRO Concludes the Brief and continues 0-AP-53.00 at Step 3.
	 SRO BOP	0-AP-53.00 *3 CHECK REACTOR POWER – LESS THAN OR EQUAL TO 100% *Reports Actual Reactor Power and Trend using PCS 30-minute power indication.*

Event Description: “C” SG PORV spuriously opens, 0-AP-53.00 and 1-AP-38.00.

Cue: By Evaluator

Time	Position	Applicant’s Action or Behavior
		0-AP-53.00 **CAUTION** Prior to Step 4: If Reactor power has been affected by a secondary transient, Turbine adjustment may be needed to control Tave. **NOTES** prior to Step 4: • Step 4 failures are listed in order of performance priority. Only the failed instrument/control and associated step number should be read aloud. • When the affected instrument/controller malfunction(s) has been addressed by this procedure, recovery actions should continue at Step 11.
	SRO	*4. DETERMINE THE FAILED INSTRUMENT / CONTROL AND GO TO APPROPRIATE STEP OR PROCEDURE: • Steam Dumps / SG PORVs 1-AP-38.00
	BOP	*Reports Yes, SG “C” SG PORV*.
	SRO	Goes to 1-AP-38.00 **Note**: SRO may have directly entered 1-AP-38.00, Main Steam System Malfunction.
		1-AP-38.00 **NOTE** Prior to Step 1: Attachment 3 has one-line diagrams of steam dump permissive and modulating circuits.
	SRO	1. CHECK STEAM DUMP VALVES – CLOSED
	BOP	*Reports Yes, Steam Dumps closed*.

Event Description: “C” SG PORV spuriously opens, 0-AP-53.00 and 1-AP-38.00.

Cue: By Evaluator

Time	Position	Applicant’s Action or Behavior
		1-AP-38.00
	SRO	2. CHECK SG PORVS – CLOSED
	BOP	Reports, Yes “C” SG PORV closed, but was open.
		(**NOTE:** *If 1-AP-38.00 was entered directly, the report will be No, “C” SG PORV open, and the team will perform Step 2 RNO.)*
	SRO	2. RNO IF SG pressure greater than desired pressure, THEN check PORV(s) close when SG pressure lowers below desired pressure AND GO TO Step 3.
	BOP	*Reports No, “C” SG Pressure NORMAL.*
	SRO	IF SG pressure less than desired pressure, THEN do the following: a) Place affected PORV controller in Manual and close valve.
	BOP	*Reports Yes, “C” SG PORV in Manual and closed*. (**NOTE:** If 0-AP-53.00 was not performed, this is where the BOP will place the “C” SG PORV Controller in MANUAL, lower output to 0%, and verify the valve closes.)
	SRO	b) IF any SG PORV NOT closed, THEN do either of the following:
	BOP	*Reports No, PORV is closed.*
	SRO	c) Check associated MS line pressure transmitter (1-MS-PI-101A, B, C) for the affected PORV at the ASD Panel to determine if transmitter failure is cause of PORV failure.
	BOP	Directs BOP to dispatch Service Bldg Inside operator to check status of MS line pressure indicators on Aux Shutdown Panel. **Note**: Service Bldg Inside operator will report 1-MS-PI-101C indicates 800 psig. SRO continues to Step 3, while awaiting local report.
		1-AP-38.00
	SRO	3. CHECK THE FOLLOWING CONDITIONS: • Reactor power - LESS THAN OR EQUAL TO 100% • Turbine load – NORMAL
	BOP	*Reports Yes, reactor power is less than 100% and Turbine load is normal.*

Event Description: “C” SG PORV spuriously opens, 0-AP-53.00 and 1-AP-38.00.

Cue: By Evaluator

Time	Position	Applicant’s Action or Behavior
	SRO BOP	1-AP-38.00 **NOTES** prior to Step 4: • The power reductions required by Step 4 are intended for failures causing full or partial closure of a control valve, or if valve closure is required for maintenance. • 1-MS-FCV-104B has been upgraded to a different style valve and may start to drift closed with IA pressure less than 65 psig. 4. CHECK MAIN TURBINE AND MSR STEAM CONTROL VALVES: a) MSR Steam supply MOVs and FCVs – NORMAL b) Turbine Governor Valves and Stop Valves – NORMAL c) Reheat Stop and Intercept Valves – NORMAL *Reports Yes, Turbine and MST Steam Control Valves normal.*
	SRO BOP	1-AP-38.00 5. CHECK TURBINE MONITORING LIGHTS – NORMAL *Reports Yes, Turbine Monitoring Lights are normal.*
	SRO RO/BOP	1-AP-38.00 6. STABILIZE UNIT CONDITIONS: a) Adjust Turbine load as necessary b) Borate or dilute as necessary *Report Yes, Unit Conditions Stable*.
	SRO RO/BOP	1-AP-38.00 7. SUBMIT CONDITION REPORT AS NECESSARY *Acknowledge CR submission required.*

Event Description: "C" SG PORV spuriously opens, 0-AP-53.00 and 1-AP-38.00.

Cue: By Evaluator

Time	Position	Applicant's Action or Behavior
	SRO	1-AP-38.00 8. PROVIDE NOTIFICATIONS: • Shift Supervision • STA (PRA determination) • OMOC • MOC *SRO will contact Shift Manager; notify of failure, Unit Status, and procedure entered; request OMOC and I&C be notified.*
	SRO	1-AP-38.00 9. CHECK ABNORMAL CONDITION - CORRECTED 9 RNO: a) Consult with Shift Supervision. b) Submit Condition Report. c) IF problem of short term nature, THEN GO TO Step 10 when problem corrected. SRO will conduct a focus brief and discuss failure with the Crew; 1-AP-38.00 will be suspended until resolution by I&C.
		END EVENT 4

Event Description: Degraded Isophase Bus Duct Cooling, ARP 1G-E5 and 0-AP-23.00.

Cue: By Evaluator

Time	Position	Applicant's Action or Behavior
	BOP	Diagnoses failure based on the following indications: Alarms: 1G-E5, GEN LEADS CLG TRBL PCS Alarms for high Main Generator Phase Temperature Indications: Rising Main Generator "B" Phase Temperature on PCS (T2456A)
	BOP	ARP 1G-E5 **NOTE:** The following Computer points may be used to monitor duct temperature trend. • T2545A - 1-EP-TIS-IPBDA - Isolated Phase Bus Duct A Phase Air Temperature • T2546A - 1-EP-TIS-IPBDB - Isolated Phase Bus Duct B Phase Air Temperature • T2547A - 1-EP-TIS-IPBDC - Isolated Phase Bus Duct C Phase Air Temperature 1 SEND OPERATOR TO 1-EP-PNL-IPBD1, IPBD LOCAL ANNUNCIATOR PANEL 2 LOCALLY CHECK DROP – HIGH TEMPERATURE *Field operator will report Yes, the local drop is "High Temperature".*
	BOP	ARP 1G-E5 **NOTE:** Do not delay required actions while establishing portable fan cooling. 3. LOCALLY CHECK TEMPERATURE INDICATION ON 1-EP-PNL IPBD2, TEMPERATURE MONITORING SYSTEM • Phase Temp greater than 115°C / 239°F (Any of three phases) *Field operator will report local temperature <u>in Celsius</u>.*

Event Description: Degraded Isophase Bus Duct Cooling, ARP 1G-E5 and 0-AP-23.00.

Cue: By Evaluator

Time	Position	Applicant's Action or Behavior
		ARP 1G-E5
	BOP	4. REDUCE TURBINE LOAD BY 10% OF CURRENT LOAD AT NORMAL RAMP RATE
	SRO	*Directs the RO to review the Reactivity Plan for a 10% Turbine Load reduction at normal ramp rate.*
		Informs the team they are initiating 0-AP-23.00, Rapid Load Reduction.
		(0-AP-23.00 actions begin on the next page.)

Event Description: Degraded Isophase Bus Duct Cooling, ARP 1G-E5 and 0-AP-23.00.

Cue: By Evaluator

Time	Position	Applicant's Action or Behavior
	 SRO STA RO SRO	**Start of 0-AP-23.00** Conducts a Brief summarizing the Event and Establish priorities. The RO/BOP will report Annunciators received related to the event, and Critical Parameters affected. STA will have no input for the brief. Reactivity control during 0-AP-23.00 Ramp: 65 gallons of Boric Acid needed to reduce power to 90% using normal boration. Control Bank 'D' rod height at end of ramp 213 Steps. Completes Brief and continues with 0-AP-23.00.
	 SRO	0-AP-23.00 Caution Prior to Step 1: • Conservative decision-making must be maintained during rapid load reductions. Refer to Attachment 1 for trip criteria. Notes Prior to Step 1: • Actions that can be completed independently of preceding steps may be performed out of sequence as directed by the SRO • When the Turbine is not being actively ramped, the REFERENCE and SETTER values must remain matched to prevent inadvertent ramp. • Pre-planned reactivity plans located in the Main Control Room will be used as guidance for ramping down to the desired power level. • The ramp rate in IMP OUT is nonlinear and therefore pre-planned reactivity plans based on IMP IN are not as accurate. However, total amounts of boration and dilution can be used as guidance. • For ramp rates greater than or equal to 1%/minute, Rod Control should remain in Automatic if available.
	 RO	0-AP-23.00 1. **TURN ON ALL PRZR HEATERS**

Event Description: Degraded Isophase Bus Duct Cooling, ARP 1G-E5 and 0-AP-23.00.

Cue: By Evaluator

		0-AP-23.00 2. INITIATE PLANT LOAD REDUCTION AT 2%/MINUTE OR LESS:
	BOP	a) Verify turbine valve position - NOT ON LIMITER
		The turbine is NOT on the limiter.
	RO	b) Insert control rods in AUTO or MANUAL as necessary to maintain Tave and Tref within 5°F.
	SRO	a) Check or place Turbine in Operator Auto.
	BOP	d) **Verify or place turbine in IMP IN or IMP OUT as determined by Shift Supervision**
	SRO	The SRO can choose IMP IN or IMP OUT.
	BOP	e) **Adjust SETTER to desired power level** f) **Adjust LOAD RATE %/MIN thumbwheel to desired ramp rate (setting of 6 = 0.3%/minute)** g) **Initiate Turbine load reduction using OPERATOR AUTO (pushes the GO button)** h) **Reduce Turbine Valve Position Limiter as load decreases** The BOP will periodically reduce the limiter setpoint during the ramp.
		0-AP-23.00
	SRO	3. CHECK EMERGENCY BORATION – REQUIRED
	RO	*Report No, not required.*
	SRO	Goes to Step 3 RNO – GO TO Step 5.

Event Description: Degraded Isophase Bus Duct Cooling, ARP 1G-E5 and 0-AP-23.00.

Cue: By Evaluator

	RO	0-AP-23.00 5. ESTABLISH A NORMAL BORATION TO MAINTAIN CONTROL ROD POSITION ABOVE THE LO-LO INSERTION LIMITS IAW ATTACHMENT 4 Attachment 4 (Boration) and 5 (Manual Makeups) are at the end of this section. SRO may direct manual rod motion to maintain Δ flux within specified band.
	SRO	0-AP-23.00 Notes Prior to Step 6: • If at any time plant conditions no longer require rapid load reduction, actions should continue at Step 36. • RCS Tave must be maintained less than or equal to 577°F and RCS pressure must be maintained greater than or equal to 2205 psig. Tech Spec 3.12.F.1 should be reviewed if either parameter is exceeded. • I & C should be contacted to provide assistance with adjusting IRPIs.

Event Description: Degraded Isophase Bus Duct Cooling, ARP 1G-E5 and 0-AP-23.00.

Cue: By Evaluator

	RO	0-AP-23.00 6. CONTROL RAMP RATE TO MAINTAIN RCS PRESSURE GREATER THAN 2205 PSIG
	RO	0-AP-23.00 *7. CHECK LETDOWN ORIFICES – TWO IN SERVICE *Evaluator note: two orifices will already be in service.*
	BOP	0-AP-23.00 8. MONITOR STEAM DUMPS FOR PROPER OPERATION
	SRO	0-AP-23.00 9. NOTIFY THE FOLLOWING: • Energy Supply (MOC) • Polishing Building • Chemistry • OMOC
	SRO SM STA	0-AP-23.00 10. EVALUATE THE FOLLOWING: • EPIP applicability *The Shift Manager will review EPIPs for applicability. (They are not applicable.)* • VPAP-2802, NOTIFICATIONS AND REPORTS, applicability *If directed to review VPAP-2802. The STA reports completion of review of VPAP-2802 and required notifications discussed with SM.* *No further actions are required for this event.*
	SRO RO SRO	0-AP-23.00 11. CHECK RAMP WILL BE TO LESS THAN APPROXIMATELY 35% REACTOR POWER Reports No, ramping to 90% power. Goes to Step 11 RNO – GO TO Step 13.

Event Description: Degraded Isophase Bus Duct Cooling, ARP 1G-E5 and 0-AP-23.00.

Cue: By Evaluator

		0-AP-23.00
	SRO	*13. CHECK REACTOR POWER HAS LOWERED MORE THAN 15% IN ONE HOUR.
	RO	Reports No, Reactor power will not be lowered more than 15% in one hour.
	SRO	Goes to Step 13 RNO – GO TO Step 15.
		0-AP-23.00
	SRO	**CAUTION:** Secondary plant evolutions affecting Feedwater Flow or temperature will affect RCS temperature and Reactor Power. This effect will be greater at beginning of core life due to a lower value for isothermal temperature coefficient. The operating team must be prepared to mitigate the effects of the secondary evolutions on the RCS.
		15. AT APPROXIMATELY 70% REACTOR POWER CHECK AUXILIARY STEAM MAINTAINING BETWEEN 160 AND 180 PSIG.
		END EVENT #5

Event Description: Degraded Isophase Bus Duct Cooling, ARP 1G-E5 and 0-AP-23.00.

Cue: By Evaluator

		0-AP-23.00 Attachment 4 (NORMAL BORATION) Actions
	RO	1. **Place the MAKE-UP MODE CNTRL switch in the STOP position.**
	RO	2. **Adjust 1-CH-YIC-1113 to desired total gallons**
	RO	3. **Adjust 1-CH-FC-1113A to desired flow rate.**
	RO	4. **Place the MAKE-UP MOD SEL switch in the BORATE position**.
	RO	5. **Place the MAKE MODE CNTRL switch in the START position.**
	RO	6. Verify proper valve positions.
	RO	7. Adjust boration rate using 1-CH-FC-1113A, as necessary.
	RO	8. WHEN boration is complete, THEN perform the following. IF boric acid is to remain in the Blender to support ramping the Unit, THEN enter N/A. a) Manually blend approximately 20 gallons to flush the boration path IAW Attachment 5, Manual Makeups. b) Enter N/A for the remaining steps in this Attachment. *Attachment 5 is on the next page*
	RO	9. Verify controllers for Primary Grade water and Boric Acid are set correctly.
	RO	10. **Place the MAKE-UP MODE SEL switch in the AUTO position.**
	RO	11. **Place the MAKE-UP MODE CNTRL switch in the START position.**
	RO	12. Notify Shift Supervision of blender status.

Event Description: Degraded Isophase Bus Duct Cooling, ARP 1G-E5 and 0-AP-23.00.

Cue: By Evaluator

		0-AP-23.00 Attachment 5 (Manual Makeups) Actions
		1. Place the MAKE-UP MODE CNTRL switch in the STOP position.
		2. Check controllers for the flow rate of Boric Acid and Primary Grade water are set correctly.
		3. Check integrators for the gallons of Boric Acid and Primary Grade water are set correctly.
		4. Place the MAKE-UP MODE SEL switch in the MANUAL position.
		5. Place the MAKE-UP MODE CNTRL switch in the START position.
		6. Open 1-CH-FCV-1113B, BLENDER TO CHG PUMP.
		7. Check proper valve positions.
		8. WHEN the Manual Makeup operation is complete, THEN place 1-CH-FCV-1 113B in the AUTO position
		9. Place the MAKE-UP MODE CNTRL switch in the STOP position.
		10. Check or place the control switches in the AUTO position.
		11. Check controllers for Primary Grade water and Boric Acid are set correctly.
		12. Place the MAKE-UP MODE SEL switch in the AUTO position.
		13. Place the MAKE-UP MODE CNTRL switch in the START position.
		14. Notify Shift Supervision of blender status.

Event Description: SG Tube Leak 20 gpm, A/E Auto Functions Fail,

Cue: By Evaluator.

Time	Position	Applicant's Action or Behavior
	Team BOP SRO	Diagnose SGTL B SG based on the following: Alarms: • 1A-B3 N-16 ALERT • 1A-A3 N-16 HIGH • RM-G8 CNDSR AIR EJECTOR ALERT/FAILURE • RM-H8 1-SV-RI-111 HIGH Indications: • Increasing trend on 1-MS-RR-193, Control Room N16 Trend Recorder, from Normal to 200 GPD. • STM LINE B Trend will Lead STM LINE A and STM LINE B. Perform ARP 1A-A3, N-16 HIGH. *Note: ARP 1A-A3 is included in this guide after ARP 1-RM-H8.* Direct Unit 2 to Perform Annunciator Response Procedure for A/E Alert and High Alarms. *Note: Unit 2 Operator will perform ARP for A/E RM Alarms. Unit 2 will hand Page 3 and 4 of RM-H8 ARP to BOP to check Auto Actions complete; following E-0 Team Brief.*
	BOP	ARP RM-H8, A/E RM HIGH (Unit 2 will hand the ARP to the BOP at Step 6) NOTE: On a high alarm, air ejector gaseous effluent is diverted from vent stack to containment. 6. CHECK AUTOMATIC ACTIONS – VALVES POSITIONED AS FOLLOWS: • 1-SV-TV-103 – CLOSED **Identifies 1-SV-TV-103 Open, places control switch in CLOSE.** • 1-SV-TV-102 – OPEN **Identifies 1-SV-TV-102 Closed, places control switch in OPEN**.
	BOP	RM-H8 7. CHECK AIR EJECTOR VENT TO CTMT VV - OPEN • 1-SV-TV-102A *Identifies 1-SV-TV-102A open* *Report to SRO that A/E manually aligned to containment.* ***Note:*** *No other verifiable actions are in this ARP.*

Event Description: SG Tube Leak 20 gpm, A/E Auto Functions Fail,

Cue: By Evaluator.

Time	Position	Applicant's Action or Behavior
	BOP	RM-H8 8. LOCALLY CHECK PROPER AIR EJECTOR OPERATION AND LOOP SEAL INTACT *Direct Field operator to locally check Air Ejector operation and loop seals intact.*
	BOP	RM-H8 9. CHECK FLOW RATE MEASURING DEVICES – OPERABLE: • 1-CN-SC-1A • 1-CN-SC-1B *Direct Field operator to locally check Air Ejector flow rates*
	BOP	RM-H8 10. PROVIDE NOTIFICATIONS AS NECESSARY: • Shift Supervision • OMOC • STA • Health Physics • Instrumentation Department *Informs the SRO of required notifications.*

Event Description: SG Tube Leak 20 gpm, A/E Auto Functions Fail,

Cue: By Evaluator.

Time	Position	Applicant's Action or Behavior
	BOP	ARP 1A-A3, N-16 HIGH NOTES before Step 1: • N-16 Radiation Monitor setpoints are available in the NI/Radiation Monitor information book. • N-16 Radiation Monitor readings are invalid when Reactor power is less than 25%. 1. CHECK REACTOR POWER – GREATER THAN 25% *Identifies Reactor power is greater than 25% (value depending on ramp in progress).*
	BOP	1A-A3 2. CHECK N-16 RECORDER - ANY MONITOR READING GREATER THAN OR EQUAL TO HIGH SETPOINT • 1-MS-RR-193 *Identifies all three monitors reading greater than setpoint.*
	BOP	1A-A3 NOTE before Step 3: A Steam Generator tube leak of 150 gpd equates to 0.1 gpm. Leaks of this size will probably not cause an observable change in primary system parameters. 3. CHECK RCS LEAK RATE: • PRZR level – DECREASING OR • Annunciator 1D-E5, CHG PP TO REGEN HX HI-LO FLOW – LIT OR • A discernible negative change in VCT level trend has developed *Depending on the control of the ramp, the team may identify a discernable negative change in VCT level trend.*
	BOP SRO	1A-A3 4. INITIATE 1-AP-16.00, EXCESSIVE RCS LEAKAGE Direct the RO to perform the Immediate Action Steps of 1-AP-16.00.

Op-Test No.: Surry 2021-1 Scenario No.: 5 Event No.: 6 Page 35 of 90

Event Description: SG Tube Leak 20 gpm, A/E Auto Functions Fail,

Cue: By Evaluator.

Time	Position	Applicant's Action or Behavior
	RO RO	1-AP-16.00 NOTE: • If SI Accumulators are isolated, 1-AP-16.01, SHUTDOWN LOCA, should be used for guidance. • RCS average temperature has a direct impact on pressurizer level. [1] ___ MAINTAIN PRZR LEVEL: • Isolate Letdown **Close 1-CH-LCV-1460A and 1-CH-LCV-1460B** • Control Charging flow **Place 1-CH-FCV-1122, CH Flow Control Valve, in Manual.** *Monitor CH Flow on 1-CH-FI-1122* **Identify RCS leak rate less than the capacity of a single CH pump.** *Continue adjustment of CH flow to quantify leak rate to determine if reactor trip required*
	SRO	1-AP-16.00 Upon report of completion of Immediate Action Step of 1-AP-16.00, Perform a commensurate brief; continue to Step 2 of 1-AP-16.00.
	SRO RO	1-AP-16.00 2. CHECK THE FOLLOWING PARAMETERS - STABLE OR INCREASING • PRZR level • PRZR pressure • RCS subcooling Report that PRZR Level is rising; Pressure and Subcooling are stable *RO continues actions to quantify leakrate*
	SRO RO	1-AP-16.00 3. PLACE THE FOLLOWING COMPONENTS IN OFF: • CTMT sump pumps **Places 1-DA-P-4B control switch on OFF** • CTMT vacuum pumps **Places 1-CV-P-1A control switch in OFF**

Event Description: SG Tube Leak 20 gpm, A/E Auto Functions Fail,

Cue: By Evaluator.

Time	Position	Applicant's Action or Behavior
		1-AP-16.00
	SRO	NOTE before Step 4: Shift Supervision and STA must remain informed of RCS leak rate for EPIP applicability.
	SRO	4. CHECK REACTOR TRIP – REQUIRED • Leak rate - GREATER THAN 50 GPM OR • Adequate makeup not being provided by blender
	RO	Reports RCS leak rate is less than 50 gpm.
	SRO	GO TO Step 7. **NOTE**: *Due to transient on RCS caused by Ramp for previous event, exact quantification of leak rate will be difficult.*
		1-AP-16.00
	SRO	7. CHECK SECONDARY RADIATION - NORMAL OR STABLE IF THERE IS PRE-EXISTING TUBE LEAK • Air Ejector Rad Monitor • SG Blowdown Rad Monitors • Main Steam Line Rad Monitors • Secondary sample • N-16 Rad Monitors
	RO	Reports No, secondary radiation is not normal, based on multiple secondary RM alarms in.
	SRO	Goes to Step 7 RNO:
		1-AP-16.00
	SRO	Step 7 RNO: Do the following: a) Consult with Shift Manager. b) IF Reactor trip NOT required, THEN initiate 1-AP-24.00, MINOR SG TUBE LEAK.
	RO	Reports Reactor trip is not required. **NOTE:** *Performing 1-AP-24.00 is not part of this scenario. If not done already, the next event (SGTR) is to be initiated at this time.*
		END EVENT 6

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
	 RO RO	Diagnose SGTR B SG based on the following: Indications: • Change in Pressurizer level trend. • Change in B SG Level trend • Change in B MS Rad Monitor trend Alarms: • 1C-B8 PRZR LO PRESS • 1C-D8 PRZR LO LVL • 0-RMA-A2 UNIT 1 MN STM ABC RAD ON ALERT / HI 1-AP-16.00 *(Performed a second time)* NOTE: • If SI Accumulators are isolated, 1-AP-16.01, SHUTDOWN LOCA, should be used for guidance. • RCS average temperature has a direct impact on pressurizer level. [1] MAINTAIN PRZR LEVEL: • Isolate Letdown • Control Charging flow **With 1-CH-FCV-1122, CH Flow Control Valve, already in Manual, raises flow to maximum.** Reports Immediate Actions of 1-AP-16.00 are complete.
	 SRO	1-AP-16.00 Upon report of completion of Immediate Action Step of 1-AP-16.00, Perform a commensurate brief; continue to Step 2 of 1-AP-16.00.
	SRO RO	1-AP-16.00 2. CHECK THE FOLLOWING PARAMETERS - STABLE OR INCREASING • PRZR level • PRZR pressure • RCS subcooling Reports that PRZR Level, Pressure and Subcooling are all lowering. Goes to Step 2 RNO.
	 SRO	1-AP-16.00 Step 2 RNO. GO TO 1-E-0, REACTOR TRIP OR SAFETY INJECTION. Directs RO to perform 1-E-0 Immediate Actions.

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
	RO	1-E-0, Reactor Trip or Safety Injection [1] CHECK REACTOR TRIP: a) Manually trip reactor **Pushes a reactor trip pushbutton.** b) Check the following: • All Rods On Bottom light – LIT • Reactor trip and bypass breakers – OPEN • Neutron flux – DECREASING *Reports "Reactor Tripped" at completion of Step 1.*
	RO	1-E-0 [2] CHECK TURBINE TRIP: a) Manually trip the turbine **Pushes the turbine trip push buttons.** b) Check all turbine stop valves - CLOSED c) **Isolate reheaters by closing MSR steam supply SOV** • **1-MS-SOV-104** d) Verify generator output breakers – OPEN (Time Delayed) *Reports "Turbine Tripped" at completion of Step 2.*
	RO	1-E-0 [3] VERIFY BOTH AC EMERGENCY BUSES – ENERGIZED *Reports "Both AC Emergency Buses Energized" at completion of Step 3.*

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
		1-E-0
	RO	[4] CHECK IF SI INITIATED: a) Check if SI is actuated: • LHSI pumps – RUNNING • SI annunciators – LIT • A-F-3 SI INITIATED – TRAIN A • A-F-4 SI INITIATED – TRAIN B
	RO	RO will determine that SI has not occurred and perform step 4a RNO actions: 4a RNO Check if SI is required or imminent as indicated by any of the following: • Low PRZR pressure • High CTMT pressure • High steamline differential pressure • High steam flow with low Tave or low line pressure IF SI is required, THEN GO TO Step 4b. *Determines SI is imminent.* **Manually depresses SI Initiation pushbuttons.** **NOTE:** *The SRO may have directed the RO to manually initiate SI at Step 4 of 1-E-0. In that case, the RO will have already determined that SI is imminent.*
	RO	RO reports "1-E-0 Immediate Actions are complete, SI is in service" after completion of Step 4. After the immediate actions of 1-E-0 are reported as complete, the SRO will check off immediate action steps in his copy of 1-E-0 and conduct a commensurate brief. During the Brief RO/BOP reports that ALL RCPs are tripped. Identify 1B SG experiencing a SG Tube Rupture.
	STA	*The STA will have nothing to add to the brief.*
	SRO	Establish priorities at Brief End, RO: • 1-E-0, Attachment 9, RUPTURED SG ISOLATION AND AFW FLOW CONTROL. BOP: • 1-E-0 Attachments 1, 2, and 3. • Throttle AFW to the SGs IAW Attachment 8 of AP-24.01. • Contact Service Building Operator to check status of RCP breakers.

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
	SRO/BOP	1-E-0 5. Initiate Attachment 1 (***Attachment 1, 2, and 3 actions contained under last section of Event 9***.
	SRO/RO	SRO may direct the RO to perform Attachment 9 of 1-E-0 for Ruptured SG Isolation and AFW Control. This may or may not be initiated at any time during the performance of E-0. ***Attachment 9 actions are contained at the end of this section***.
	SRO RO SRO RO	1-E-0 CAUTION before Step 6: 1-MS-15 may need to be closed to stop RCS cooldown and 1-MS-17 opened to supply AS to GS. *6. CHECK RCS AVERAGE TEMPERATURE • STABLE AT 547°F OR • TRENDING TO 547°F *Reports No, Tave less than 547°F and lowering.* Goes to Step 6 RNO. **NOTE:** *Based on the duration of the 1-E-0 transient brief, RCS Tave may not be lowering at this time.* 6. RNO: IF temperature less than 547°F AND lowering, THEN do the following: a) Stop dumping steam. b) IF cooldown continues, THEN control total feed flow. Maintain total feed flow greater than 350 gpm [450 gpm] until narrow range level greater than 12% [18%] in at least one SG. c) IF RCS cooldown is occurring, THEN close 1-MS-15 AND open 1-MS-17 to align AS to GS. d) IF cooldown continues, THEN close MSTVs. **Throttles total AFW flow to stop RCS cooldown.**

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
	SRO	1-E-0 7. CHECK PRZR PORVs AND SPRAY VALVES: a) PRZR PORVs – CLOSED b) PRZR spray controls • Demand at Zero (or) • Controlling Pressure c) PORV block valves - AT LEAST ONE OPEN
	SRO RO	1- E-0 NOTE before Step 8: Seal injection flow should be maintained to all RCPs. *8. CHECK RCP TRIP AND MINIFLOW RECIRC CRITERIA: a) Charging Pumps – AT LEAST ONE RUNNING AND FLOWING TO RCS Two or three Charging pumps will be running and flowing to the RCS. b) RCS subcooling - LESS THAN 30°F [85°F] RCS subcooling will NOT be less than 30 °F RNO for the step is to go to step 9.

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
	 SRO RO	1-E-0 9. CHECK IF SGs ARE NOT FAULTED: • Check pressures in all SGs a) STABLE OR INCREASING AND b) GREATER THAN 100 PSIG Reports a slightly decreasing trend on SG pressures. This will be attributed to the RCS cooldown. The team will not transition to 1-E-2.
	 SRO RO SRO	1-E-0 10. CHECK IF SG TUBES ARE NOT RUPTURED: • Condenser air ejector radiation – NOT NORMAL • SG blowdown radiation – NOT NORMAL • SG MS radiation – NORMAL • TD AFW pump exhaust radiation – NORMAL • SG NR Level - NOT INCREASING IN AN UNCONTROLLED MANNER Reports No, 'B' SG NR level going up uncontrollably. RNO: GO TO 1-E-3, STEAM GENERATOR TUBE RUPTURE.
	SRO STA	The team will hold a transition brief. During the brief it will be identified that 'B' SG is ruptured, current isolation status of the ruptured SG and that the team is transitioning to 1-E-3. *The STA will have nothing to add to the transient brief.*

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
		BEGIN Step 1, 1-E-3:
	SRO	NOTE before Step 1: Seal injection flow should be maintained to all RCPs.
		*CHECK RCP TRIP AND MINIFLOW RECIRC CRITERIA:
		a) Charging Pumps – AT LEAST ONE RUNNING AND FLOWING TO RCS
	RO	*RO will identify that two charging pumps are running.*
	SRO	b) RCS subcooling - LESS THAN 30°F [85°F]
	RO	*RO will identify that RCS subcooling is greater than 30°F*
	SRO	Goes to Step 1 RNO - GO TO step 2
		1-E-3
	SRO	2. IDENTIFY RUPTURED SG(s):
		• Unexpected rise in any SG narrow range level OR • High radiation from any SG MS line monitor OR • High radiation from any SG blowdown line OR • High radiation from any SG sample
	RO	Reports 'B' SG NR level rising unexpectedly.

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
	SRO	1-E-3 CAUTIONS before Step 3: • If the TD AFW pump is the only available source of feed flow, steam supply to the TD AFW pump must be maintained from at least one SG. • At least one SG must be maintained available for RCS cooldown. 3. ISOLATE RUPTURED SG(s): a) Adjust ruptured SG PORV controller setpoint to 1035 psig b) Check ruptured SG(s) PORV – CLOSED c) Verify blowdown TVs from ruptured SG(s) – CLOSED d) Locally close steam supply valve(s) to TD AFW pump: • 1-MS-120 for 'B' SG
	RO	*If 1-MS-120 not closed iaw attachment 9 of 1-E-0, then a field operator will be dispatched to close it at this time.* e) **Close ruptured SG(s) MSTV (1-MS-TV-101B**)

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
		1-E-3
	SRO	CAUTION before Step 4: If any ruptured SG is faulted, feed flow to that SG should remain isolated during subsequent recovery actions unless needed for RCS cooldown.
		*4. CHECK RUPTURED SG LEVEL: a) Narrow range level – GREATER THAN 12% [18%] b) Stop feed flow to ruptured SG(s)
	RO	**Identifies 'B' SG level >12%, closes 1-FW-MOV-151C/D to isolate AFW Flow**
	SRO	c) Check ruptured SG AFW MOVs auto-open signal – DEFEATED
		Identifies auto-open signal not defeated, SRO goes to Step 4 c) RNO
	RO	**NOTE***: BOP may have performed the following IAW Attachment 9.*
		1) Select the ruptured SG AFW MOVs using the following switches: • **H TRAIN DISABLE SELECTOR SWITCH (C)** • **J TRAIN DISABLE SELECTOR SWITCH (D)**
		2) Defeat the auto-open signal for the selected MOVs by placing the following key switches in the DISABLE SELECTED position: • **H TRAIN AUTO OPEN ENABLE SWITCH** • **J TRAIN AUTO OPEN ENABLE SWITCH**
		1-E-3
	SRO	CAUTION before Step 5: Major steam flow paths from the ruptured SG(s) should be isolated before initiating RCS cooldown.
		5. CHECK RUPTURED SG(S) PRESSURE - GREATER THAN 350 PSIG
	RO	*Reports Yes, 'B' SG pressure ~ 1000 psig.*

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
	 SRO RO	1-E-3 *6. CHECK LOW PRZR PRESS SI SIGNAL – BLOCKED • Permissive Status light C-2 – LIT *Identifies PSL C-2 is LIT*. **NOTE**: *BOP should have completed this action in E-0, Attachment 1.*
	 SRO RO SRO RO	1-E-3 *7. CHECK LOW TAVE SI SIGNAL – BLOCKED • Permissive Status light F-1 – LIT Identifies PSL F-1 NOT LIT. <u>WHEN</u> Tave less than 543°F, <u>THEN</u> do the following: **a) Turn both HI STM FLOW & LO TAVG OR LP switches to block.** b) Check Permissive Status light F-1 - LIT. **NOTE**: *These actions may be performed after the 1-E-3 cooldown is initiated.* **NOTE**: *BOP may have completed this action in E-0, Attachment 1, if Tave was allowed to lower below 543°F.*
	 SRO SRO/BOP	1-E-3 CAUTIONS and NOTE before Step 8: **CAUTION**: • Flow on each Main Steamline should be kept less than 1.0 x 10^6 PPH to prevent Main Steamline isolation during RCS cooldown with the Steam Dumps. • If no RCPs are running, RCS cooldown and depressurization may cause a false Integrity Status Tree indication on the ruptured loop. The Cold Leg indication on the ruptured loop should be disregarded until after the performance of Step 36. **NOTE**: RCP trip criteria does NOT apply after initiation of an operator controlled cooldown. 8. INITIATE RCS COOLDOWN: a) Determine required core exit temperature (ONE TIME): Concur Target CETC temperature 485 °F if SG pressure between 901 and 1000 psig, or 495° if SG pressure between 1001 and 1085 psig.

Op-Test No.: Surry 2021-1 Scenario No.: 5 Event No.: 7 Page 47 of 90

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
		1-E-3
	SRO	Step 8, continued:
	BOP	b) **Place Steam Dump Mode Select switch in Steam Pressure mode**
	RO	c) Check RCS Tave - LESS THAN 543°F
	BOP \	d) **Place the STM DUMP CNTRL switch in BYP INTLK and then return to ON**
	RO	e) Check Bypass Status light D-2 – LIT
	BOP	f) **Dump steam to condenser from intact SG(s) at maximum rate**
	SRO	g) Check CETCs - LESS THAN REQUIRED TEMPERATURE
		When RCS Temperature < 543°F, SRO will direct the block of HSF SI and check of PSL F-1 LIT. *When RCS pressure < 2000 psig, SRO will direct the block of Low Pressure/Header-to-Line SI Signal, and check the PSL C-2 LIT.*
	RO	**Performs the Block of SI Signals and check of PSLs when directed**.
		h) Stop RCS cooldown
	RO	**When target CETC Temperature reached, RO throttles back on steam dumps.**
	SRO	i) Maintain CETCs - LESS THAN REQUIRED TEMPERATURE
		SRO will direct a band for control of CETC temperature.
		1-E-3
	SRO	*9. CHECK INTACT SG LEVELS:
		a) Any narrow range level – GREATER THAN 12% [18%]
		b) Check emergency buses – BOTH ENERGIZED
		c) Control feed flow to maintain narrow range level between 22% and 50%
	RO/BOP	**Adjust AFW to restore "A" and "C" SG NR Level to 22-50%.**

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
	SRO	1-E-3 **CAUTION before Step 10:** If any PRZR PORV opens because of high PRZR pressure, the PORV must be verified closed or isolated after pressure lowers to less than 2335 psig. *10. CHECK PRZR PORVs AND BLOCK VALVES: a) Power to PRZR PORV block valves – AVAILABLE b) PRZR PORVs – CLOSED c) PRZR PORV block valves - AT LEAST ONE OPEN
	SRO RO	1-E-3 11. RESET BOTH TRAINS OF SI *Push SI Reset Pushbuttons if SI not previously reset*.
	SRO RO	1- E-3 12. RESET CLS: a) Check CTMT pressure – HAS EXCEEDED 17.7 psia *Report No, CTMT has not exceeded 17.7 psia.* RNO a) GO TO Step 13.
	SRO RO SRO RO SRO RO	1-E-3 13. CHECK INSTRUMENT AIR AVAILABLE: a) Check annunciator B-E-6 - NOT LIT *Report Yes, B-E-6 Not Lit*. b) Check at least one CTMT IA compressor – RUNNING • 1-IA-C-4A or 1-IA-C-4B *Report Yes, 1-IA-C-4A running* c) Check 1-IA-TV-100 – OPEN *Report Yes, 1-IA-TV-100 open*.

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
		1- E-3
	SRO	14. ALIGN CONDENSER AIR EJECTOR TO CTMT:
		a) Check the following:
		• 1-SV-TV-102 – OPEN • 1-SV-TV-103 – CLOSED
	RO	*Reports valves in required position. <u>Valves Manually Aligned by BOP on A/E RM auto failure during Event 6</u>.*
	SRO	b) Open the following valve: • 1-SV-TV-102A
	RO/BOP	**Opens 1-SV-TV-102A**.
		1- E-3
	SRO	CAUTION before Step 15: RCS pressure should be monitored. If RCS pressure decreases in an uncontrolled manner to less than 250 psig [400 psig], one LHSI pump must be manually restarted to supply water to the RCS.
		*15. CHECK IF LHSI PUMPS SHOULD BE STOPPED:
		a) Check LHSI pumps - ANY RUNNING WITH SUCTION ALIGNED TO RWST
	RO	*Reports one LHSI pump running with suction aligned to RWST*.
		b) RCS pressure – GREATER THAN 250 PSIG [400 PSIG]
	RO	*Reports RCS pressure greater than 250 psig*.
		c) Stop LHSI pumps and put in AUTO
	RO	**Stops running LHSI pump and places in AUTO**.

Op-Test No.: Surry 2021-1   Scenario No.: 5   Event No.: 7   Page 50 of 90

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
	 SRO RO/BOP SRO RO/BOP SRO RO/BOP	1- E-3 16. CHECK IF RCS COOLDOWN SHOULD BE STOPPED: a) Check CETCs - LESS THAN REQUIRED TEMPERATURE *Reports CETCs < required temperature* b) Stop RCS cooldown *Reports RCS Coodown stopped*. c) Maintain CETCs - LESS THAN REQUIRED TEMPERATURE *Reports that RCS temperature being maintained in required band*.
	 SRO BOP	1-E-3 17. CHECK RUPTURED SG(s) PRESSURE - STABLE OR INCREASING Reports Yes, "B" SG pressure stable.
	 SRO BOP	1-E-3 18. CHECK RCS SUBCOOLING BASED ON CETCs - GREATER THAN 50°F [105°F] Reports indicated subcooling value.
	 SRO RO	1-E-3 19. DEPRESSURIZE RCS TO MINIMIZE BREAK FLOW AND REFILL PRZR: a) Check normal spray – AVAILABLE • RCP C AND 1-RC-PCV-1455B - BOTH AVAILABLE OR • RCPs A and B, AND 1-RC-PCV-1455A – BOTH AVAILABLE *Identifies No pressurizer spray available, SRO Goes To Step 19 a) RNO – GO TO Step 20.*

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
		1-E-3
	SRO	CAUTIONS and NOTE before Step 20: **CAUTION:** • The PRT may rupture if a PRZR PORV is used for RCS depressurization. Rupturing the PRT may result in abnormal containment conditions. • Cycling of the PRZR PORV should be minimized. **NOTE:** The upper head region may void during RCS depressurization if RCPs are not running. This will result in a rapidly increasing PRZR level. 20. DEPRESSURIZE RCS USING PRZR PORV TO MINIMIZE BREAK FLOW AND REFILL PRZR: a) PRZR PORV - AT LEAST ONE AVAILABLE b) Open one PRZR PORV until ANY of the following conditions satisfied: (Attachment 3 lists conditions) • PRZR level - GREATER THAN 69% <u>OR</u> • RCS subcooling based on CETCs - LESS THAN 30°F [85°F] <u>OR</u> • BOTH of the following exist: 1) RCS pressure - LESS THAN RUPTURE SG(s) PRESSURE 2) PRZR level - GREATER THAN 22% [50%]
	RO	**When Attempt Made to open 1-RC-PCV-1455C, PCV will Not Open.**
	SRO	**Transition to 1-ECA-3.3**

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

Time	Position	Applicant's Action or Behavior
	RO/BOP	ATTACHMENT 9 of 1-E-0 1. Check SI is in progress. <u>IF</u> SI <u>NOT</u> in progress, <u>THEN</u> RETURN TO procedure step in effect. RO/BOP identifies that SI is in progress.
	RO/BOP	ATTACHMENT 9 of 1-E-0 2. Identify Ruptured SG by one of the following conditions: • Unexpected rise in any SG Narrow Range level • High radiation from any SG MS line monitor • High radiation from any SG Blowdown line Identifies 'B' SG as the ruptured SG
	RO/BOP	ATTACHMENT 9 of 1-E-0 3. Check running or start AFW Pumps, as necessary • 1-FW-P-3A • 1-FW-P-3B • 1-FW-P-2
	RO/BOP	ATTACHMENT 9 of 1-E-0 4. When ruptured SG Narrow Range level is greater than 12%, then isolate feed flow to ruptured SG by closing SG AFW Isolation MOVs: • SG B, 1-FW-MOV-151C and 1-FW-MOV-151D **RO/BOP closes 1-FW-MOV-151C/D when SG level is greater than 12% Narrow Range**. ***This step Completes Critical Task CT-3; Isolate feed flow to the ruptured SG before "B" SG NR Level reaches 100%.***
	RO/BOP	ATTACHMENT 9 of 1-E-0 5. Select the ruptured SG AFW MOVs using the following switches: • H TRAIN DISABLE SELECTOR SWITCH • J TRAIN DISABLE SELECTOR SWITCH

Event Description: SGTL becomes SGTR (600) gpm, AP-16.00, E-0, RCPs trip on swap to RSST, E-3.

Cue: By Evaluator, prior to entry to 1-AP-24.00.

	RO/BOP	ATTACHMENT 9 of 1-E-0 6. Disable the auto-open signal for the selected MOVs by placing the following keyswitches in the DISABLE SELETED position: • **H TRAIN AUTO OPEN ENABLE SWITCH** • **J TRAIN AUTO OPEN ENABLE SWITCH**
	RO/BOP	ATTACHMENT 9 of 1-E-0 CAUTION: At least one SG must be maintained available for RCS heat sink. 7. Locally close steam supply valve to the TD AFW pump: • SG B, 1-MS-120 RO/BOP directs field operator to close 1-MS-120. *The field operator will acknowledge the requirement to close 1-MS-120. The field operator will later report that 1-MS-120 is closed.*
	RO/BOP	ATTACHMENT 9 of 1-E-0 8. Control Feed Flow to the SG IAW the following requirements: • Minimum AFW flow is 350 gpm with SI initiated, until one SG Narrow Range level is greater than 12% • When minimum heat sink has been verified, AFW MOVs should be controlled to maintain intact SG Narrow Range levels between 22% and 50%. • SG A, 1-FW-MOV-151E and 1-FW-MOV-151F • SG C, 1-FW-MOV-151A and 1-FW-MOV-151B
	RO/BOP	ATTACHMENT 9 of 1-E-0 9. Isolate AFW header with deenergized Emergency Bus MOVs by closing the following header isolation valves *No Emergency Bus MOVs are deenergized.*
		END EVENT #7

Event Description: 1-RC-PCV-1455C not open, 1-ECA-3.3

Cue: Transition from 1-E-3.

Time	Position	Applicant's Action or Behavior
		1-ECA-3.3 Actions
	SRO	**CAUTION:** If no RCPs were running during the cooldown performed in 1-E-3, SI flow may cause a false Integrity Status Tree indication on the ruptured loop. The Cold Leg indication on the ruptured loop should be disregarded until after the performance of Step 21.
		1. CHECK RUPTURED SG(S) NARROW RANGE LEVEL - LESS THAN 75% [73%]
	RO	*Reports that 'B' SG Level is greater than 75%.*
	SRO	1. RNO - GO TO Step 6
		1-ECA-3.3
	SRO	6. CHECK IF SI CAN BE TERMINATED:
		a) Check RCS subcooling based on CETCs - GREATER THAN 30°F [85°F]
	RO/BOP	*Identifies that RCS subcooling is greater than 30°F.*
		b) Check secondary heat sink: • Total feed flow to SGs – GREATER THAN 350 GPM [450 GPM] AVAILABLE OR • Narrow range level in at least one intact SG - GREATER THAN 12% [18%]
	RO/BOP	*Identifies That >350 gpm AFW Available, and "A" and "C" SG NR level >12%.*
	SRO	c) Check RVLIS indication - GREATER THAN VALUE FROM TABLE

RCPs Running	RVLIS INDICATION	
	Full Range	Dynamic Range
0	GREATER THAN 63%	
1		GREATER THAN 36%
2		GREATER THAN 51%
3		GREATER THAN 82%

Time	Position	Applicant's Action or Behavior
	RO/BOP	*Identify that RVLIS Full Range is Greater than 63%.*

Event Description: 1-RC-PCV-1455C not open, 1-ECA-3.3

Cue: Transition from 1-E-3.

Time	Position	Applicant's Action or Behavior
	SRO BOP	1-ECA-3.3 Step 6, continued: d) Check any ruptured SG narrow range level - INCREASING IN AN UNCONTROLLED MANNER OR OFFSCALE HIGH *Identify that 'B' SG Level is Off-Scale High*.
	SRO RO	7. STOP ALL BUT ONE CHG PUMP AND PUT IN AUTO **Secure one of the running charging pumps**
	SRO RO RO	8. ISOLATE HHSI TO COLD LEGS: a) Verify the following: 1) CHG pump suctions from RWST - OPEN • 1-CH-MOV-1115B • 1-CH-MOV-1115D 2) Check CHG pump miniflow recirc valves - OPEN • 1-CH-MOV-1275A • 1-CH-MOV-1275B • 1-CH-MOV-1275C • 1-CH-MOV-1373 b) Close HHSI to Cold Leg: • **1-SI-MOV-1867C** • **1-SI-MOV-1867D** • 1-SI-MOV-1842
		END Event 8 **End Scenario**

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

	BOP	Attachment 1 OF E-0 1. CHECK FW ISOLATION: • Feed pump discharge MOVs – CLOSED • 1-FW-MOV-150A • 1-FW-MOV-150B • MFW pumps – TRIPPED • Feed REG valves – CLOSED • SG FW bypass flow valves – DEMAND AT ZERO • SG blowdown TVs – CLOSED
	BOP	Attachment 1 OF E-0 2. CHECK CTMT ISOLATION PHASE I: • Phase I TVs – CLOSED • 1-CH-MOV-1381 – CLOSED • 1-SV-TV-102A – CLOSED • PAM isolation valves – CLOSED • 1-DA-TV-103A • 1-DA-TV-103B **BOP will identify 1-DA-TV-100A/B, and 1-MS-TV-109 OPEN and CLOSE them.**
	BOP	Attachment 1 OF E-0 3. CHECK AFW PUMPS RUNNING: a) MD AFW pumps – RUNNING (Time Delayed) b) TD AFW pump - RUNNING IF NECESSARY

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

	BOP	Attachment 1 of 1-E-0 4. CHECK SI PUMPS RUNNING: • CHG pumps – RUNNING • LHSI pumps – RUNNING **BOP starts 1-SI-P-1B**
	BOP	Attachment 1 OF 1-E-0 5. CHECK CHG PUMP AUXILIARIES: • CHG pump CC pump – RUNNING • CHG pump SW pump - RUNNING
	BOP	Attachment 1 OF 1-E-0 6. CHECK INTAKE CANAL: • Level - GREATER THAN 24 FT • Level - BEING MAINTAINED BY CIRC WATER PUMPS
	BOP	Attachment 1 OF 1-E-0 7. CHECK IF MAIN STEAMLINES SHOULD BE ISOLATED: a) Check if ANY of the following annunciators - HAVE BEEN LIT • E-F-10 (High Steam Flow SI) • B-C-4 (Hi Hi CLS Train A) • B-C-5 (Hi Hi CLS Train B) Identifies annunciators not lit and goes to step 8.
	BOP	Attachment 1 OF 1-E-0 *8. CHECK IF CS REQUIRED: a) CTMT pressure – HAS EXCEEDED 23 PSIA Identifies pressure has not exceeded 23 or 17.7 psia and goes to step 10.

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

	BOP	Attachment 1 of 1-E-0 *10. BLOCK LOW PRZR PRESS SI SIGNAL: a) Check PRZR pressure – LESS THAN 2000 psig **b) Turn both LO PRZR PRESS & STM HDR/LINE ΔP switches to block** c) Check Permissive Status light C-2 - LIT BOP may block the low pressurizer pressure SI signal depending on current RCS pressure.
	BOP	Attachment 1 OF 1-E-0 *11. BLOCK LOW TAVE SI SIGNAL: Step may not be performed at this time (if Tave is greater than 543°F). a) Check RCS Tave - LESS THAN 543°F b) Turn both HI STM FLOW & LO TAVG OR LP switches to block c) Check Permissive Status light F-1 - LIT
	BOP	Attachment 1 OF 1-E-0 **NOTE:** • CHG pumps should be run in the following order of priority: C, B, A. • Subsequent SI signals may be reset by re-performing Step 12. 12. CHECK SI FLOW: a) HHSI to cold legs - FLOW INDICATED • 1-SI-FI-1961 (NQ) • 1-SI-FI-1962 (NQ) • 1-SI-FI-1963 (NQ) • 1-SI-FI-1943 or 1-SI-FI-1943A b) Check CHG pumps - THREE RUNNING **c) Reset SI** **d) Stop one CHG pump and out in AUTO**

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

	BOP	Attachment 1 of 1-E-0 e) RCS pressure - LESS THAN 185 PSIG RNO: e) <u>IF</u> two LHSI pumps are running, <u>THEN</u> do the following: 1) Verify reset or reset SI. 2) Stop one LHSI pump and put in AUTO. **Stops either 1-SI-P-1A or 1B and leaves control switch in AUTO.** 3) GO TO Step 13.
	BOP	Attachment 1 of 1-E-0 13. CHECK TOTAL AFW FLOW - GREATER THAN 350 GPM [450 GPM]
	BOP	Attachment 1 of 1-E-0 14. CHECK AFW MOVs - OPEN BOP will identify that all AFW MOVS are not open and will read the RNO portion of this step and manually align valves as necessary.
	BOP	Attachment 1 of 1-E-0 15. INITIATE SI VALVE ALIGNMENT IAW ATTACHMENT 2 See attached copy of Attachment 2. (Next page of this guide)
	BOP	Attachment 1 of 1-E-0 16. INITIATE VENTILATION, AC POWER, AND SFP STATUS CHECKS IAW ATTACHMENT 3 *Attachment 3 follows Attachment 2 on next page* **Identify failure of 1-VS-MOD-103A CLOSES the MOD.** *Unit 2 Operator will state that Unit 2 is at 100% power (if asked)* *Unit 2 will also accept responsibility to complete Attachment 3 if it is given to Unit 2 at the point where differential pressure indications are requested.*

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

	BOP	Attachment 1 of 1-E-0 17. CHECK RCS DILUTION FLOWPATH - ISOLATED AND LOCKED, SEALED, OR OTHERWISE SECURED • Close and lock, seal, or otherwise secure 1-CH-223 *May contact the Desk (WCC) SRO to Close and lock, seal, or otherwise secure 1-CH-223.*

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

Time	Position	Applicant's Action or Behavior
	BOP	Attachment 2 of 1-E-0 **NOTE:** Components previously aligned by SI termination steps, must not be realigned by this Attachment.
	BOP	Attachment 2 of 1-E-0 1. Check opened or open CHG pump suction from RWST MOVs. • 1-CH-MOV-1115B • 1-CH-MOV-1115D
	BOP	Attachment 2 of 1-E-0 2. Check closed or close CHG pump suction from VCT MOVs. • 1-CH-MOV-1115C • 1-CH-MOV-1115E
	BOP	Attachment 2 of 1-E-0 3. Check running or start at least two CHG pumps. (listed in preferred order) • 1-CH-P-1C • 1-CH-P-1B • 1-CH-P-1A
	BOP	Attachment 2 of 1-E-0 4. Check opened or open HHSI to cold legs MOVs. • 1-SI-MOV-1867C • 1-SI-MOV-1867D
	BOP	Attachment 2 of 1-E-0 5. Check closed or close CHG line isolation MOVs. • 1-CH-MOV-1289A • 1-CH-MOV-1289B

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

	BOP	Attachment 2 of 1-E-0 6. Check closed or close Letdown orifice isolation valves. • 1-CH-HCV-1200A • 1-CH-HCV-1200B • 1-CH-HCV-1200C **RO/BOP will CLOSE 1-CH-HCV-1200A and 1-CH-HCV-1200B**
	BOP	Attachment 2 of 1-E-0 7. Check opened or open LHSI suction from RWST MOVs. • 1-SI-MOV-1862A • 1-SI-MOV-1862B
	BOP	Attachment 2 of 1-E-0 8. Check opened or open LHSI to cold legs MOVs. • 1-SI-MOV-1864A • 1-SI-MOV-1864B
	BOP	Attachment 2 of 1-E-0 9. Check running or start at least one LHSI pump. • 1-SI-P-1A • 1-SI-P-1B **BOP START 1-SI-P-1B** *if not already performed in Attachment 1.*
	BOP	Attachment 2 of 1-E-0 10. Check High Head SI flow to cold legs indicated. • 1-SI-FI-1961 • 1-SI-FI-1962 • 1-SI-FI-1963 • 1-SI-FI-1943 or 1-SI-FI-1943A

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

	BOP	Attachment 2 of 1-E-0 11. IF flow not indicated, THEN manually start pumps and align valves. IF flow NOT established, THEN consult with Shift Supervision to establish another high pressure injection flow path while continuing with this procedure. • Alternate SI to Cold legs • Hot leg injection

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 1 of 6

1. ___ Check or place REFUEL SFTY MODE switches in NORMAL.

2. ___ Check ventilation alignment IAW Tables 1 and 2.

TABLE 1
UNIT #1 VENTILATION PANEL

	MARK NUMBER	EQUIPMENT STATUS
☐	1-VS-F-4A & B	OFF
☐	1-VS-HV-1A & B	OFF
☐	1-VS-F-8A & B	OFF
☐	1-VS-F-9A & B	GREEN
☐	1-VS-F-59	GREEN
☐	1-VS-F-6	OFF
☐	1-VS-F-39	GREEN
☐	1-VS-F-7A & B	GREEN
☐	1-VS-HV-5	GREEN
☐	1-VS-F-56A & B	GREEN
☐	1-VS-F-40A & B	GREEN
☐	1-VS-HV-4	OFF
☐	2-VS-F-40A or B	RED
☐	2-VS-HV-4	OFF

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 2 of 6

TABLE 2
VNTX PANEL

	MARK NUMBER	EXPECTED EQUIPMENT STATUS		RESPONSE NOT OBTAINED
☐	a. AOD-VS-107A & B AOD-VS-108	RED GREEN	☐	a. Place AUX BLDG CENTRAL AREA MODE switch to FILTER.
☐	b. MOD-VS-100A & B AOD-VS-106	RED GREEN	☐	b. • Place MOD-VS-100A to FILTER. • Place MOD-VS-100B to FILTER.
☐	c. MOD-VS-200A & B AOD-VS-206	GREEN RED	☐	c. • Place MOD-VS-200A to UNFILTER. • Place MOD-VS-200B to UNFILTER.
☐	d. AOD-VS-103A & B AOD-VS-104	GREEN GREEN	☐	d. • Place AOD-VS-103A in UNFILTER. • Place AOD-VS-103B in UNFILTER. • Place AOD-VS-104 in FILTER.
☐	e. AOD-VS-101A & B AOD-VS-102	GREEN GREEN	☐	e. Place AOD-VS-101A and 101B in UNFILTER.
☐	f. AOD-VS-111A & B	GREEN	☐	f. Place COMBINE CONTAINMENT EXHAUST in ISOLATE.
☐	g. AOD-VS-110	GREEN	☐	g. Place AOD-VS-109A and 109B in FILTER.
☐	h. AOD-VS-112A & B	GREEN	☐	h. • Place AOD-VS-112A in CLOSE. • Place AOD-VS-112B in CLOSE.
☐	i. MOD-VS-58A & B 1-VS-F-58A & B	RED RED	☐	i. Start 1-VS-F-58A and 1-VS-F-58B.

3. ___ Check filtered exhaust flow: (as read on FI-VS-117A and FI-VS-117B)

- ☐ • Total flow - GREATER THAN 32400 cfm

AND

- ☐ • Flow through each filter bank - LESS THAN 39600 cfm

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 3 of 6

4. ___ Check all Station Service Buses - ENERGIZED. IF NOT, THEN initiate 1-AP-10.07, LOSS OF UNIT 1 POWER.

5. ___ Check annunciator VSP-J2 - LIT.

6. ___ Check Unit 1 RSST LTC time delay bypass light - LIT.

7. ___ Check stopped or stop 1-VS-AC-4.

8. ___ Place 1-VS-43-VS103X, MCR ISOLATION switch to the OFF position.

9. ___ Check closed or close MCR isolation dampers.
   - ☐ 1-VS-MOD-103A
   - ☐ 1-VS-MOD-103B
   - ☐ 1-VS-MOD-103C
   - ☐ 1-VS-MOD-103D

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 4 of 6

* *

CAUTION:
- Only one Emergency Supply Fan must be started in the following step.
- Chilled Water flow to the in-service Unit 1 MCR AHU must be throttled to at least 15 gpm when the Emergency Supply fan is started.
- Chilled Water flow to the in-service Unit 2 MCR AHU must be throttled to at least 25 gpm when the Emergency Supply fan is started.
- An Emergency Supply Fan must not be started if the filter is wet.

* *

10. Immediately start ONE Emergency Supply Fan IAW the following: (1-VS-F-41 or 2-VS-F-41 preferred)

a. IF 1-VS-F-41, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 1-VS-MOD-104A, CONT RM EMERG SUP MOD.

___ 2. Start 1-VS-F-41.

b. IF 2-VS-F-41, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 2-VS-MOD-204A, CONT RM EMERG SUP MOD.

___ 2. Start 2-VS-F-41.

c. IF 1-VS-F-42, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 1-VS-MOD-104B, CONT RM EMERG SUP MOD.

___ 2. Start 1-VS-F-42.

d. IF 2-VS-F-42, CONT RM EMERG SUP FAN, will be used, THEN perform the following substeps.

___ 1. Open 2-VS-MOD-204B, CONT RM EMERG SUP MOD.

___ 2. Start 2-VS-F-42.

e. ___ Adjust Chilled Water flow to MCR AHUs IAW Step 10 Caution.

Op-Test No.: Surry 2021-1 Scenario No.: 5 Event No.: 9 Page 68 of 90

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

NUMBER 1-E-0	ATTACHMENT TITLE	ATTACHMENT 3
REVISION 77	AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	PAGE 5 of 6

11. ___ Check readings on the following Differential Pressure Indicators - POSITIVE PRESSURE INDICATED.
   - ☐ • PDI-VS-100, D.P.-U1CR/U1TB (Unit 2 Turbine Ventilation Panel)
   - ☐ • PDI-VS-101, D.P.-U1RR/U1TB (Unit 2 Turbine Ventilation Panel)
   - ☐ • PDI-VS-200, D.P.-U2CR/U2TB (Unit 2 Turbine Ventilation Panel)
   - ☐ • PDI-VS-201, D.P.-U2RR/U2TB (Unit 2 Turbine Ventilation Panel)
   - ☐ • 1-VS-PDI-118 (Unit 1 Computer Room)
   - ☐ • 1-VS-PDI-116 (Near Unit 1 Semi-Vital Bus)
   - ☐ • 2-VS-PDI-215 (Unit 2 AC Room)
   - ☐ • 2-VS-PDI-206 (Near Unit 2 Semi-Vital Bus)

12. ___ IF any reading NOT positive, THEN initiate Attachment 6 to secure MCR boundary fans.

13. ___ Check initiated or initiate 0-AP-50.00, OPPOSITE UNIT EMERGENCY.

14. ___ Check the following MCR and ESGR air conditioning equipment operating. IF NOT, THEN start equipment within 1 hour IAW the appropriate subsection of 0-OP-VS-006, CONTROL ROOM AND RELAY ROOM VENTILATION SYSTEM.
   - ☐ • One Control Room chiller
   - ☐ • One Unit 1 Control Room AHU
   - ☐ • One Unit 2 Control Room AHU
   - ☐ • One Unit 1 ESGR AHU
   - ☐ • One Unit 2 ESGR AHU

15. ___ IF both of the following conditions exist, THEN check that Load Shed is activated.
   - ☐ • Unit 2 - SUPPLIED BY RSST
   - ☐ • Unit 2 RCPs - RUNNING

16. ___ IF Load Shed is required and not activated, THEN initiate 0-AP-10.10, LOSS OF AUTO LOAD SHED.

Event Description: BOP Failures. 1-SI-P-1B not auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100 A/B not close.

Cue: Pre-load Malfunctions.

NUMBER 1-E-0	ATTACHMENT TITLE AUXILIARY VENTILATION, AC POWER, AND SFP STATUS CHECKS	ATTACHMENT 3
REVISION 77		PAGE 6 of 6

NOTE:
- SFP checks should be initiated WITHIN ONE TO TWO HOURS of EOP entry.
- Loss of power may render SFP indications and alarms non-functional and require local checks. Power supplies are as follows:
  - TI-FC-103, Unit 1 Semi-Vital Bus
  - TI-FC-203, Unit 2 Semi-Vital Bus
  - 1-FC-LIS-104, Panel 1ABDA1
- Loss of AC Power to the SFP level indicator is indicated if both low and high level alarms are in simultaneously. (0-VSP-C4 and 0-VSP-D4)
- 1-DRP-003, CURVE BOOK, provides a graph for SFP time to 200°F if loss of SFP cooling occurs.

17. ___ Initiate monitoring SFP parameters:

- ☐ • SFP level - Greater than Cooling Pump suction AND Stable
- ☐ • SFP temperature - Stable or Lowering
- ☐ • SFP Cooling Pumps - Either Running
- ☐ • Component Cooling - Normal
- ☐ • SFP Radiation - Normal

18. ___ Continue to monitor parameters every one to two hours or until authorized to terminate monitoring by the Station Emergency Manager and/or the Shift Manager.

19. ___ Notify the Station Emergency Manager and/or the Shift Manager of the status and trend of SFP parameters.

20. ___ IF any abnormality or adverse trend is identified, THEN initiate 0-AP-22.02, MALFUNCTION OF SPENT FUEL PIT SYSTEMS.

FOLDOUT PAGES FOR REFERENCED PROCEDURES

NUMBER 1-E-0	CONTINUOUS ACTIONS PAGE	REVISION 77

1. RCP TRIP CRITERIA

   Trip all RCPs if BOTH conditions listed below occur:

   a. Charging Pumps - AT LEAST ONE RUNNING AND FLOWING TO RCS

   b. RCS Subcooling - LESS THAN 30°F [85°F]

2. MINIFLOW RECIRC CRITERIA

   a. CLOSED - When RCS pressure is less than 1275 psig [1475 psig] AND RCP Trip Criteria are met (RCPs OFF).

   b. OPEN - When RCS pressure is greater than 2000 psig.

3. ADVERSE CONTAINMENT CRITERIA

   Use Adverse Containment setpoints if EITHER condition listed below occurs:

   - Containment Pressure - GREATER THAN 20 PSIA
   - Containment Radiation - GREATER THAN 1.0E5 R/HR

4. COLD LEG RECIRCULATION SWITCHOVER CRITERIA

   GO TO 1-ES-1.3, TRANSFER TO COLD LEG RECIRCULATION, if RWST level lowers to less than 20%.

---

1. AMSAC RESET CRITERIA

   AMSAC may be manually reset when level in all three SGs is greater than 13% or six minutes have elapsed since the Reactor trip. When AMSAC is reset, AMSAC ARMED annunciator H-D-1 should clear and affected components may be realigned as needed.

2. TD AFW PUMP SHUTDOWN CRITERIA

   The TD AFW pump may be secured when SG NR level is greater than 22% in at least 2 SGs, AMSAC is reset, and no auto-start signal exists. To secure the pump, the pump SOV control switches must be taken to OPEN-RESET and then to CLOSE.

3. MANUAL SI ALIGNMENT

   If SI fails to automatically align, Attachment 2 may be used for guidance on manual SI valve alignment.

4. * TRANSIENT AFW FLOW CONTROL (IF SI in progress)

   Attachment 7 may be used for guidance on transient AFW flow control.

5. * FAULTED SG ISOLATION AND AFW FLOW CONTROL (IF SI in progress)

   Attachment 8 may be used for guidance on faulted SG(s) isolation and AFW flow control.

6. * RUPTURED SG ISOLATION AND AFW FLOW CONTROL (IF SI in progress)

   Attachment 9 may be used for guidance on ruptured SG(s) isolation and AFW flow control.

7. * LOSS OF RCP SUPPORT CONDITIONS

   Trip RCPs if a loss of a support condition occurs. (for example, loss of CC)

* Preemptive Actions

FOLDOUT PAGES FOR REFERENCED PROCEDURES

NUMBER 1-E-0	CONTINUOUS ACTION STEPS	REVISION 77

1. Check RCS Average Temperature - STABLE AT OR TRENDING TO 547°F. (E-0, Step 6)
2. Monitor RCP Trip and Miniflow Recirc Criteria. (E-0, Step 8)
3. Check SG Narrow Range Level - ANY SG GREATER THAN 12%. (Control feed flow to maintain Narrow Range Level between 22% and 50%) (E-0, Step 25)
4. Monitor LHSI pumps and secure as necessary. (E-0, Step 30)

NOTE: Subsequent SI signals may be reset by reperforming Step 12 of Attachment 1.

5. Monitor CTMT pressure and check CLS initiation as necessary. (Attachment 1, Step 8)
6. Monitor RWST level and check RS initiation as necessary. (Attachment 1, Step 9)
7. Block Low PRZR Pressure SI signal when less than 2000 psig. (Attachment 1, Step 10)
8. Block Low Tave SI signal when less than 543°F. (Attachment 1, Step 11)

FOLDOUT PAGES FOR REFERENCED PROCEDURES

CONTINUOUS ACTIONS PAGE FOR 1-E-3

1. SI REINITIATION CRITERIA

   Manually operate SI pumps and align valves as necessary if EITHER condition listed below occurs:
   - RCS subcooling based on CETCs - LESS THAN 30°F [85°F]
   - PRZR level - CANNOT BE MAINTAINED GREATER THAN 22% [50%]

   IF SI reinitiation occurs after Step 23, THEN GO TO 1-ECA-3.1, SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY.

2. ADVERSE CONTAINMENT CRITERIA

   Use Adverse Containment setpoints if EITHER condition listed below occurs:
   - Containment pressure - GREATER THAN 20 PSIA
   - Containment Radiation - GREATER THAN 1.0E5 R/HR

3. SECONDARY INTEGRITY CRITERIA

   GO TO 1-E-2, FAULTED STEAM GENERATOR ISOLATION, if any SG pressure is lowering in an uncontrolled manner or has completely depressurized, and has not been isolated, unless needed for RCS cooldown.

4. AFW SUPPLY SWITCHOVER CRITERIA (Refer to Attachment 8)

   Transfer to one of the following alternate AFW water supplies if ECST level lowers to less than 20%.
   a. 1-CN-TK-2, using 1-CN-150.
   b. 1-CN-TK-3, using AFW Booster Pumps.
   c. AFW Crosstie.
   d. Firemain.

5. MULTIPLE TUBE RUPTURE CRITERIA

   STABILIZE the plant and RETURN TO 1-E-3, STEAM GENERATOR TUBE RUPTURE, Step 1, if any intact SG level rises in an uncontrolled manner or any intact SG has abnormal radiation.

6. AMSAC RESET CRITERIA

   AMSAC may be manually reset when level in all three SGs is greater than 13% or six minutes have elapsed since the Reactor trip. When AMSAC is reset, annunciator H-D-1 should clear and affected components may be realigned as needed.

7. TD AFW PUMP SHUTDOWN CRITERIA

   The TD AFW pump may be secured when SG NR level is greater than 22%, AMSAC is reset, and no auto-start signal exists. To secure the pump, the pump SOV control switches must be taken to OPEN-RESET and then to CLOSE.

FOLDOUT PAGES FOR REFERENCED PROCEDURES

CONTINUOUS ACTIONS PAGE FOR 1-ECA-3.3

1. SI REINITIATION CRITERIA

Following SI termination or SI flow reduction, manually start SI pumps as necessary and GO TO 1-ECA-3.1, SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY DESIRED, if EITHER condition listed below occurs:

- RCS subcooling based on CETCs - LESS THAN 30°F [85°F]
- RVLIS indication - LESS THAN VALUE FROM TABLE

RCPs Running	RVLIS INDICATION	
	Full Range	Dynamic Range
0	LESS THAN 63%	———
1	———	LESS THAN 36%
2	———	LESS THAN 51%
3	———	LESS THAN 82%

2. ADVERSE CONTAINMENT CRITERIA

Use Adverse Containment setpoints if EITHER condition listed below occurs:

- Containment Pressure - GREATER THAN 20 PSIA
- Containment Radiation - GREATER THAN 1.0E5 R/HR

3. SECONDARY INTEGRITY CRITERIA

GO TO 1-E-2, FAULTED STEAM GENERATOR ISOLATION, if any SG pressure is lowering in an uncontrolled manner or has completely depressurized, and has not been isolated unless needed for RCS cooldown.

4. AFW SUPPLY SWITCHOVER CRITERIA (Refer to Attachment 7)

Transfer to one of the following alternate AFW water supplies if ECST level lowers to less than 20%.

a. 1-CN-TK-2, using 1-CN-150.

b. 1-CN-TK-3, using AFW Booster Pumps.

c. AFW Crosstie.

d. Firemain.

5. RCP START CRITERIA

- Following a loss of all seal cooling, affected RCP(s) should NOT be started without prior status evaluation.
- RCPs should be run in the following order of priority to provide PRZR spray: C, A and B.

SIMULATOR OPERATOR'S GUIDE

Simulator Scenario Checklist

- ❑ Perform Simulator Turnover Pre-session, and Post-session Checklist prior to the first Scenario of the day.
- ❑ Perform Simulator Turnover Post-session Checklist after the last Scenario of the day.

Perform/Verify Simulator Setup:

❑ ❑ ❑ Recall IC-380 (100%) **and verify Trigger #30 implemented.**

OR

Recall Base IC (IC-001), Open Schedule, and Event Files for Scenario 5. Run Schedule file, and i**mplement Trigger 30.**

❑ ❑ ❑ Verify Impulse Pressure is selected for channel 3.

❑ ❑ ❑ **Enter/Verify the following MALFUNCTIONS:**

Malfunction	Delay	Ramp	Trigger	Value	Final	Trigger Type (Auto or Manual)
RC4903 PRZR LEVEL XMTR CH 3 FAILURE (461)	5	20	1	0.0	-0.3	Manual
FW1902 B S/G MN FD FLOW CNTRLR FC-1488 FAILS	5	30	3	0.0	-0.5	Manual
MS1503 SG C PORV CONTROLLER FAILS HIGH/LOW	5	30	5	0.0	+1.0	Manual
GL0102 IPBD CONDUCTOR TEMPERATURE HIGH PHASE B	0	0	7	0.0	70	Manual
RC2402 STEAM GENERATOR B TUBE RUPTURE	5	30	9	0.0	3	Manual
RC2402 STEAM GENERATOR B TUBE RUPTURE (New Event)	5	30	11	0.0	100	Manual
RC64 MOV-RC-535 49 Thermal Overload	0	0	16	1	0	AUTO
RC5601 RC-P-1A BKR 15A3 SPURIOUS TRIP	0	0	17	FALSE	TRUE	AUTO
RC5602 RC-P-1B BKR 15B3 SPURIOUS TRIP	0	0	17	FALSE	TRUE	AUTO
RC5603 RC-P-1C BKR 15C3 SPURIOUS TRIP	0	0	17	FALSE	TRUE	AUTO
AS02 DISABLE SV-TV-102 AUTO OPEN	0	0	30	FALSE	TRUE	ACTIVE
AS05 DISABLE SV-TV-103 AUTO CLOSURE	0	0	30	FALSE	TRUE	ACTIVE
SI2409 SI RELAY CI1A FAILS TO ACTUATE	0	0	30	FALSE	TRUE	ACTIVE
SI2505 SI RELAY SI5B FAILS TO ACTUATE	0	0	30	FALSE	TRUE	ACTIVE

SIMULATOR OPERATOR'S GUIDE

❑ ❑ ❑ **Enter/Verify the following EVENT TRIGGERS:**

Event ID	Event code	Command
Trigger setup to trip 1-RC-MOV-1535 breaker when control switch in open to stroke test open time, Event 1. Trigger 14 sets when 1-RC-MOV-1535 closed. Trigger 15 sets when 1-RC-MOV-1535 control switch taken to open. Trigger 16 set when both Trigger 14 and 15 are TRUE. Trigger 16 implements Remote Function trip of 1-RC-MOV-1535 breaker.		
14	rcmov535 <= 0.0002	Sets Trigger 14
15	mov535_open	Sets Trigger 15
16	et_array(14) & et_array(15)	Sets Trigger 16
Trigger setup to trip A, B, C, RCPs when Main Generator Output breakers open. (EL2 Auto Trigger). Actuates Trigger which implements Malfunction RC5601/5602/5603.		
17	"!(elg102_bkr(2) & elg1T240_bkr)"	Sets Trigger 17

❑ ❑ **Enter/Verify the following REMOTE FUNCTIONS:**

Description	Delay	Ramp	Trigger	Value	Final	Trigger Type (Auto or Manual)
AAC_SMS_MODE OFF AAC DG LOCAL MODE SWITCH POSITION	0	0	30	STANDBY	OFF	MANUAL
MS-120 STEAM GENERATOR B STEAM SUPPLY TO FW-P-2	300	15	13	100	0	MANUAL

❑ ❑ **Enter/Verify the following SWITCH OVERRIDES:**

Override	Override To:	Trigger
PCV455C_OPEN RC-PCV-1455C OPEN POS PRZR RELIEF VALVE	OFF	11
PCV455C_ENABLE RC-PCV-1455C ENABLE POS OVERPRESS MITIGATION ENABLE	OFF	11

SIMULATOR OPERATOR'S GUIDE

TRIGGER	TYPE	DESCRIPTION
1	MAN	Fails PZR Level CH III to 25%.
3	MAN	B SG MFRV controller fails low.
5	MAN	C SG PORV fails open
7	MAN	B Isophase Bus Duct High Temperature
9	MAN	Steam Generator Tube Leak, 20 gpm
11	MAN	Overrides 1-RC-PCV-1455C control switch in Close Overrides OPMS key switch for PCV-1455C in DISABLE
13	MAN	Close 1-MS-120 B SG supply to TDAFW Pump
16	AUTO	Open Breaker to 1-RC-MOV-1535
17	AUTO	Spurious Trip A/B/C RCPs when Gen. Output Bkrs open
30	ACTIVE	AS02 DISABLE SV-TV-102 OPEN AS03 DISABLE SV-TV-103 CLOSE SI2409 SI RELAY CI1A FAILS TO ACTUATE SI2505 SI RELAY SI5B FAILS TO ACTUATE AAC_SMS_MODE OFF AAC DG LOCAL MODE SWITCH POSITION

SIMULATOR OPERATOR'S GUIDE

Verify the following control room setup:

- ❑ ❑ ❑ Place the simulator in RUN and verify normal 100% power operation indications.
- ❑ ❑ ❑ Verify All pink magnets collected from previous scenarios.
- ❑ ❑ ❑ Verify vertical board PCS monitor on ALARM SCREEN.
- ❑ ❑ ❑ Reset ICCMs.
- ❑ ❑ ❑ Verify all calcalc points are displayed on PCS: U9103, U9104, U9105V.
- ❑ ❑ ❑ Verify Component Switch Flags; 1-VS-F-58A and 1-VS-F-58B switches (AUTO AFTER STOP).
- ❑ ❑ ❑ Verify Brass Caps properly placed (Hi-Hi CLS, MSTVs, CH-MOV-1350, CW and SW MOVs, CTMT Hogger suction, CNDSR Vacuum breaker).
- ❑ ❑ ❑ Radiation Monitors all clear.
- ❑ ❑ ❑ Verify SG PORVs set for 1035 psig.
- ❑ ❑ ❑ Verify "D" bank rod height at 229 steps and Bank Overlap Counter at 612.
- ❑ ❑ ❑ Verify Chart recorders are on the correct scale (SF/FF and Tave/Tref) and speed (NI)
- ❑ ❑ ❑ Advance Charts.
- ❑ ❑ ❑ **Verify Air Ejector Discharge is aligned through 1-SV-TV-103 (all RMs reset).**
- ❑ ❑ ❑ Verify SYNC keys in proper place.
- ❑ ❑ ❑ Verify MOL reactivity plans and benchboard Reactivity Placard is current.
- ❑ ❑ ❑ Reset Blender Integrators for Boric Acid to 100 and PG to 1000.
- ❑ ❑ ❑ Verify Stop Watches are available for RO and BOP.
- ❑ ❑ ❑ Verify Simulator "Session In Progress" light is turned ON.
- ❑ ❑ ❑ Verify no persons are logged onto network computer to ensure no procedures displayed.
- ❑ ❑ ❑ Verify PCS time matches Sim time.

SIMULATOR OPERATOR'S GUIDE

❑ ❑ ❑ Spot check all ARPs are clean, **verify** the following ARPs are clean.

1A-A3	1F-D8		
1A-B3	1G-E5		
1C-B8	1H-E6		
1C-D8	1-RM-G8		
1F-C8	1-RM-H8		

❑ ❑ ❑ Verify CLEAN copies of the following procedures are in place.

❑ AP-53.00 (2)	❑ AP-18.00	❑ AP-23.00	❑ AP-16.00
❑ AP-24.00	❑ E-0	❑ E-3	❑ ECA-3.3
❑ OP-CH-007		❑ Reactivity Sheet	
❑ OP-ZZ-002		❑ **PT-18.6I**	

SIMULATOR OPERATOR'S GUIDE

Brief

This simulator performance scenario is performed in the EVALUATION MODE. You should not direct questions to the evaluators. Otherwise, you should perform as if you were in the MCR.

Your ability to maintain a log is not being graded, but maintaining a rough log is recommended to help during briefs.

If you need to communicate with the Unit 2 operator, verbally state, "Unit 2" and an instructor will locate to the Unit 2 area and respond to you as quickly as possible.

In the unlikely event that the simulator fails such that illogical indications result, the session will be terminated. In other words, respond to what you see. If there is a problem with the simulation, the session will be terminated or adjusted as appropriate based on the specific problem.

Assign operating positions.

Ask for and answer questions.

SIMULATOR OPERATOR'S GUIDE

Conduct shift turnover:

The initial conditions have Unit 1 is at 100% power with RCS boron concentration of 760 ppm.

Unit conditions have been stable at approximately 100% power since the last refueling outage.

All systems and crossties are operable with the following exception:

- AAC DG is tagged out for maintenance. In accordance with VPAP-2802, Notifications and Reports, Section 6.29.1, a review of Reportability is required if the AAC DG is out of service greater than 14 days.

Unit #2 is at 100% power with all systems and crossties operable.

Shift orders are to maintain 100% power on Unit #1 and upon relieving the watch, perform PT-18.6I, Pressurizer Block Valve Stroke Test. Performance of PT-18.6I has been authorized and has been PSA analyzed for current plant conditions.

The last shift performed two 35 gallon dilutions followed by a manual makeup for training. "A" BAST boron concentration is 8.0 w/%.

SIMULATOR OPERATOR'S GUIDE

Pre Session Checks:

Safety Injection Section (Magnets)	**CW/SW Section**	**RCS Section**	**CVCS**
SI-MOV-1865A □ R □ G SI-MOV-1865B □ R □ G SI-MOV-1865C □ R □ G SI-MOV-1869A □ R □ G SI-MOV-1869B □ R □ G SI-MOV-1890A □ R □ G □ T/O SI-MOV-1890B □ R □ G □ T/O SI-MOV-1890C □ R □ G □ T/O Brass Cap □ CLS TR A □ CLS TR B	Brass Caps SW MOVs □ 103A □ 103B □ 103C □ 103D CW MOVs □ 106A □ 106B □ 106C □ 106D CW Inlet Throttle Plaques (10%) □ 100A □ 100B □ 100C □ 100D CTMT Hogger Suction Cap □	Tcold Loop Stop Pos (R – O) □ A □ B □ C Loop Bypass Valves (G – C) □ A □ B □ C Thot Loop Stop Pos (R - O) □ A □ B □ C SFP PPs Pwr □Norm □ Alt PZR Level Recorder □	Core Life Plaque □ Ramp Plan Book □ OP-RX-010 Book □ PG Int Set 1000 □ BA Int Set 100 □ Tavg/Tref Rec. □ NI-NR-B □ Group Step Ctrs □ CERPIs □ CH-MOV-1350 □
Main Steam/Feedwater	**Electrical/VSP**	**PCS**	**RM/WD/BR**
SG PORVs Set □ MSTV Caps □ A □ B □ C SF/FF Rec Scale □ Cond Vac Bkr Cap □	Synch Key □ SVB Power □ H □ J LO System Switches □ VS-F-58A Pwr □ H □ J □ Grn Flag VS-F-58B Pwr □ H □ J □ Grn Flag	PCS Main Screen U9103 □ U9104 □ U9105V □ Alarm Screen (List) □	RM-112 □ A □ B □ C RM-113 □ A □ B □ C Comm RM Pwr □ 1J □ 2J Synch Key □

Post Session Checks:

PCS Screens (Cleared/Display) □ RO □ BOP □ SM □ STA □ PCs Logged OFF (including Booth) □ Phone cleared
□ Recall IC-1 □ Advance Charts □ Procedures Changed □ Red Light □ Binders Stored □ Trash Picked Up/Emptied □ Vacuum Req'd?
□ Pink Magnets in Drawer □ BB and VB Scenario Magnets removed □ E-Mail to SSG Required □ DVD Finalized □ EAL Charts
□ Note Pads □ Manning Sheets □ Sticky Tabs (SRO/SM/ARPs) □ Markers (ARPs) □ Personnel/Comms Tracking Sheets (Booth)
□ Floor timers reset/In place □ Booth timers reset/In place □ Printers ready/have paper

SIMULATOR OPERATOR'S GUIDE

EVENT 1 **Test Cycle PORV Block Valves, 1-PT-18.6I**

BOOTH:
30 minutes prior to the beginning of the scenario, provide the team with a copy of 1-PT-18.6I, Pressurizer Block Valve Stroke Test. The team will pre-brief the PT prior to entering the simulator.

Trigger setup to trip 1-RC-MOV-1535 breaker when control switch in open to stroke test open time, Event 1. Monitor the following triggers as 1-RC-MOV-1535 is closed/opened.

Trigger 14 sets (becomes Active) when 1-RC-MOC-1535 closed.
Trigger 15 sets (becomes Active) when 1-RC-MOV-1535 control switch taken to open.
Trigger 16 sets when both Trigger 14 and 15 are TRUE.
Trigger 16 implements the Malfunction to trip 1-RC-MOV-1535 breaker.

Operations Supervisor/Management/Work Week Coordinator:

- **If contacted**, will acknowledge 1-RC-MOV-1535 breaker tripped when the valve was re-opened, suspension of the PT, and Tech Spec Clock identified (1 hour/72 hour).

Field Operator: (3 *minute delay from request to answer*)

- **If Contacted**, as Service Building Operator, to check the status of 1-RC-MOV-1535 breaker, 1H1-2S 6A; report that the breaker has tripped (in the "trip free" position).

STA:

- **If contacted,** will take responsibility for writing the CR.

SIMULATOR OPERATOR'S GUIDE

EVENT 2 PRZR Level Transmitter 1-RC-LI-1461 Fail to 25%, 0-AP-53.00.

When cued by examiner, implement **Trigger #1**.

Operations Supervisor/Management:

- **If contacted**, will acknowledge the failure of 1-RC-LI-1461. The individual(s) contacted will also acknowledge any TS LCOs and entry into AP-53.00.
- **If contacted,** will recommend to the team that channels remain as they are for now (i.e., do not perform 1-OP-RP-001 at this time).
- **If contacted,** will take responsibility for writing the CR.

STA:

- **If contacted,** will take responsibility for writing the CR.
- **If the team has a transient brief:** The STA will state they have nothing to add.

Field Operators:

Maintenance/Work Week Coordinator:

- **If contacted**, will acknowledge instrumentation failure and commence investigations and/or efforts to place the channel in trip.

Unit 2 Operator:

- No action for this event.

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 3 **"B" Main Feed Reg Valve Controller Fails Low, 0-AP-53.00.**

When cued by examiner, implement **Trigger #3**.

Operations Supervisor/Management:

- **If contacted**, acknowledge B MFRV controller failure.
- **If contacted,** will take responsibility for writing the CR.
- **If contacted,** will acknowledge entry into 0-AP-53.00.

STA:

- **If contacted**, will acknowledge B MFRV controller failure.
- **If contacted,** will take responsibility for writing the CR.
- **IF contacted:** CEP-0029 has been reviewed, Reg. Guide 1.97 only requires one channel of Feed Flow indication per steam generator. VPAP-2802 and TRM section 3.3 are not affected.
- **IF contacted:** acknowledge that TRM 3.3.5 requires the calorimetric program be changes from the Feedwater UFM System to the Normalized Feedwater Venturi System, within 1 hour; and, Restore the UFM system to FUNCTIONAL status in 48 hours.
- **If the team has a transient brief:** The STA will state they have nothing to add.

Field Operators:

- Will perform actions as directed.

Maintenance/ Work Week Coordinator:

- **If contacted**, will acknowledge the B MFRV controller failure and contact I&C to commence preparation to troubleshoot.

Unit 2:

- **If contacted**, will acknowledge the B MFRV controller failure.

Role-play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 4 **"C" SG PORV spuriously opens, 0-AP-53.00 and 1-AP-38.00.**

When the Evaluator indicates Ready, Activate Trigger #5.

Operations Supervisor/Management:

- **If contacted**, will acknowledge the failure of "C" SG PORV.
- **If contacted,** will take responsibility for writing the CR.
- **If contacted,** will acknowledge entry into 0-AP-53.00 and 1-AP-38.00.

STA:

- **If contacted**, will acknowledge the failure of "C" SG PORV.
- **If contacted,** will take responsibility for writing the CR.
- **If the team has a transient brief:** The STA will state they have nothing to add.

Maintenance/ Work Week Coordinator:

- **If contacted**, will acknowledge the failure and notify I&C to investigate.

Field Operators: *(Wait three (3) minutes from direction of a local action to the report of local condition found.)*

- **If contacted**, the operator will report no abnormalities observed locally at the "C" SG PORV.
- **If contacted**, the operator will report 1-MS-PI-101C indicates ~780 psig (at the Aux Shutdown Panel).

Unit 2:

- **If contacted**, will acknowledge the failure of "C" SG PORV.

Role-play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 5 **"B" Isophase Bus Duct High Temperature, ARP 1G-E5 and 0-AP-23.00.**

When the Evaluator is ready, implement Trigger # 7.

Operations Supervisor/Management:

- **If contacted**, will acknowledge the high "B" Phase IBD Temperature.
- **If contacted**, will acknowledge the required 10% load reduction.
- **If contacted,** will take responsibility for writing the CR.
- **When contacted:** The Shift Manager will review EPIPs for applicability.

STA:

- **If contacted**, will acknowledge the high "B" Phase IBD Temperature.
- **If contacted,** will take responsibility for writing the CR.
- **When contacted:** The STA reports that he has completed his review of VPAP-2802 and no notifications are required.
- **If the team has a transient brief:** The STA will state they have nothing to add.
- **If asked,** will concur with the reactivity plan for the load reduction.

Unit 2 Operator:

- **If notified of Ramp:** Acknowledge ramp of Unit 1.

Field Operators:

- **If contacted**, the condensate polishing building operator will acknowledge the need to ramp the unit.
- **If contacted**, report the the "B" Phase High Air Temperature drop is in.
- **NOTE:** ***To report IBD Air temperatures, convert PCS indication from °F to °C and report that value. To convert, use the following: (°F – 32°) x 5/9 = °C***

Role play as other individuals as needed.

SIMULATOR OPERATOR'S GUIDE

EVENT 6 **"B" SGTL 20 gpm, A/E RM Auto Actions Fail.**

When the Evaluator is ready, implement Trigger # 9.

Note: It would be preferable to wait until power is 90% to implement this failure to allow for ramp stabilization prior to creating RCS leak to allow the team to assess leakrate with more precision.

Operations Supervisor/Management:

- **If contacted**, will acknowledge RCS leakage into the 'B' SG. Will also acknowledge any TS information (time permitting) and information related to radiation monitors alarming.
- **If contacted,** will take responsibility for writing the WR and CR.
- **If contacted,** will take responsibility for writing the CR.
- **If contacted,** will acknowledge entry into 1-AP-16.00.

Unit 2 Operator:

- **When** radiation alarms sound on the radiation alarm panel, silence the alarms when directed and report the alarm to the Unit 1 SRO.
- **If directed** perform the associated steps of the RM ARP without leaving the confines of the Unit 2 control area. If actions or verifications are required on the Unit 1 side, inform the Unit 1 SRO of the need for an operator to complete the ARP.
- **If contacted,** Unit Two has implemented 0-AP-50.00, and all conditions on U2 are normal.

STA:

- **If contacted**, will acknowledge the RCS leakage into the 'B' SG.
- **If asked** to calculate the RCS leak rate, state that it is difficult to ascertain at this time, but you will continue to monitor as time permits.
- **If contacted,** will take responsibility for writing the CR.
- **If the team has a transient brief:** The STA will state they have nothing to add.

Field Operators:

- **If contacted**, the air ejector loop seal temperatures are normal.

SIMULATOR OPERATOR'S GUIDE

EVENT 7 **"B" SGTR (600) gpm). RCPs Trip on swap to RSST. 1-AP-16.00, 1-E-0, 1-E-3.**

When Examiner ready, implement Trigger 11.

Operations Supervisor/Management:

- **If contacted**, will acknowledge the SGTR on "B" SG.
- **If contacted,** will acknowledge entry into 1-E-0, 1-E-3.
- **If contacted,** will take responsibility for writing the WR and CR.
- **If contacted**, will acknowledge the isolation of 'B' SG (if informed).

STA:

- **If the team has a transient brief:** The STA will state they have nothing to add.

Unit Two:

- **If asked**, blowdown and air ejector RM readings are [*as indicated at the time*].
- **If requested**, acknowledge RM alarms, and perform ARP actions.
- **If contacted,** Unit Two has implemented 0-AP-50.00, and all conditions on U2 are normal.
- **If asked:** Unit 2 RWST cross-tie valves are open.
- **If asked:** take responsibility to notify HP of "B" SG PORV lifting.

Field Operators:

- **If contacted**, report all RCP breakers (15A3, 15B3, 15C3) are open with no other abnormal conditions.
- **If contacted**, field operators will perform valve manipulations as required:
  - Closing 1-MS-120 – implement Trigger 13. When the Final value for MS_120 = 0, report 1-MS-120 is closed.
  - Acknowledge direction to place Number 1 and 2 Turbine Building Sump pumps in OFF locally, and initiate 0-OSP-PL-003, Turbine Building Sump Pump Status Verification.

SIMULATOR OPERATOR'S GUIDE

EVENT 8 **PZR PORV 1-RC-PCV-1455C not open, 1-ECA-3.3.**

Operations Supervisor/Management:

- **If contacted,** will acknowledge entry into 1-ECA-3.3.
- **If contacted**, will acknowledge the SGTR on "B" SG.
- **If contacted,** will take responsibility for writing the CR.
- **If contacted**, will acknowledge the isolation of 'B' SG (if informed).

STA:

- **If the team has a transient brief:** The STA will state they have nothing to add.

Unit Two:

- **If asked**, blowdown and air ejector RM readings are [*as indicated at the time*].
- **If requested**, acknowledge RM alarms, and perform ARP actions.
- **If contacted,** Unit Two has implemented 0-AP-50.00, and all conditions on U2 are normal.

Field Operators:

- **If contacted**, field operators will perform valve manipulations as required:
  - 1-MS-120 – set ms_120 to zero upon request

EVENT 9 **BOP Failures, 1-SI-P-1B no auto start, 1-CH-HCV-1200 A/B not close, 1-VS-MOD-103A not close, 1-MS-TV-109 and 1-DA-TV-100A/B not close.**

Operations Supervisor/Management:

- **If contacted,** will take responsibility for writing the WR and CR.

Unit Two:

- **If contacted,** Unit Two has implemented 0-AP-50.00, and all conditions on U2 are normal.
- **If asked,** MCR differential pressure is as found. Unit 2 will assume responsibility for throttling SW flow IAW E-0, Attachment 3 guidance.

SIMULATOR OPERATOR'S GUIDE

Field Operators:

- **If contacted**, field operators will perform valve manipulations as required.

Maintenance/Work Week Coordinator:

- **If contacted**, will acknowledge the failures and commence investigations.

HP:

- **If contacted**, will acknowledge "B" SGTR.

STA:

- **If asked**, will report that he will calculate the time to 'B' fill, time permitting.
- **If contacted**, will enter the control room and commence reviewing status trees and prepare for the transient brief (items are reported "as you see them or previously reported").

Role play as other individuals as needed.

The scenario will end upon reaching Step 11 of 1-ECA-3.3 or at the lead examiners discretion.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
In Plant Job Performance Measure EPE038G2.1.30

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Locally Isolate U2 S/G PORV &TDAFW pump.

K/A: EPE 038 G2.1.30, Steam Generator Tube Rupture Ability to locate and operate components, including local controls. (4.4/4.0)

Applicability	**Estimated Time**	**Actual Time**
RO/SRO	15 Minutes	

Conditions

- Task is to be SIMULATED in the Plant.
- Simulated plant conditions are that a SGTR has occurred and been identified in the Unit 2, "A" SG. 2-E-3, SGTR, has been performed up to step 3b.

Standards

- 2-MS-86 is CLOSED.
- 2-MS-87 is attempted to be CLOSED.
- 2-FW-P-2 Trip Throttle Valve is tripped.

Initiating Cues

- Shift Manager direction.

Terminating Cues

- Report received that 2-FW-P-2 is tripped locally.

Procedures

- 2-E-3, Steam Generator Tube Rupture.

Tools and Equipment

- None

Safety Considerations

- Standard Personal Safety Equipment

PERFORMANCE CHECKLIST

Notes to the Evaluator

- This task is to be SIMULATED. Do NOT allow the operator to manipulate controls, operate switches or reposition valves.
- Task critical elements are bolded.
- **START TIME: ________**

STEP 1: **CRITICAL STEP** IF PORV can NOT be closed, THEN locally isolate. (*E-3, step 3bRNO)* **STANDARD:** a) Operator reports to Unit two Safeguards. **b) Closes 2-MS-86, SG A RELIEF VALVE ISOLATION VALVE by turning valve in the clockwise direction. CRITICAL STEP** **EVALUATOR'S NOTE:** • **Cue:** As the operator is turning handwheel in clockwise direction, indicate flow noise through the PORV is subsiding and the stem is moving into the valve and stops. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2: **CRITICAL STEP** Locally close steam supply valve to TD AFW pump. *(E-3, step 3d)* **STANDARD:** a) Locates the "A" main steam line in relation to "B" & "C". b) **Attempts to close chain valve 2-MS-87. CRITICAL STEP** **EVALUATOR'S NOTE:** • **Cue**: **When the operator attempts to close 2-MS-87, inform him/her that the valve will not move and indicate the valve position is as shown**. • **If asked:** The TDAFWP (2-FW-P-2) is still running. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 3: **CRITICAL STEP** IF at least one MD AFW pump running THEN locally Trip the Overspeed Trip valve. IF NOT tripped, THEN close 2-MS-196. (*E-3 step 3dRNO)* **STANDARD:** a) Proceeds to the turbine end of 2-FW-P-2. b) **SIMULATES pushing down on the manual trip lever to trip the TDAFWP. CRITICAL STEP.** c) Verifies that the TDAFWP TTV trips. d) Verifies TDAFWP is coasting down after local trip. **EVALUATOR'S NOTE:** • **If asked**: After simulating local trip, the emergency tappet nut is in the "up" position, the emergency connecting rod has moved to the right, the trip hook has released the latch-up lever, and the TTV stem has relocated downwards). • **If asked:** 2-FW-P-2 speed is lowering **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 10: Reports to Shift Manager that 2-FW-P-2 is tripped locally **EVALUATOR'S NOTE:** • Acknowledge report. **COMMENTS:** **** JPM COMPLETE ****	_______ **SAT** _______ **UNSAT**

STOP TIME: ____________________________

Comments: ____

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Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- This task is to be SIMULATED. Do NOT turn switches, manipulate controls or reposition valves.
- The Unit 2 "A" SG is Ruptured. We are in the process of isolating the Ruptured SG iaw 2-E-3 step 3.
- 2-MS-RV-101A, SG ‘A’ PORV is not fully closed and efforts to close the PORV from the MCR has failed.
- 2-FW-P-3A and 2-FW-P-3B are running.

Initiating Cues

- Here is Step 3 of 2-E-3. I need you to perform Step 3b RNO, and 3d:
    - Locally isolate the failed ‘A’ SG PORV by closing 2-MS-86, SG A RELIEF VALVE ISOLATION VALVE.
    - After the PORV is isolated then locally isolate the ‘A’ SG from 2-FW-P-2 by closing 2-MS-87.
- When you finish the actions necessary to accomplish this, please inform me.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- This task is to be SIMULATED. Do NOT turn switches, manipulate controls or reposition valves.
- The Unit 2 "A" SG is Ruptured. We are in the process of isolating the Ruptured SG iaw 2-E-3 step 3.
- 2-MS-RV-101A, SG ‘A’ PORV is not fully closed and efforts to close the PORV from the MCR has failed.
- 2-FW-P-3A and 2-FW-P-3B are running.

Initiating Cues

- Here is Step 3 of 2-E-3. I need you to perform Step 3b RNO, and 3d:
    - Locally isolate the failed ‘A’ SG PORV by closing 2-MS-86, SG A RELIEF VALVE ISOLATION VALVE.
    - After the PORV is isolated then locally isolate the ‘A’ SG from 2-FW-P-2 by closing 2-MS-87.
- When you finish the actions necessary to accomplish this, please inform me.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

* *

CAUTION: • If the TD AFW pump is the only available source of feed flow, steam supply to the TD AFW pump must be maintained from at least one SG.

• At least one SG must be maintained available for RCS cooldown.

* *

3. ___ ISOLATE RUPTURED SG(s):

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
☑ a) Adjust ruptured SG PORV controller setpoint to 1035 psig	
☐ b) Check ruptured SG(s) PORV - CLOSED	☐ b) WHEN ruptured SG pressure less than 1035 psig, THEN check SG PORV closed. NO
	☐ IF PORV does NOT close, THEN put PORV controller in MANUAL AND close PORV. NO
	☐ IF PORV can NOT be closed, THEN locally isolate.
☑ c) Check blowdown TVs from ruptured SG(s) - CLOSED	☐ c) Manually close valves.
d) Locally close steam supply valve(s) to TD AFW pump: ☐ • 2-MS-87 for SG A ☐ • 2-MS-120 for SG B ☐ • 2-MS-158 for SG C	☐ d) IF at least one MD AFW pump running, THEN locally Trip the Overspeed Trip valve. IF NOT tripped, THEN close 2-MS-196.

(STEP 3 CONTINUED ON NEXT PAGE)

U.S. Nuclear Regulatory Commission
Surry Power Station

SR16301
In Plant Job Performance Measure 061K4.01
[Alternate Path]

Applicant__________________________________ Start Time____________________

Examiner_________________________________

Date _____________________________________ Stop Time____________________

Title

LOCALLY START AN EDG.

K/A: APE068AA1.31 Ability operate and / or monitor the following as they apply to the Control Room Evacuation: EDG. (3.9/4.0)

Applicability	Validation Time	Actual Time
RO/SRO(I)/SRO(U)	20 Minutes	_____ Minutes

Conditions

- Task is to be SIMULATED in the plant.

Standards

- Depresses Engine Start pushbutton.
- Turns 4160 V EMERG GEN SUP FEED TO BUS 1H SYNCH TO “ON”.
- Raises incoming voltage to 120 volts using EMERG GEN 1H VOLTAGE CONTROL HS.
- Places EMERG GEN 1H FAST START DEFEAT HS to ON.
- Closes breaker 15H3 by taking breaker control switch to CLOSE.

Procedures

- 0-FCA-12.00

Tools and Equipment
- None

Safety Considerations
- Standard PPE Required.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are **bolded**.
- This task is to be SIMULATED. Do NOT allow the operator to manipulate controls, operate switches or reposition valves
- **START TIME_______:**

STEP 1: NOTE and CAUTION prior to step 31. (FCA-12.00, step 31) • CAUTION: Personnel in the EDG Room should be wearing hearing protection at this time. • NOTE: Local EDG start will cause both start circuits to actuate simultaneously. **Standards** • Acknowledges Note and Caution. **Evaluator's Notes** **Evaluator's Comments**	**_______ SAT** **_______ UNSAT**

STEP 2: **CRITICAL STEP** LOCALLY START THE EDG. (AP-12.00, step 31). a) Depress the ENGINE START Pushbutton. b) Check EDG – STARTED. c) Check EDG SPEED – 900 RPM. d) Check EDG Output breaker closed. **Standards** **(a) Depresses the ENGINE START pushbutton (simulates). CRITICAL STEP.** (b) Check EDG started and speed at approximately 900 RPM. (c) Determines that EDG Output breaker (15H3) did NOT close. Goes to 31d RNO which directs the operator to return to step 9. **Evaluator's Cues** **Cue:** Acknowledge EDG Start and inform the operator that the Diesel is starting. **Cue:** When asked report that EDG is at 900 RPM by indicator on local panel. **Cue:** If asked about EDG Output breaker (15H3) report that indications are as you see them (green light on, red light out) **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**
STEP 3: NOTES prior to step 9. • The following conditions must exist in order for the EDG Output breaker to automatically close: o EDG speed is greater than 870 RPM. o EDG incoming voltage is greater than 113 volts. o The 15H8 breaker is opened. o The control switch for the 15H3 breaker is in the AFTER TRIP position. o DC control power is available to the breaker. **Standards** • Acknowledges NOTES. **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**

STEP 4: CHECK EDG SPEET – GREATER THAN 870 RPM. (FCA-12.00, step 9) **Standards** (a) Determines that EDG speed is greater than 870 RPM. Continues to step 10. **Evaluator's Notes** Evaluator Cue: If asked (again) indicate on the RPM meter that EDG speed is 900 RPM **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**
STEP 5: **CRITICAL STEP** CAUTION: EDG is running unloaded at this point. RAISE EDG INCOMING VOLTAGE TO GREATER THAN 113 VOLTS: (FCA-12.00, step 10) a) Turn 4160V EMERG GEN SUP FEED TO BUS 1H SYNC 15H3 to ON position. b) CHECK generator voltage – ESTABLISHED. c) Raise incoming voltage to 120 volts using EMERG GEN 1H VOLTAGE CONTROL HAND SW. **Standards** **(a) Turn 4160V EMERG GEN SUP FEED TO BUS 1H SYNC 15H3 to ON position (simulates). CRITICAL STEP.** (b) Check generator voltage – ESTABLISHED. Determines generator voltage has been established. **(c) Raises incoming voltage to 120 volts using VOLTAGE CONTROL HS. CRITICAL STEP** **Evaluator's Cues** **Cue: After Synch sw is placed;** If asked for generator voltage value. Indicate on voltage gauge that EDG voltage is APPROXIMATELY 115 VOLTS. **Cue: After Voltage control handswitch is operated** indicate that Generator volts is rising to 120 volts. **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**

STEP 6: CHECK 15H8 BREAKER – OPEN. (FCA-12.00, step 11) **Standards** (a) Operator determines that breaker 15H8 is OPEN. **Evaluator's Cues** Cue: If asked breaker 15H8 indication is green light ON, red light OFF. **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**
STEP 7: CHECK CONTROL POWER FOR BREAKER 15H3 – AVAILABLE. (FCA-12.00, step 12) • Breaker indicating lights - LIT **Standards** • Operator determines that Breaker 15H3 has control power. **Evaluator's Cues** **Cue**: If asked for breaker indicating lights, report that breaker lights are as indicated. **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**

STEP 8: CHECK BREAKER 15H3 CLOSED. (FCA-12.00, step 13) **Standards** Operator determines that breaker 15H3 is NOT CLOSED. Goes to step 13 RNO, which directs the operator to go to step 15. **Evaluator's Cues** Cue: If asked, breaker 15H3 is as you see it (green light lit, red light out). **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**
STEP 9: **CRITICAL STEP** MOMENTARILY PLACE EMERG GEN 1H FAST START DEFEAT HAND SW TO ON. (FCA-12.00, step 15) • Red light – ON. **Standards** • **Places EMERG GEN 1H FAST START DEFEAT HS TO ON. CRITICAL STEP.** • Checks red light on. **Evaluator's Cues** **Cue:** When asked for light indication, state that light above Fast Start Defeat HS is ON. **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**

STEP 10: CHECK INCOMING VOLTAGE – 120 VOLTS. (FCA-12.00, step 16) **Standards** • Operator checks incoming voltage is 120 volts. **Evaluator's Cues** **Cue: If Operator asks for incoming voltage (and indicates correct indicator).** Inform him voltage is 120 volts. **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**
STEP 11: NOTES before step 17: • Running voltage will be zero and the synchroscope will be motionless at this time. • If DC Bus A is deenergized, the EDG output breaker and Bus 1H load breakers must be manually closed. **Standards** • Acknowledges NOTES. **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**

STEP 12: **CRITICAL STEP** CLOSES EMERG SUP BREKER 15H3 (FCA-12.00, step 17) **Standards** • **Operator places HS for Breaker 15H3 to CLOSE. CRITICAL STEP.** **Evaluator's Cues** **Cue: When asked for status of breaker 15H3** report that red light is lit and green light is off. **Cue: If asked for changes to Running Voltage,** indicate that running voltage matches incoming voltage. **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**
STEP 13: TURN 4160 V EMERG GEN SUP FEED TO BUS 1H SYNCH 15H3 TO OFF**.** (FCA-12.00 step 18) **Standards** • Places 15H3 Synch switch to OFF. **Evaluator's Notes** **Evaluator's Comments**	_______ **SAT** _______ **UNSAT**

STEP 14:	
CHECK 1H BUS VOLTAGE BETWEEN 4000 AND 4400 VOLTS. (FCA-12.00, step 19) CHECK 1H BUS FREQUENCY STABLE BETWEEN 59.7 HZ AND 60.3 HZ. (FCA-12.00, step 20) **Standards** • Operator checks Bus voltage and frequency. **Evaluator's Cues** **If asked for voltage and frequency,** report that voltage is approx. 4200 volts, and frequency indicates 60.1 HZ. **Evaluator's Notes** **Evaluator's Comments** **END OF JPM**	_______ **SAT** _______ **UNSAT**

STOP TIME ___________:

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Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

<u>Initial Conditions</u>

- This task is to be SIMULATED. Do NOT turn switches, manipulate controls or reposition valves.
- The Main Control Room has been evacuated due to a fire.
- The crew is initiating actions per 0-FCA-1.00, LIMITING MCR FIRE
- Offsite power to the station has been lost and EDG #1 has failed to auto start.

<u>Initiating Cues</u>

- Another operator has completed the pre-start checks per 0-FCA-12.00, up to step 30. The Service Bldg operator will close the stub bus breaker and complete the procedure once the EDG is loaded on the bus.
- Here is a copy of 0-FCA-12.00. Your task is to start the #1 Emergency Diesel Generator at the local panel per 0-FCA-12.00 starting at <u>step 31</u>.

.

<u>Notes to the Evaluator</u>

- This task is to be SIMULATED. Do NOT allow the operator to manipulate controls, operate switches or reposition valves.
- Critical step sequencing requirements: None.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- This task is to be SIMULATED. Do NOT turn switches, manipulate controls or reposition valves.
- The Main Control Room has been evacuated due to a fire.
- The crew is initiating actions per 0-FCA-1.00, LIMITING MCR FIRE
- Offsite power to the station has been lost and EDG #1 has failed to auto start.

Initiating Cues

- Another operator has completed the pre-start checks per 0-FCA-12.00, up to step 30. The Service Bldg operator will close the stub bus breaker and complete the procedure once the EDG is loaded on the bus.
- Here is a copy of 0-FCA-12.00. Your task is to start the #1 Emergency Diesel Generator at the local panel per 0-FCA-12.00 starting at step 31.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure [KA: 036G2.1.44 3.9/3.8]

Applicant________________________________ Start Time___________________

Examiner________________________________

Date ___________________________________ Stop Time___________________

Title

MCR pressure boundary verification in plant using 0-AP-22.00, Fuel Handling Abnormal Conditions

K/A: 036G2.1.44, Knowledge of RO duties in the control room during fuel handling, such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation. (3.9 / 3.8).

Applicability	**Validation Time**	**Actual Time**
RO/SRO(I)/SRO(U)	10 Minutes	____ Minutes

Conditions

- Task is to be SIMULATED in plant.

Standards

- ….
- ….
- ….
- ….

Procedures

- 0-AP-22.00, Fuel Handling Abnormal Conditions.

Tools and Equipment

- None

Safety Considerations

- This JPM involves climbing up a narrow spiral staircase (twice) to access the U1/U2 Upper cable vault. Ensure you use the handrail when climbing stairs.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- *An additional instructor may be needed to silence alarms for the examinee.*
- **START TIME_______:**

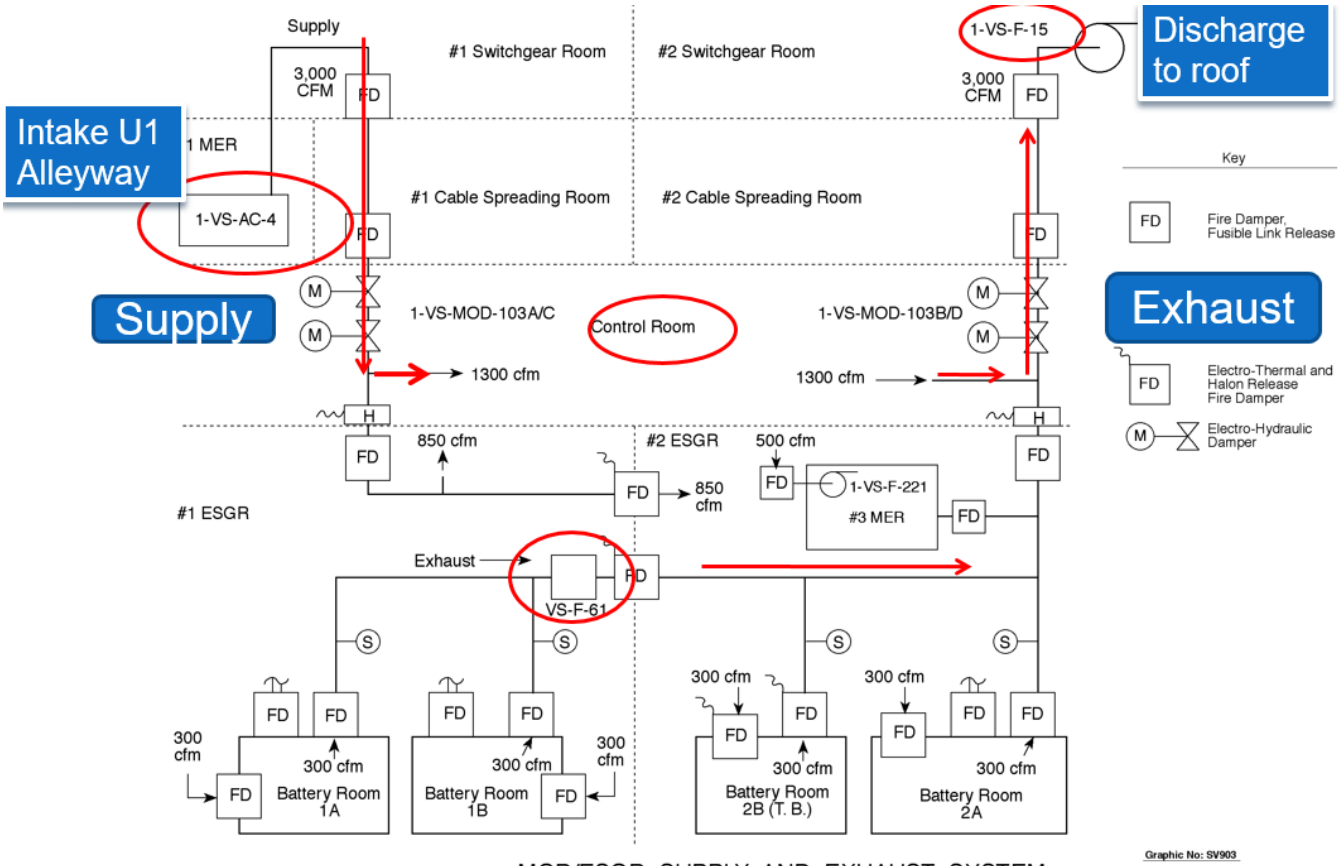
STEP 1 Check readings on the following Differential Pressure Indicators - POSITIVE PRESSURE INDICATED (0-AP-22.00 Attachment 1, step 1) **STANDARD:** a) Checks for positive pressure on all listed Differential Pressure Indicators: • PDI-VS-100, just inside MCR at Ventilation Panel • PDI-VS-101, just inside MCR at Ventilation Panel • PDI-VS-200, just inside MCR at Ventilation Panel • PDI-VS-201, just inside MCR at Ventilation Panel • 1-VS-PDI-118, in U1 Computer Room. • 1-VS-PDI-116, near entrance to U1 Computer Room. • 2-VS-PDI-216, in U2 Air Handler room. • 2-VS-PDI-206, near entrance to U2 Air Handler room. b) Determines all pressures are positive with the following two exceptions: • **1-VS-PDI-116 indicates zero.** • **2-VS-PDI-206 indicates zero.** **EVALUATOR'S NOTE:** **Note:** The Applicant may go to Step 2 after identifying the first PDI that does not indicate positive pressure. Determination of the need to locally secure Fans and AHUs satisfies the critical task in this step. **At the evaluator's discretion**: Attached screen shots of the eight listed Differential Pressure Indicators may be provided to the Applicant. **If Asked:** Show indication between 0.1 and 0.2 Inches of Water for the following six indicators: • PDI-VS-100, just inside MCR at Ventilation Panel • PDI-VS-101, just inside MCR at Ventilation Panel • PDI-VS-200, just inside MCR at Ventilation Panel • PDI-VS-201, just inside MCR at Ventilation Panel • 1-VS-PDI-118, in U1 Computer Room. • 2-VS-PDI-216, in U2 Air Handler room. **If Asked:** Show indication of 0.0 Inches of Water for the following two indicators: • **1-VS-PDI-116, near entrance to U1 Computer Room.** • **2-VS-PDI-206, near entrance to U2 Air Handler room.** **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 2 IF any reading NOT positive, THEN dispatch operator to perform Step 3 to secure MCR boundary fans. (0-AP-22.00 Attachment 1, step 2) **STANDARD:** a) Recalls from step 1 that 1-VS-PDI-116 and 2-VS-PDI-206 are not indicating positive pressure. b) Goes to Step 3. **EVALUATOR'S NOTE:** **Note**: If the Applicant incorrectly interprets the direction in Step 2 and does not perform Step 3, it will result in failure of this JPM. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 3 Secure MCR boundary fans by opening the following breakers (0-AP-22.00 Attachment 1, step 3) **STANDARD:** a) **Opens the supply breaker for every location listed below:** **___ • CABLE TRAY ROOM AIR HANDLING UNIT AHU-1, 1-EP-DB-HVAC, Ckt 1 (Unit 1 Switchgear Room, West wall)** **___ • CABLE TRAY ROOM AIR HANDLING UNIT, 2-EP-DB-HVAC, Ckt 2 (Unit 2 Switchgear Room, South wall)** **___ • 1-VS-F-16, CABLE TUNNEL EXHAUST FAN, 1-EP-BKR-1B2-1-2D (Unit 1 Switchgear Room)** **___ • 2-VS-F-16, CABLE TUNNEL EXHAUST FAN, 2-EP-BKR-2B2-1-4D (Unit 2 Switchgear Room)** **___ • 1-VS-F-RAF-1, CABLE TRAY ROOM RETURN FAN, 1-EP-BKR-1B2-1-3D (Unit 1 Switchgear Room)** **___ • 2-VS-F-RAF-2, CABLE TRAY ROOM RET FAN, 2-EP-BKR-2B2-1-3D (Unit 2 Switchgear Room)** **___ • 1-VS-HV-2, CABLE VAULT HTG AND VENT UNITS, 1-EP-BKR-1A1-1EA1 (Unit 1 Upper Cable Vault)** **___ • 2-VS-HV-2, CABLE VAULT HTG AND VENT UNIT, 2-EP-BKR-2A1-1EA1 (Unit 2 Upper Cable Vault)** b) Goes to Step 4. **EVALUATOR'S NOTE:** **IF asked**: For each of the breakers listed above, state the breaker is as they see it (all are expected to be closed). **IF asked**: After the Applicant simulates opening each of the breakers listed above, indicate the breaker is in the OFF position. **Note**: All listed breakers must be opened to satisfy the Critical Step. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4 Check readings on the following Differential Pressure Indicators - POSITIVE PRESSURE INDICATED (0-AP-22.20 Attachment 1, step 4) **STANDARD:** a) Checks for positive pressure on all listed Differential Pressure Indicators: • PDI-VS-100, just inside MCR at Ventilation Panel • PDI-VS-101, just inside MCR at Ventilation Panel • PDI-VS-200, just inside MCR at Ventilation Panel • PDI-VS-201, just inside MCR at Ventilation Panel • 1-VS-PDI-118, in U1 Computer Room. • 1-VS-PDI-116, near entrance to U1 Computer Room. • 2-VS-PDI-216, in U2 Air Handler room.	_______ **SAT** _______ **UNSAT**

• 2-VS-PDI-206, near entrance to U2 Air Handler room. b) Determines all pressures are positive. **EVALUATOR'S NOTE:** . **COMMENTS:** **END OF JPM**	

STOP TIME: _______



MCR/ESGR SUPPLY AND EXHAUST SYSTEM

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initiating Conditions

- Unit 1 is operating at 100% power; Unit 2 is in Refueling Shutdown. Fuel shuffling was in progress in the Fuel Building.
- There has been a Fuel Handling accident in the Fuel Building.
- The Fuel Handling crew has placed the leaking fuel assembly in the designated storage location and has evacuated the Fuel Building.

Initiating Cues

- Here is a copy of 0-AP-22.00, Fuel Handling Abnormal Conditions. Your task is to isolate the Main Control Room Boundary and place it on Emergency Ventilation.
- When you finish the actions necessary to accomplish this, please inform me.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initiating Conditions

- Unit 1 is operating at 100% power; Unit 2 is in Refueling Shutdown. Fuel shuffling was in progress in the Fuel Building.
- There has been a Fuel Handling accident in the Fuel Building.
- The Fuel Handling crew has placed the leaking fuel assembly in the designated storage location and has evacuated the Fuel Building.

Initiating Cues

- Here is a copy of 0-AP-22.00, Fuel Handling Abnormal Conditions. Your task is to isolate the Main Control Room Boundary and place it on Emergency Ventilation.
- When you finish the actions necessary to accomplish this, please inform me.

1. ___ Check readings on the following Differential Pressure Indicators - POSITIVE PRESSURE INDICATED.

☐ • PDI-VS-100, D.P.-U1CR/U1TB (Unit 2 Turbine Ventilation Panel)

☐ • PDI-VS-101, D.P.-U1RR/U1TB (Unit 2 Turbine Ventilation Panel)

☐ • PDI-VS-200, D.P.-U2CR/U2TB (Unit 2 Turbine Ventilation Panel)

☐ • PDI-VS-201, D.P.-U2RR/U2TB (Unit 2 Turbine Ventilation Panel)

☐ • 1-VS-PDI-118 (Unit 1 Computer Room)

☐ • 1-VS-PDI-116 (Near Unit 1 Semi-Vital Bus)

☐ • 2-VS-PDI-215 (Unit 2 AC Room)

☐ • 2-VS-PDI-206 (Near Unit 2 Semi-Vital Bus)

2. ___ IF any reading NOT positive, THEN dispatch operator to perform Step 3 to secure MCR boundary fans. Otherwise, enter N/A for Steps 3 through 5.

3. Secure MCR boundary fans by opening the following breakers.

___ • CABLE TRAY ROOM AIR HANDLING UNIT AHU-1, 1-EP-DB-HVAC, Ckt 1 (Unit 1 Switchgear Room, West wall)

___ • CABLE TRAY ROOM AIR HANDLING UNIT, 2-EP-DB-HVAC, Ckt 2 (Unit 2 Switchgear Room, South wall)

___ • 1-VS-F-16, CABLE TUNNEL EXHAUST FAN, 1-EP-BKR-1B2-1-2D (Unit 1 Switchgear Room)

___ • 2-VS-F-16, CABLE TUNNEL EXHAUST FAN, 2-EP-BKR-2B2-1-4D (Unit 2 Switchgear Room)

___ • 1-VS-F-RAF-1, CABLE TRAY ROOM RETURN FAN, 1-EP-BKR-1B2-1-3D (Unit 1 Switchgear Room)

___ • 2-VS-F-RAF-2, CABLE TRAY ROOM RET FAN, 2-EP-BKR-2B2-1-3D (Unit 2 Switchgear Room)

___ • 1-VS-HV-2, CABLE VAULT HTG AND VENT UNITS, 1-EP-BKR-1A1-1EA1 (Unit 1 Upper Cable Vault)

___ • 2-VS-HV-2, CABLE VAULT HTG AND VENT UNIT, 2-EP-BKR-2A1-1EA1 (Unit 2 Upper Cable Vault)

4. ___ Check readings on the following Differential Pressure Indicators - POSITIVE PRESSURE INDICATED.

☐ • PDI-VS-100, D.P.-U1CR/U1TB (Unit 2 Turbine Ventilation Panel)

☐ • PDI-VS-101, D.P.-U1RR/U1TB (Unit 2 Turbine Ventilation Panel)

☐ • PDI-VS-200, D.P.-U2CR/U2TB (Unit 2 Turbine Ventilation Panel)

☐ • PDI-VS-201, D.P.-U2RR/U2TB (Unit 2 Turbine Ventilation Panel)

☐ • 1-VS-PDI-118 (Unit 1 Computer Room)

☐ • 1-VS-PDI-116 (Near Unit 1 Semi-Vital Bus)

☐ • 2-VS-PDI-215 (Unit 2 AC Room)

☐ • 2-VS-PDI-206 (Near Unit 2 Semi-Vital Bus)

5. ___ IF any reading NOT positive, THEN dispatch operator to verify secured or secure all Turbine Building Supply and Exhaust Fans. Circle any fan NOT initially secured.

MCC 1A1-2 Turbine Bldg, 9' 6" West

___ • 1-VS-F-29A, 1A1-2-2A

___ • 1-VS-F-29B, 1A1-2-2B

MCC 1B1-3 Turbine Bldg, 9' 6" West

___ • 1-VS-F-29F, 1B1-3-3B

___ • 1-VS-F-29E, 1B1-3-4D

MCC 1A2-2 Mezzanine

___ • 1-VS-F-29C, 1A2-2-2B

___ • 1-VS-F-29D, 1A2-2-2C

___ • 1-VS-F-28B, 1A2-2-4C

___ • 1-VS-F-28A, 1A2-2-5B

MCC 1C2-2 Mezzanine

___ • 1-VS-F-29G, 1C2-2-2B

___ • 1-VS-F-29H, 1C2-2-3B

___ • 1-VS-F-28C, 1C2-2-4A

MCC 2A1-2 Turbine Bldg, 9' 6" West

___ • 2-VS-F-29A, 2A1-2-2A

___ • 2-VS-F-29B, 2A1-2-2B

MCC 2B1-3 Turbine Bldg, 9' 6" West

___ • 2-VS-F-29E, 2B1-3-3B

___ • 2-VS-F-29F, 2B1-3-3C

MCC 2A2-2 Mezzanine

___ • 2-VS-F-29C, 2A2-2-2B

___ • 2-VS-F-29D, 2A2-2-2C

___ • 2-VS-F-28A, 2A2-2-2D

___ • 2-VS-F-28B, 2A2-2-4C

MCC 2C2-2 Mezzanine

___ • 2-VS-F-29G, 2C2-2-2B

___ • 2-VS-F-29H, 2C2-2-3B

___ • 2-VS-F-28C, 2C2-2-4A

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure [KA: 024AA1.17 3.9/3.9]
[Alternate Path]

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Emergency Borate the RCS in accordance with 1-AP-3.00, Emergency Boration

K/A: 024AA1.17, Ability to operate and / or monitor the following as they apply to Emergency Boration: Emergency borate control valve and indicators (3.9 / 3.9).

Applicability	**Validation Time**	**Actual Time**
RO/SRO(I)/SRO(U)	10 Minutes	____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.

Standards

- Manually adjusts Charging flow to > 75 gpm.
- Attempts to open 1-CH-MOV-1350.
- Aligns charging to RWST (Sequence Critical):
  - Opens 1-CH-MOV-1115B OR D.
  - CLOSES 1-CH-MOV-1115C OR E.

Procedures

- 1-AP-3.00, Emergency Boration.

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- Recall 100% power IC and initialize or recall IC-381. Place simulator in RUN.
- Set 1-CH-MOV-1350 to thermal on auto trigger when .001 open. CH73 Trigger 1, Auto Trigger Event CHMOV350 .ge. 0.0001”.
- Insert meter Override CHFI110, EMRG BORATE FLOW, 0, ACTIVE.
- Trip Reactor and Stabilize at Hot Shutdown.
- Adjust CH flow using 1-CH-LC-1459G to 50 gpm and return to Auto.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- *An additional instructor may be needed to silence alarms for the examinee.*
- **START TIME_______:**

STEP 1 NOTES Prior to Step 1 (AP-3.0 step 1) • If a Reactor Trip occurs or is required, 1-E-0, REACTOR TRIP OR SAFETY INJECTION, should be implemented. • When the Reactor is shutdown with the Shutdown Banks withdrawn, tripping the Shutdown Banks may eliminate the need for emergency boration. **STANDARD:** • Acknowledges Notes. **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 2 (CRITICAL STEP) CHECK CHARGING FLOW – GREATER THAN 75 GPM (AP-3.0 step 1) **STANDARD:** a) Checks CHG Line Flow on 1-CH-FI-1122A and identifies flow < 75 gpm. b) Goes to Step 1 RNO c) **Manually adjusts charging flow to greater than 75 gpm. CRITICAL STEP** • Using 1-CH-LC-1459G, PRZR LEVEL CNTRL, in Manual -OR- • Using 1-CH-FCV-1122, CHG FLOW CNTRL in Manual **EVALUATOR'S NOTE:** NONE. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 3 START EMERGENCY BORATION (AP-3.0 step 2a) a) Transfer the in-service BATP to FAST. **STANDARD:** • Places control switch for 1-CH-P-2A, Boric Acid Transfer Pump to FAST. • Identifies RED "Slow" Light - OUT; RED "FAST" light - LIT • Acknowledges Annunciator 1D-C5, BA XFER PPS NON-AUTO CONT. **EVALUATOR'S NOTE:** NONE. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4 (CRITICAL STEP) START EMERGENCY BORATE (AP-3.0 step 2b) NOTE: Opening breaker prior to local operation of 1-CH-MOV-1350 is NOT required in this AP, based on the urgent need to borate. b) Open 1-CH-MOV-1350. **STANDARD:** a) Acknowledges Note. b) **Open 1-CH-MOV-1350. CRITICAL STEP** • Removes Brass Cap on 1-CH-MOV-1350 control switch and places in OPEN position. • Identifies RED and GREEN MOV Indicating lights extinguish. • Identifies "0" indicated flow on 1-CH-FI-1110, EMRG BORATE FLOW indicator. • Reports trip indication for 1-CH-MOV-1350 to Evaluator. • **GOES to Step 2b) RNO. (This begins the Faulted Portion of the JPM).** **EVALUATOR'S NOTE:** **When Notified**: Acknowledge 1-CH-MOV-1350 indication report. **IF asked**: Will direct electricians to investigate MCC 1H1-2S 7C breaker status. **BOOTH OPERATOR**: **IF Asked**: Report that a time compression has occurred and 1-CH-P-2A breaker MCC-1H1-2S 7C Thermal Overload is tripped. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5 (CRITICAL STEP) START EMERGENCY BORATION (AP-3.0 step 2b RNO) Locally open 1-CH-MOV-1350. IF 1-CH-MOV-1350 can NOT be opened, THEN do the following: 1) Manually open 1-CH-FCV-1113A. 2) Locally open 1-CH-228. 3) Monitor Boric Acid flow on FR-1-113. 4) GO TO Step 3. 5) If neither valve can be opened, THEN manually align CHG pump suction to the RWST AND GO TO Step 5. **STANDARD:** a) Directs Auxiliary Building Operator to locally open 1-CH-MOV-1350, Emergency Borate MOV. b) Acknowledges Statement: "IF 1-CH-MOV-1350 can NOT be opened…:" c) Manually open 1-CH-FCV-1113A. • Checks 1-CH-FCV-1113A indicates open. • Places 1-CH-FCV-1113A control switch in OPEN. d) Directs Auxiliary Building Operator to Open 1-CH-228. e) Monitors for Boric Acid flow on FR-1-1113 (red trace). f) Acknowledge Statement "IF neither valve can be opened, THEN manually align CHG pump suction to the RWST AND GO TO Step 5. **g) Opens 1-CH-MOV-1115B AND 1-CH-MOV-1115D,** CH Pump Suction from RWST. **CRITICAL STEP, and Sequence Critical:** Either 1-CH-MOV-1115B **OR 1**-CH-MOV-1115D **OPEN** will provide the necessary flowpath to the CH Pump and will satisfy the Critical Step. **This must be done before closing 1-CH-MOV-1115C, and 1115E.** **h) Closes 1-CH-MOV-1115C AND 1-CH-MOV1115E,** CH Pump Suction From VCT. **Critical Step.** Either 1-CH-MOV-1115C **OR** 1-CH-MOV-1115E **CLOSED** will isolate the CH pump suction from the VCT and will satisfy the Critical Step**.** Goes to Step 5 . **EVALUATOR'S NOTE:** **CUE:** Acknowledge Charging alignment and state the following: "The STA will check SDM as we borate from the RWST. Remain in this lineup until directed to change this alignment. **BOOTH OPERATOR:** **If Directed**: Report that a "Time Compression has occurred" and MCC 1H1-2S 7C breaker is open. **When Directed**: Report that a 'Time Compression has occurred" and 1-CH-MOV-1350 motor will not disengage, and the handwheel will not move. **When Directed**: Report that a 'Time Compression has occurred" and 1-CH-228 handwheel spins without changing valve stem position. **After flow from the RWST**; Announce the following: "Time compression, Shutdown Margin has been verified. **COMMENTS:** **END OF JPM**	_______ **SAT** _______ **UNSAT**

STOP TIME: _______

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initiating Conditions

Unit 1 tripped approximately 10 minutes ago. The STA just informed the Team that we have a challenge to our shutdown margin requirements based on RCS boron results just obtained from Chemistry. The STA recommends a twenty (20) minute emergency boration.

Initiating Cues

- Here is a copy of 1-AP-3.00, Emergency Borate. Your task is to Emergency Borate from the Boric Acid Storage tanks for twenty (20) minutes in accordance with 1-AP-3.00.
- When you finish the actions necessary to accomplish this, please inform me.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initiating Conditions

Unit 1 tripped approximately 10 minutes ago. The STA just informed the Team that we have a challenge to our shutdown margin requirements based on RCS boron results just obtained from Chemistry. The STA recommends a twenty (20) minute emergency boration.

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- When you finish the actions necessary to accomplish this, please inform me.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure 013A4.01
[Alternate Path]

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Transfer the SI System to the Cold Leg Recirculation Mode

K/A: 013A4.01 Ability to manually operate and/or monitor in the control room: ESFAS-initiated equipment which fails to actuate. (4.5/4.8)

Applicability	Validation Time	Actual Time
RO/SRO(I)	10 Minutes	______ minutes

Conditions

- Task is to be PERFORMED in the simulator.

Standards

- Determines only one LHSI pump in service and secures 1-CH-P-1B and places in PTL.
- Manually initiate RMT by depressing both Train RMT pushbuttons simultaneously.
- Opens 1-SI-MOV-1860B by placing control switch to OPEN.
- Closes 1-SI-MOV-1862B by placing control switch to CLOSE after 1-SI-MOV-1860B is FULL OPEN..
- Closes 1-CH-MOV-1115B by placing control switch to CLOSE.
- Closes 1-CH-MOV-1115D by placing control switch to CLOSE.
- Long term RMT established before SI pump cavitates as indicated by fluctuating amps and discharge pressure.

Procedures

- 1-ES-1.3, Transfer to Cold Leg Recirculation. (Rev. 20)

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- Recall **IC-382**.

  -OR-

- Call up 100% power IC and initialize. Place simulator in RUN.
- Initiate malfunction for "A" loop cold leg rupture (RC0101).
- Perform E-0 & transition to 1-E-1. Perform 1-E-1 through Step 21, which checks for transition to ES-1.3.
- Two (2) LHSI pumps, two (2) HHSI pumps & all ISRS pumps, OSRS pumps and CS pumps should be running. HHSI pumps should be on redundant flowpath alignment and charging pump mini-flow recirc valves should be closed.
- When RWST level is 21% insert the following malfunctions:
    - EL1201 – Loss of 480v Emergency Switchgear 1H. This will result in loss of power to 1-RS-P-1A (ISRS), 1-RS-P-2A (OSRS), and 1-SI-P-1A (LHSI). The red lights should remain lit, but there will be no amps indicated for these pumps.
    - SI1701, 1702. This will cause a loss of RMT (AUTO).
    - SI29. This will disable SI-MOV-1860B from auto opening.
    - SI31. This will disable SI-MOV-1862B from auto closing.
    - CH78, 79. This will disable CH-MOV-1115B and D from auto closing.
- When RWST level is 20% (RWST LOW LEVEL alarm is LIT), freeze simulator for performance.

Notes

- When possible place Simulator in RUN prior to the candidate entering the Simulator.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are **bolded**.
- *An additional instructor may be needed to silence and acknowledge alarms for the examinee.*
- **START TIME:**

STEP 1: CAUTIONS and NOTES Prior to Step 1. **STANDARD:** a) Reads caution that SI recirc flow to RCS must be maintained at all times. b) Reads caution that transfer to recirculation may cause high radiation in the Auxiliary Building. c) Notes that Steps 1 through 5 should be performed without delay and FRs should not be implemented before completion of these steps. d) Notes that if sump blockage or a complete loss of sump suction capability occurs, FRs should NOT be implemented until directed in Attachment 1, or in 1-ECA-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2: CHECK OR PLACE BOTH RMT MODE TRANSFER SWITCHES IN RMT. *(Step 1)* **STANDARD:** Verifies BOTH RMT Transfer Switches in RMT position. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 3: RESET SI. *(Step 2)* **STANDARD:** Depresses both SI Reset Pushbuttons on Benchboard 1-1. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: CHECK SI RECIRC PHASE HEAT SINK. *(Step 3)* Check SW flow established to at least two RSHXs. *(Step 3a)* **STANDARD:** Checks the following flow indications for SW flow to at least two RS HXs: a) 1-SW-FI-106A (SW flow to "A" RSHX). b) 1-SW-FI-106B (SW flow to "B" RSHX). c) 1-SW-FI-106C (SW flow to "C" RSHX). d) 1-SW-FI-106D (SW flow to "D" RSHX). **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 5: Check AC emergency buses - ENERGIZED BY OFF-SITE POWER. *(Step 3b)* **STANDARD:** a) Checks "H" Bus voltage indicated (between 4000 and 4400 volts). b) Checks "H" Bus normal supply breaker, 15H8, closed (red light on & green off). c) Checks "J" Bus voltage indicated (between 4000 and 4400 volts). d) Checks "J" Bus normal supply breaker, 15J8, closed (red light on & green off). **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 6: Check RS pumps associated with RSHXs supplied by SW - AT LEAST TWO RUNNING. *(Step 3c)* **STANDARD:** Checks if the following pumps to determine if at least two are running: a) 1-RS-P-1A (associated w/ A RSHX) – breaker closed BUT NO AMPS INDICATED. b) 1-RS-P-1B (associated w/ B RSHX) – breaker closed, amps indicated. c) 1-RS-P-2A (associated w/ C RSHX) – breaker closed BUT NO AMPS INDICATED. d) 1-RS-P-2B (associated w/ D RSHX) - breaker closed, amps indicated. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: **CRITICAL STEP** CHECK LHSI PUMPS. *(Step 4)* LHSI pumps – BOTH RUNNING. *(Step 4a)* IF RCS pressure is less than 185 psig AND only one LHSI pump can be started then run only ONE CHG pump. IF SI headers are split, then run the CHG pump supplying the normal header and place the remaining CHG pump in PTL. **STANDARD:** a) Checks 1-SI-P-1A breaker indication red light on BUT NO amps indicated. b) Check RCS Pressure – LESS THAN 185 psig. • Checks 1-SI-P-1B breaker indication red light on and amps indicated. • **Determines only one LHSI pump in service and secures 1-CH-P-1B and places in PTL. CRITICAL STEP** (the 'B' CHG pump is supplying the alternate header**).** • Verifies 1-CH-P-1A in PTL. • Checks RCS Pressure is less than 185 psig (yes). **EVALUATOR'S NOTE:** • **Cue: If asked about SI headers,** state that SI headers are split. Note: this is also given under Initial Conditions. • **NOTE:** The operator can determine which pump is running on the normal and alternate headers by vertical board indication. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 8:	
ALIGNS SI SYSTEM FOR RECIRC. *(Step 5a & b)* • CAUTION: If suction source is lost to any SI or CS pump, the pump should be stopped. a) Close CHG pump miniflow recirc valves • 1-CH-MOV-1275A • 1-CH-MOV-1275B • 1-CH-MOV-1275C b) RWST Level – LESS THAN 13% **STANDARD** a) Checks 1-CH-MOV-1275A, 1275B, and 1275C closed by observing green light on and red light off for each MOV. b) Checks RWST level less than 13% on the following indicators: • 1-CS-LI-100A • 1-CS-LI-100B • 1-CS-LI-100C • 1-CS-LI-100D 1) If RWST level not less than 13%, waits for level to reach 13%. **EVALUATOR'S NOTE:** If annunciators 1A-A2, 1A-B2, 1A-C2, and 1A-D2 are lit, the operator should identify auto RMT failure and proceed to Step 5c. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 9: **CRITICAL STEP** Check Phase 1 - INITIATED. *(Step 5c(1) and RNO)* **STANDARD:** a) Checks Phase 1 White Status light NOT lit. (Goes to RNO) **b) Pushes both RMT actuation pushbuttons for Train A.** **c) Pushes both RMT actuation pushbuttons for Train B.** d) Verifies RMT has actuated and that valves automatically align. **EVALUATOR'S NOTE:** • Phase 1 White Status light is lit. • RMT actuation pushbuttons will function when pushed. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 10: LHSI discharge to HHSI - OPEN. *(Step 5c(2))* **STANDARD:** a) Checks OPEN 1-SI-MOV-1863A by observing red light on and green light off. b) Checks OPEN 1-SI-MOV-1863B by observing red light on and green light off. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 11: LHSI Recirc valves - CLOSED. *(Step 5c(3))* **STANDARD:** a) Checks CLOSED 1-SI-MOV-1885A closed by observing green light on & red off. b) Checks CLOSED 1-SI-MOV-1885B closed by observing green light on & red off. c) Checks CLOSED 1-SI-MOV-1885C closed by observing green light on & red off. d) Checks CLOSED 1-SI-MOV-1885D closed by observing green light on & red off. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 12: Check Phase 2 - INITIATED. *(Step 5d(1) and RNO)* **STANDARD:** a) Checks Phase 2 Amber Status light LIT. b) Ensures 1 minute elapsed since RMT *should have actuated* prior to continuing. **EVALUATOR'S NOTE:** • Phase 2 amber light will work, but only the 'A' train will respond. This is the train that has the de-energized LHSI pump. The 'B' train will not automatically respond, requiring the operator to manually align the 'B' train. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

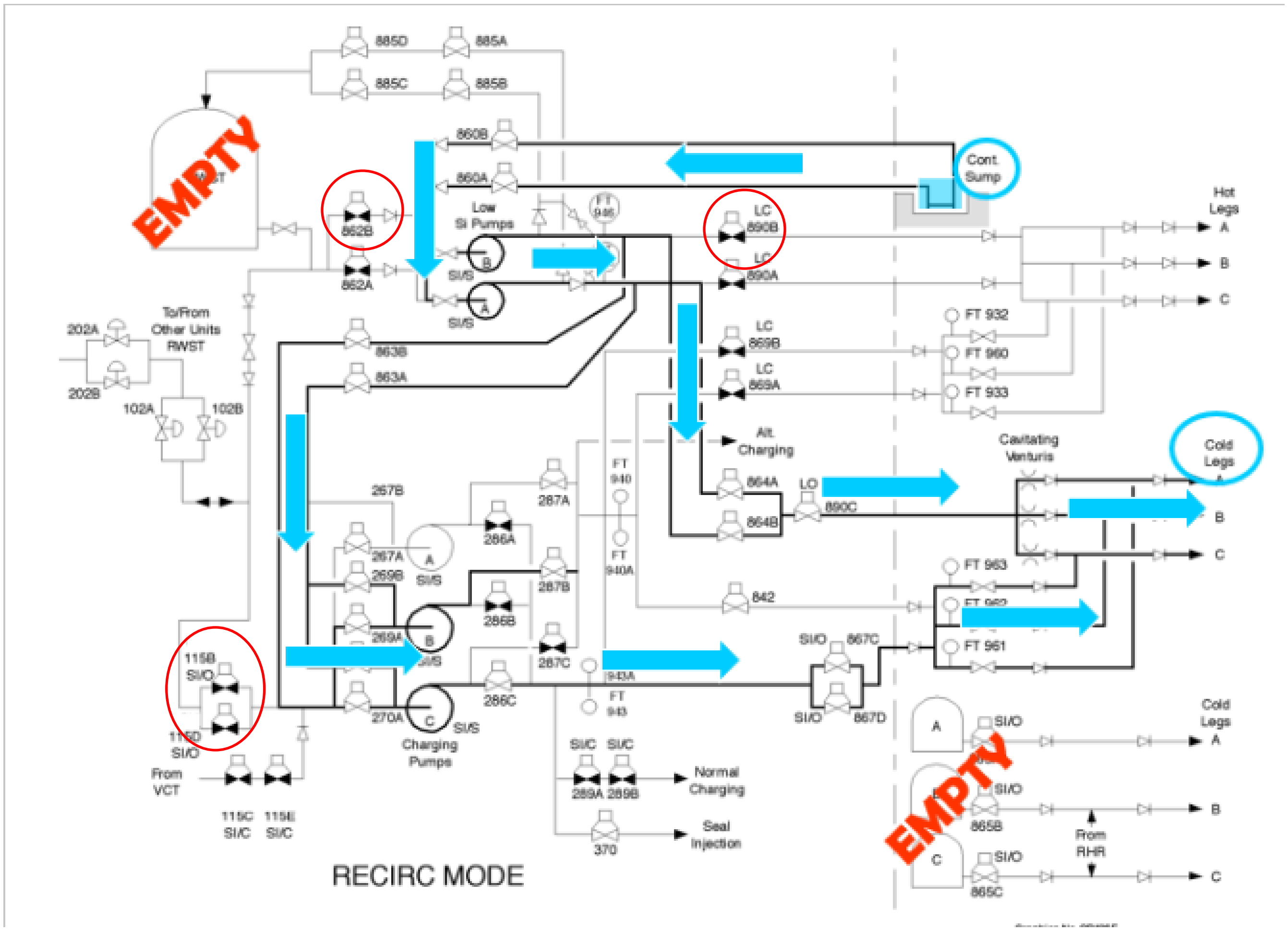
STEP 13: **CRITICAL STEP** LHSI suction from sump - OPEN. *(Step 5d(2))* **STANDARD:** a) Checks OPEN 1-SI-MOV-1860A open by observing red light on & green off. **b) Opens 1-SI-MOV-1860B by placing control switch to OPEN. CRITICAL STEP** c) Checks 1-SI-MOV-1860B open by observing red light on & green off. **EVALUATOR'S NOTE:** These valves take approximately 1 minute to open. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 14: **CRITICAL STEP** LHSI suction from RWST - CLOSED. *(Step 5d(3))* **STANDARD:** a) Checks CLOSED 1-SI-MOV-1862A closed by observing green light on & red off. **b) Closes 1-SI-MOV-1862B by placing control switch to CLOSE. CRITICAL STEP. Note: MOV-1862B should not be closed until after MOV-1860B is FULL OPEN.** c) Checks 1-SI-MOV-1862B closed by observing green light on & red off. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 15: **CRITICAL STEP.** CHG pump suction from RWST valves - CLOSED. *(Step 5d(4))* **STANDARD:** **a) Closes 1-CH-MOV-1115B by placing control switch to CLOSE. CRITICAL STEP. Note: This valve should not be closed until after MOV 1860B is FULL OPEN.** b) Checks 1-CH-MOV-1115B closed by observing green light on & red off. **c) Closes 1-CH-MOV-1115D by placing control switch to CLOSE. CRITICAL STEP. Note: This valve should not be closed until after MOV 1860B is FULL OPEN.** d) Checks 1-CH-MOV-1115D closed by observing green light on & red off. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 16: **CRITICAL STEP** Check recirculation flow - ESTABLISHED. *(Step 5e)* **STANDARD:** **Verifies SI flow to the Rx core via cold leg flowpath by checking the following flow instrumentation: CRITICAL STEP. Recirc flow should be established prior to any indication of pump cavitation.** • 1-SI-FI-1945 (A LHSI FT) – 0 gpm, • 1-SI-FI-1946 (B LHSI FT) - ~3400 gpm, • 1-SI-FI-1961 (A Loop FT) - ~ 150 gpm, • 1-SI-FI-1962 (B Loop FT) - ~ 150 gpm, • 1-SI-FI-1963 (C Loop FT) - ~ 150 gpm, • 1-SI-FI-1943 (Total flow normal hdr) - ~440 gpm, • 1-SI-FI-1943A (Total flow normal hdr) - ~ 440 gpm, • 1-SI-FI-1940 (Total flow alt hdr) – 0 gpm, • 1-SI-FI-1940A (Total flow alt hdr) – 0 gpm. **EVALUATOR'S NOTE:** No flow should be noted on the "A" LHSI and Alternate Header flow indicators since 1-SI-P-1A has no power and only the Charging Pump aligned to the Normal Header is running. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 17: REPORTS TO NUCLEAR SHIFT MANAGER (EVALUATOR). **STANDARD:** Verbal status report made that cold leg recirculation established. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STOP TIME:

Simplified drawing of RECIRC MODE. Shown in red circles are the MOVs the operator will need to manually operate in order to place the 'B' train in RMT.



Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- A Large-Break LOCA has occurred on Unit 1.
- A few minutes ago, power was lost to 480V switchgear 1H. Electrical maintenance has been dispatched to investigate.
- The team has just transitioned to 1-ES-1.3.
- The SI headers are split.

Initiating Cue

- Perform steps 1-5 of 1-ES-1.3, Transfer to Cold Leg Recirculation.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- A Large-Break LOCA has occurred on Unit 1.
- A few minutes ago, power was lost to 480V switchgear 1H. Electrical maintenance has been dispatched to investigate.
- The team has just transitioned to 1-ES-1.3.
- The SI headers are split.

Initiating Cue

- Perform steps 1-5 of 1-ES-1.3, Transfer to Cold Leg Recirculation.

SURRY POWER STATION

EMERGENCY PROCEDURE

NUMBER	PROCEDURE TITLE	REVISION
1-ES-1.3	TRANSFER TO COLD LEG RECIRCULATION (WITH 3 ATTACHMENTS)	21
		PAGE 1 of 11

PURPOSE

To provide guidance to transfer the Safety Injection System to the cold leg recirculation mode.

TIME CRITICAL ACTIONS

ENTRY CONDITIONS

This procedure is applicable when RCS temperature is greater than or equal to 350°F assuming RHR is not in service. Using this procedure in any other plant condition requires a step by step evaluation to determine if a specified action is still applicable.

Transition from any of the following procedures:

- 1-E-1, LOSS OF REACTOR OR SECONDARY COOLANT,
- 1-ECA-2.1, UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS,
- From any other emergency response procedure whenever RWST level reaches 20%.

CONTINUOUS USE

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

* *

CAUTION:
- SI recirculation flow to RCS must be maintained at all times.
- Transfer to recirculation may cause high radiation in the Auxiliary Building.

* *

NOTE:
- Steps 1 through 5 should be performed without delay. FRs should NOT be implemented before the completion of these steps.
- If sump blockage or a complete loss of sump suction capability occurs, FRs should NOT be implemented until directed in Attachment 1, or in 1-ECA-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. ___	CHECK OR PLACE BOTH RMT MODE TRANSFER SWITCHES IN RMT	
2. ___	RESET SI	
3. ___	CHECK SI RECIRC PHASE HEAT SINK	
	☐ a) Check SW flow established to at least two RS HXs	☐ a) IF less than 24 hours after reactor trip, THEN establish SW flow to at least two RS HXs. ☐ IF greater than 24 hours after reactor trip, THEN establish SW flow to at least one RS HX.
	☐ b) Check AC emergency buses - ENERGIZED BY OFFSITE POWER	☐ b) Stop CC and RHR pump(s) energized by EDG(s).
	c) Check RS pumps associated with RS HXs supplied by SW - AT LEAST TWO RUNNING ☐ • 1-RS-P-1A RS HX A ☐ • 1-RS-P-1B RS HX B ☐ • 1-RS-P-2A RS HX C ☐ • 1-RS-P-2B RS HX D	☐ c) Start RS pump(s) associated with RS HX(s) supplied by SW.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4.___	CHECK LHSI PUMPS	
	☐ a) LHSI pumps - BOTH RUNNING	a) Do the following: ☐ IF RCS pressure is less than 185 psig, THEN start both LHSI pumps. IF RCS Pressure is less than 185 psig AND only one LHSI pump can be started, THEN run only one CHG pump IAW the following: ☐ 1) IF SI headers are split, THEN run the CHG pump supplying the normal header AND place remaining CHG pumps in PTL. ☐ 2) IF SI headers are NOT split, THEN run ONE CHG pump in the preferred order - C, B, A, AND place remaining CHG pumps in PTL. ☐ IF RCS pressure is greater than 185 psig, THEN check running or start only one LHSI pump. ☐ IF no LHSI pumps can be started, THEN GO TO 1-ECA-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION. ☐ GO TO Step 5.
	☐ b) Check RCS Pressure - LESS THAN 185 PSIG	☐ b) Stop one LHSI pump and place in PTL.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

* *

CAUTION: If suspection source is lost to any SI or spray pump, the pump should be stopped.

* *

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5.___	ALIGN SI SYSTEM FOR RECIRC	
	a) Close CHG pump miniflow recirc valves	☐ a) Manually close 1-CH-MOV-1373.
	☐ • 1-CH-MOV-1275A ☐ • 1-CH-MOV-1275B ☐ • 1-CH-MOV-1275C	☐ IF 1-CH-MOV-1373 does NOT close manually, THEN locally close.
	☐ b) RWST Level - LESS THAN 13%	☐ b) Do NOT continue. WHEN RWST level less than 13%, THEN GO TO Step 5c.
	c) Check Phase 1 - INITIATED	c) Initiate RMT.
	☐ 1) White Phase 1 Status light on bench board - LIT	☐ Push both RMT actuation pushbuttons for each train.
	2) LHSI discharge to HHSI - OPEN	☐ IF RMT has NOT actuated, THEN manually align valves.
	☐ • 1-SI-MOV-1863A ☐ • 1-SI-MOV-1863B	
	3) LHSI recirc valves - CLOSED	
	☐ • 1-SI-MOV-1885A ☐ • 1-SI-MOV-1885B ☐ • 1-SI-MOV-1885C ☐ • 1-SI-MOV-1885D	

(STEP 5 CONTINUED ON NEXT PAGE)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5.	ALIGN SI SYSTEM FOR RECIRC (Continued)	
	d) Check Phase 2 - INITIATED	☐ d) IF swap over does NOT occur after 1 minute time delay, THEN manually align valves.
☐	1) Amber Phase 2 Status light on bench board - LIT	
	2) LHSI suction from sump - OPEN	
☐	• 1-SI-MOV-1860A	
☐	• 1-SI-MOV-1860B	
	3) LHSI suction from RWST - CLOSED	
☐	• 1-SI-MOV-1862A	
☐	• 1-SI-MOV-1862B	
	4) CHG pump suction from RWST valves - CLOSED	
☐	• 1-CH-MOV-1115B	
☐	• 1-CH-MOV-1115D	
☐	e) Check recirculation flow - ESTABLISHED	☐ e) Start pumps and align valves.
		☐ IF at least one flow path from the sump to the RCS can NOT be established or maintained, THEN GO TO 1-ECA-1.1, LOSS OF EMERGENCY COOLANT RECIRCULATION.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure [KA: 038EA1.04 4.3/4.1]

Applicant________________________________ Start Time___________________

Examiner________________________________

Date ___________________________________ Stop Time___________________

Title

Depressurize the RCS to minimize SGTR Breakflow.

K/A: 038EA1.04, Ability to operate and / or monitor the following as they apply to Emergency Boration: Emergency borate control valve and indicators (4.3 / 4.1).

Applicability	Validation Time	Actual Time
RO/SRO(I)/SRO(U)	10 Minutes	____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.

Standards

- Opens both Pressurizer Spray valves to begin depressurization.
- Determines Spray Termination is satisfied.
- Closes both Pressurizer Spray valves to stop depressurization.

Procedures

- 1-E-3, Steam Generator Tube Rupture.

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- Initialize Simulator to IC #383 OR Call up 100% power IC and perform the following:
    - Enter malfunction for SGTR in "B" SG at ~450 gpm (RC2402 @ 50% degradation).
    - Call up the "B" Main Steam line & close 1-MS-120.
    - Place sim in RUN, trip Unit, perform 1-E-0 and transition to 1-E-3. Perform 1-E-3 up to Step 19, (incl SI blocks). RCPs should still be running & subcooling greater than 50°F. Throttle AFW flow to A & C SGs down to ~175 gpm.
    - Verify SR NIS detectors are energized and the SR scale is indicated on 1-NI-NR-A/B.
    - Freeze simulator until ready for JPM performance.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Operator is given a copy of 1-E-3, SGTR, Step 19 during directions
- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- *An additional instructor may be needed to silence alarms for the examinee.*
- **START TIME_______:**

STEP 1 1-E-3 Step 19 a) Check normal spray – AVAILABLE • RCP C AND 1-RC-PCV-1455B - BOTH AVAILABLE OR • RCPs A and B, AND 1-RC-PCV-1455A – BOTH AVAILABLE **STANDARD:** a) Checks all RCPs are running. b) Checks both Pressurizer Spray valves are in AUTO. **EVALUATOR'S NOTE:** **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2 (CRITICAL STEP) 1-E-3 Step 19, continued b) Spray PRZR with maximum available spray **STANDARD:** **a) Places PZR spray valve controllers (1-RC-PC-1444G and 1-RC-PC-1444H) in MANUAL and raises valve demand to open both for maximum available spray. CRITICAL STEP.** **OR** **b) Places PZR Master Controller (1-CH-PC-1444J) in MANUAL and raises demand to open both spray valves for maximum available spray (keeps Output < 80% to prevent PORV from opening). CRITICAL STEP.** **EVALUATOR'S NOTE:** Performing either Standard a) or b) satisfies the **CRITICAL STEP**. **COMMENTS:**	

STEP 3 (CRITICAL STEP) 1-E-3 Step 19, continued c) Check PRZR pressure satisfactorily lowering until ANY of the following satisfied: (Attachment 3 lists conditions) • PRZR level - GREATER THAN 69% <u>OR</u> • RCS subcooling based on CETCs - LESS THAN 30°F [85°F] <u>OR</u> • BOTH of the following exist: 1) RCS pressure - LESS THAN RUPTURED SG(s) PRESSURE 2) PRZR level - GREATER THAN 22% [50%] <u>OR</u> • BOTH of the following exist: 1) RCS pressure - WITHIN 300 PSI OF RUPTURED SG(s) PRESSURE 2) PRZR level - GREATER THAN 52% **STANDARD:** a) Monitors all associated critical parameters listed instep 19 c). **b) Identifies one of the four bulleted criteria are satisfied.** c) Continues to Step 19 d). **EVALUATOR'S NOTE:** • During Validation: RCS press within 300# with PRZR level > 52% was criteria reached. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4 (CRITICAL STEP) 1-E-3 Step 19, continued d) Close PRZR normal spray valves **STANDARD:** **a) Places PZR spray valve controllers (1-RC-PC-1444G and 1-RC-PC-1444H) in MANUAL and lowers valve demand to close both spray valves. CRITICAL STEP** **<u>OR</u>** **b) Places PZR Master Controller (1-CH-PC-1444J) in MANUAL and lowers demand to close both spray valves. CRITICAL STEP** **EVALUATOR'S NOTE:** Note: Operator may place Spray valve controllers in AUTO to close valves. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 6 Reports to Shift Manager **STANDARD:** a) Reports that 1-E-3 depressurization is complete. **EVALUATOR'S NOTE:** **COMMENTS:** **END OF JPM**	_______ **SAT** _______ **UNSAT**

STOP TIME: _______

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initiating Conditions

There is a SGTR in the Unit 1 "B" SG. The SG has been identified and isolated, SI has been blocked and the RCS cooled down to the target temperature. We are at Step 19 of 1-E-3 and ready to perform the RCS depressurization to minimize the SGTR breakflow.

Initiating Cues

- Here is a copy of 1-E-3 Step 19. Your task is to depressurize the RCS IAW Step 19.
- When you finish the actions necessary to accomplish this, please inform me.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initiating Conditions

There is a SGTR in the Unit 1 "B" SG. The SG has been identified and isolated, SI has been blocked and the RCS cooled down to the target temperature. We are at Step 19 of 1-E-3 and ready to perform the RCS depressurization to minimize the SGTR breakflow.

Initiating Cues

- Here is a copy of 1-E-3 Step 19. Your task is to depressurize the RCS IAW Step 19.
- When you finish the actions necessary to accomplish this, please inform me.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
17. ___	CHECK RUPTURED SG(s) PRESSURE - STABLE OR RISING	IF ruptured SG pressure is 250 psi greater than pressure of highest intact SG used for cooldown, THEN do the following: ☐ a) Check ruptured SG isolation. ☐ b) Initiate cooldown at less than 100°F/hr using intact SG(s). ☐ c) Maintain ruptured SG pressure greater than 250 psi above pressure of highest intact SG used for cooldown. ☐ IF 250 psi pressure differential does NOT exist OR can NOT be maintained by cooldown, THEN GO TO 1-ECA-3.1, SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY.
18. ___	CHECK RCS SUBCOOLING BASED ON CETCs - GREATER THAN 50°F [105°F]	☐ GO TO 1-ECA-3.1, SGTR WITH LOSS OF REACTOR COOLANT - SUBCOOLED RECOVERY.
19. ___	DEPRESSURIZE RCS TO MINIMIZE BREAK FLOW AND REFILL PRZR:	
	a) Check normal spray - AVAILABLE	☐ a) GO TO Step 20.
	☐ • RCP C AND 1-RC-PCV-1455B - BOTH AVAILABLE OR ☐ • RCPs A and B, AND 1-RC-PCV-1455A - BOTH AVAILABLE	
	☐ b) Spray PRZR with maximum available spray	

(STEP 19 CONTINUED ON NEXT PAGE)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
19.	DEPRESSURIZE RCS TO MINIMIZE BREAK FLOW AND REFILL PRZR: (Continued)	
	c) Check PRZR pressure satisfactorily lowering until ANY of the following satisfied: (Attachment 3 lists conditions) ☐ • PRZR level - GREATER THAN 69% OR ☐ • RCS subcooling based on CETCs - LESS THAN 30°F [85°F] OR • BOTH of the following exist: ☐ 1) RCS pressure - LESS THAN RUPTURED SG(s) PRESSURE ☐ 2) PRZR level - GREATER THAN 22% [50%] OR • BOTH of the following exist: ☐ 1) RCS pressure - WITHIN 300 PSI OF RUPTURED SG(s) PRESSURE ☐ 2) PRZR level - GREATER THAN 52%	c) Do the following: ☐ 1) Close normal spray valves. 2) IF a spray valve will NOT close, THEN stop the RCP(s) supplying the failed spray valve. ☐ • RCP A for 1-RC-PCV-1455A ☐ • RCP C for 1-RC-PCV-1455B ☐ 3) GO TO Step 20.
	☐ d) Close PRZR normal spray valves	d) Stop RCP(s) supplying failed open spray valves: ☐ • RCP A for 1-RC-PCV-1455A ☐ • RCP C for 1-RC-PCV-1455B
	☐ e) GO TO Step 22	

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure 005A2.03
[Alternate Path]

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

RESPOND TO A LOSS OF DECAY HEAT REMOVAL

K/A: 005A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the RHRS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: RHR pump / motor malfunction. (2.9 / 3.1)

Applicability	Validation Time	Actual Time
RO/SRO(I)	13 minutes	______minutes

Conditions

- Task is to be PERFORMED in the simulator.

Standards

- Manually close RH Control valves; 1-RH-FCV-1605, and 1-RH-HCV-1758.
- Manually start RHR pump 1-RH-P-1B started.
- Manually opens 1-RH-FCV-1605.
- Manually opens 1-RH-HCV-1758.
- Manually opens 1-CC-TV-109A.

Procedures

- 1-AP-27.00, Loss of Decay Heat Removal Capability.

Tools and Equipment
- None

Safety Considerations
- None

Simulator Setup

- Recall **IC-384**.

  -OR-

- Call up RHR IC (028) and initialize. Place simulator in RUN.
- Verify "A" RHR pump running and "B" in AUTO.
- Verify 1-RH-FCV-1605 in auto with flow rate set at 3400 gpm.
- Verify 1-RH-HCV-1758 set at approximately 81% demand (___ on pot).
- Ensure PCS display has OSP-RC-001 displayed.
- Place simulator in FREEZE until ready to perform JPM.

Place Simulator in RUN and let the candidate take the watch.

When the Evaluator is ready implement the following malfunctions/overrides to cause a loss of RHR:
  - MALF RH0501, RHR pump 1-RH-P-1A Overcurrent trip T1.
  - OVRD TVCC109A_CLOSE (auto deletes after 10 seconds)

- **Simulator Operator Note**: Place RED magnets on 1-RH-MOV-1700, 1701 and 1720A red bulbs. Place green magnets on SI accumulator green bulbs and verify magnets are correct for SI system for CSD. Place a white magnet and green arrow on the Pressurizer level cold cal channel 1-RC-LI-1460 and make sure the trend recorder is set for this channel.

Notes

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are **bolded**.
- *An additional instructor may be needed to silence and acknowledge alarms for the examinee.*
- **START TIME:**

<table>
<tr><td>

STEP 1:

Adjusting RHR temperature. (1-OP-ZZ-002, step 5.16.1)

NOTE: The thermal design rated flow for the RHR Heat Exchanger is 4200 gpm.

5.16.1 RHR temperature can be adjusted by performing one or both of the following. Enter N/A for any valves not operated.

- Adjust 1-RH-HCV-1758, RHR HXS FLOW.
- Adjust SW outlet valves for 1-CC-E-1A or 1-CC-E-1B as required. 1-SW-39.

STANDARD:

- Acknowledges note.
- Operates 1-RH-HCV-1758 to OPEN further by lowering pot setting.

EVALUATOR'S NOTES:

- **IF ASKED: for preference on raising cooldown rate.** Respond by telling operator that they should use the method requiring adjusting of 1-RH-HCV-1758.
- **IF ASKED:** Provide copy of 1-AP-27.00, Loss of Decay Heat Removal Capability.

BOOTH NOTE: When Evaluator is ready implement Malfunctions to cause trip of 1-RH-P-1A, AND closure of T-CC-TV-109A.

COMMENTS:

</td><td>

_______ **SAT**

_______ **UNSAT**

</td></tr>
</table>

STEP 2: ***CAUTIONS and NOTE PRIOR TO STEP 1*** (AP-27.00 step 1) **CAUTION:** • Loss of RHR due to a total loss of IA is addressed by 0-AP-40.00, NON-RECOVERABLE LOSS OF IA. • Loss of RHR due to a total loss of AC Power is addressed by 1-AP-10.27, LOSS OF ALL AC POWER WHILE ON RHR. • Loss of RHR may cause CTMT radiological and heat stress conditions to degrade. Local actions in CTMT should be coordinated with HP. • During solid plant operation, inadvertent actuation of the OPMS may occur if letdown is isolated. • If RCS boiling occurs, non-essential personnel should be evacuated from CTMT. **NOTE:** EPIPs may be applicable. **STANDARD:** • Acknowledges note and acknowledges cautions and recognizes that a total loss of IA or AC Power is not occurring. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 3: CHECK RCS INVENTORY - LOWERING. (*Step 1)* • PRZR level - LOWERING • Standpipe level - LOWERING • Reactor cavity level - LOWERING • RCS Narrow Range level - LOWERING • CTMT sump level - RISING • Makeup rate - RISING • PRT level, pressure, or temperature - RISING • PDTT level - RISING • RWST level - RISING **STANDARD:** • Notes that there are no draindown evolutions in progress and inventory is stable based on the directions given. • Checks Containment Sump level (1-DA-LI-100) is stable and not rising. • Checks PRT conditions (level, LI-1-470; pressure, PI-1-472; and temperature, TI-1-471) are stable and not rising. • Checks PDTT level (1-DG-LI-107) is stable and not rising. • Checks RWST level stable. • Determines that RCS inventory is NOT lowering and performs RNO to transition to procedure STEP 4. **EVALUATOR'S NOTE:** • **If asked**: All indications are as you see them. • **If asked**: No personnel are in Containment. • **If asked**: Cavity is not flooded up. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: CHECK RHR PUMP - ONE RUNNING. *(Step 4)* **STANDARD:** • Checks that no RHR pumps are running by observing zero amps indicated and 1-RH-P-1A has red and amber lights lit, 1-RH-P-1B has green light lit. 1-RH-P-1A also has overload light due to overcurrent trip. Goes to RNO. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5: CRITICAL STEP	
IF Emergency Bus power is available, THEN do the following: *(Step 4d-g RNO)* d) Manually close RH control valves: o 1-RH-FCV-1605 o 1-RH-HCV-1758 e) Start one RHR pump. f) Adjust RH control valves to return flow to pre-event rate: o 1-RH-FCV-1605 o 1-RH-HCV-1758 g) IF an RHR pump can NOT be started, THEN GO TO Step 16. *(NO, proceeds to step 5)*	_______ SAT _______ UNSAT
STANDARD: • **Places 1-RH-FCV-1605 in manual and closes valve. CRITICAL STEP.** • Notes setpoint on ten turn pot for 1-RH-HCV-1758 (9.8) and then **closes 1-RH-HCV-1758 using ten turn pot**. **CRITICAL STEP.** • **Starts 1-RH-P-1B by taking control switch to the start position and verifying amps are indicated. CRITICAL STEP.** • **Manually opens 1-RH-FCV-1605 using controller pushbuttons. CRITICAL STEP.** • **Manually opens 1-RH-HCV-1758. CRITICAL STEP.** • Proceeds to Step 5 since an RHR pump was started and the cause of trip was NOT due to a loss of Emergency Bus power. **EVALUATOR NOTE:** • 1-RH-FCV-1605, and 1-RH-HCV-1758 should be opened to the approximate pre-event value. However it's not critical that this exact value be established. **COMMENTS:**	

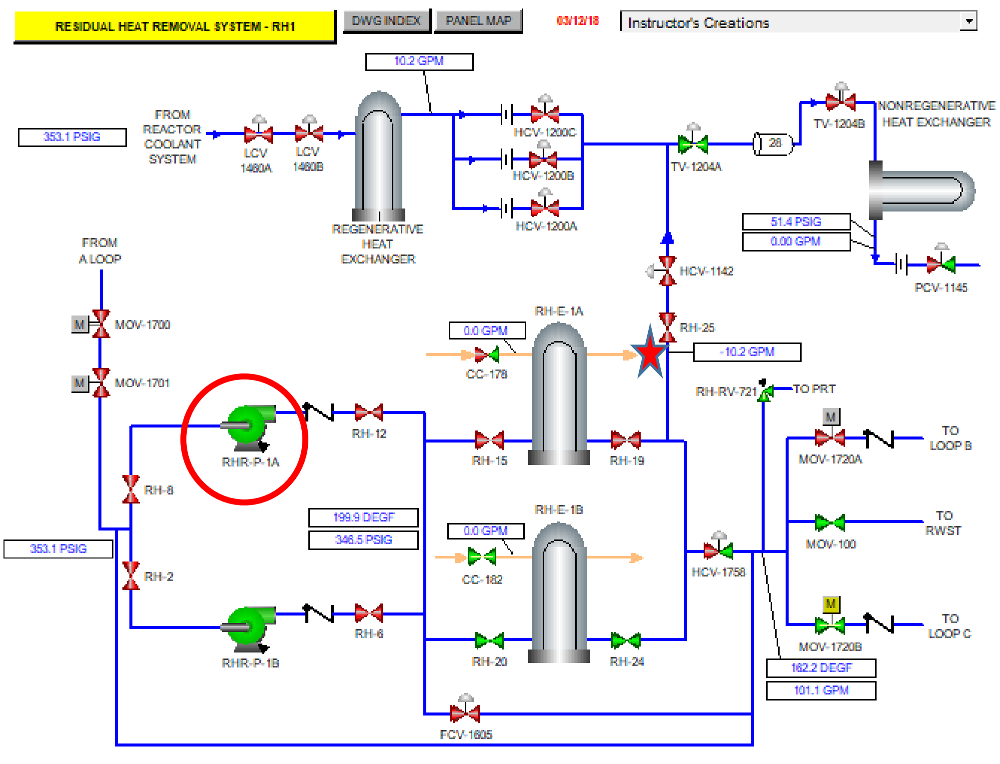
STEP 6: CHECK RHR FLOW - INDICATED ON RHR SYS FLOW. *(Step 5)* • 1-RH-FI-1605 **STANDARD:** • Checks RHR flow restored on 1-RH-FI-1605. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: CHECK RHR PUMP – VORTEXING *(Step 6)* • Flow indication on 1-RH-FI-1605 - OSCILLATING • Amperage indication - OSCILLATING **STANDARD:** • Checks flow steady on 1-RH-FI-1605 and amps steady for 1-RH-P-1B. • Goes to step 6 RNO and transitions to Step 12. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 8: CHECK RHR HEAT SINK: *(Step 12)* a) Flow on 1-RH-FI-1605 - NORMAL b) CC to RHR HX 1) In-Service RHR HX CC Outlet HDR Flow - NORMAL • 1-CC-FI-110A OR • 1-CC-FI-110B **STANDARD:** • Checks flow on 1-RH-FI-1605 indicating normal (approximately 3400 gpm) • Checks CC to RHR HX on 1-CC-FI-110A NOT normal at zero gpm. Goes to RNO. **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

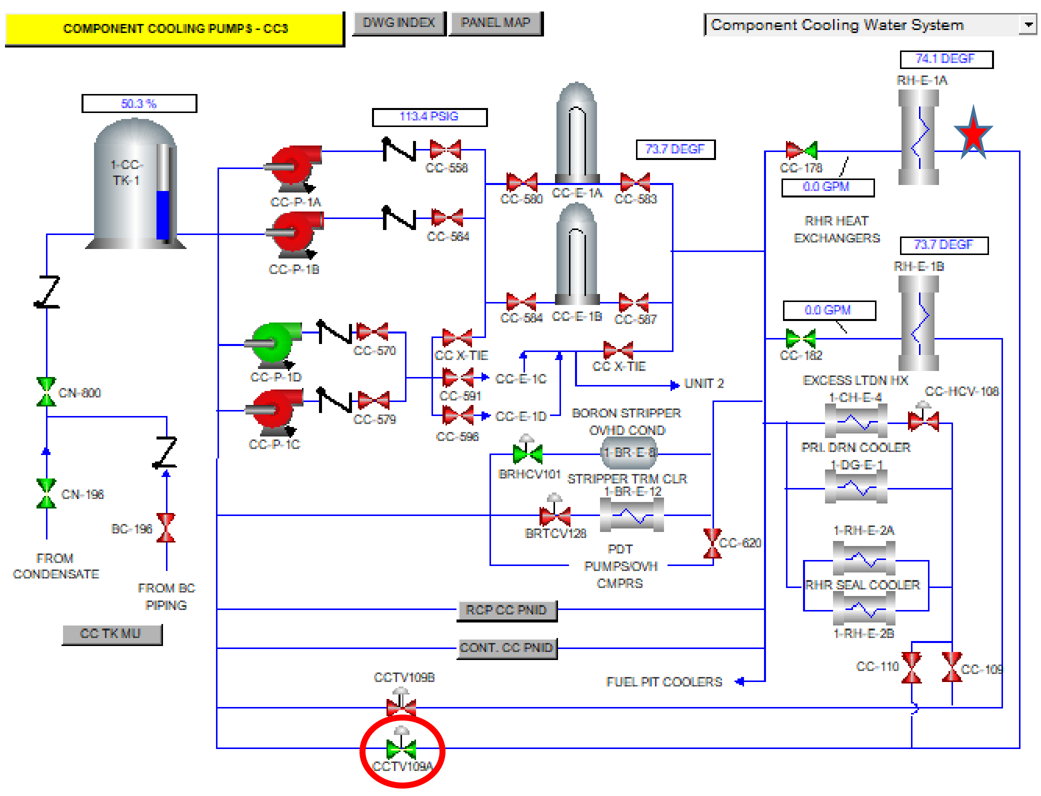
STEP 9: **CRITICAL STEP** 1) Check opened or open 1-CC-TV-109A or 1-CC-TV-109B. *(Step 12b(1) RNO)* **STANDARD:** **a) Opens 1-CC-TV-109A. CRITICAL STEP** **EVALUATOR'S NOTE:** • **<u>If asked for In service RHR/HX</u>**: Inform the Candidate that this information has already been provided. (information provided on Cue sheet). • **1**-CC-TV-109B is OPEN which is normal, but there is no flow through that valve because there are other manual valves that need to be open to provide flow. It is possible the candidate would believe the step is satisfied because 1-CC-TV-109B is open. In service RHR/HX is the <u>'A' RHR HX</u>. This is incorrect because it is NOT the in-service HX. If this happens the candidate can recover by performing next step and realizing that temp is not lowering. • **Note**: If the operator doesn't depress the OPEN pushbutton long enough, 1-CC-TV-109A may reclose. If this happens the operator should try to reopen 1-CC-TV-109A. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 10: In-Service RHR HX CC Outlet Header Temp -NORMAL. (Step 12b(2)) **STANDARD:** • Monitors 1-CC-TI-109A and determines that temperature is returning to Normal.. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 12: Check RCS TEMPERATURE –STABLE OR LOWERING. *(Step 13)* **STANDARD:** a) Monitors RCS temperature. b) May adjust 1-RH-HCV-1758. **EVALUATOR'S NOTE:** • Adjustment of 1-RH-HCV-1758 not critical because this was performed/satisfied by returning HCV-1758 to pre-event value in step 6. **COMMENTS:** **END OF JPM**	_______ **SAT** _______ **UNSAT**

STOP TIME:

SIM DRAWING RHR & COMP COOLING FOLLOWING LOSS OF RHR PUMP





Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- The Unit has been operating on RHR with 1-RH-P-1A in service on "A" RHR HX at 3400 gpm.
- The Pressurizer is at 60% Cold Cal and slowly rising in preparation for going solid.
- RCS temperature: 174 ^{o}F and slowly lowering.

Initiating Cues

- We have entered the desired temperature band, and you are to stabilize the RCS cold leg (C) to between 170^{o}F – 175^{o}F per 1-OP-ZZ-002, Maintenance of Plant Operations, section 5.16, Adjusting RHR Temperatures. It is desirable that you stabilize by adjusting 1-RH-HCV-1758.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- The Unit has been operating on RHR with 1-RH-P-1A in service on "A" RHR HX at 3400 gpm.
- The Pressurizer is at 60% Cold Cal and slowly rising in preparation for going solid.
- RCS temperature: 174 ^{o}F and slowly lowering.

Initiating Cues

- We have entered the desired temperature band, and you are to stabilize the RCS cold leg (C) to between 170^{o}F – 175^{o}F per 1-OP-ZZ-002, Maintenance of Plant Operations, section 5.16, Adjusting RHR Temperatures. It is desirable that you stabilize by adjusting 1-RH-HCV-1758.
  .

Dominion Energy **SURRY POWER STATION**	PROCEDURE NO: **1-OP-ZZ-002**
	REVISION NO: **39**
PROCEDURE TYPE: **OPERATING PROCEDURE**	UNIT NO: **1**

PROCEDURE TITLE:

MAINTENANCE OF PLANT OPERATIONS

REACT MGT						

REVISION SUMMARY:

Revised procedure in response to Operations Feedback, FBOP 2020-014522:

- Changed first Note before Step 5.4.1, guidance on waterbox MOV operation.

UNIT ONE

PROCEDURE USED:	☐ Entirely	☐ Partially	**Note:** If used partially, note reasons in remarks.
PROBLEMS ENCOUNTERED:	☐ NO	☐ YES	**Note:** If YES, note problems in remarks.

REMARKS: ____

____

____

____

____

____ (Use back for additional remarks.)

SHIFT SUPERVISION:	DATE:

CONTINUOUS USE

TABLE OF CONTENTS

Section		Page
1.0	PURPOSE	4
2.0	REFERENCES	4
3.0	INITIAL CONDITIONS	5
4.0	PRECAUTIONS AND LIMITATIONS	5
5.0	INSTRUCTIONS	6
5.1	Rod Control	6
5.2	Turbine Load Control	9
5.3	Generator Voltage Control	12
5.4	Intake Canal Level Control	13
5.5	Pumping of Containment Sump	14
5.6	Pumping of the Primary Drains Transfer Tank (PDTT)	15
5.7	Operation of Containment Isolation Sampling System Trip Valves	17
5.8	Venting the VCT to the Overhead	18
5.9	Testing Station Alarms	19
5.10	Maintenance of Overhead Gas Pressure	20
5.11	Maintenance of Waste Gas Surge Drum Pressure	21
5.12	Maintenance of PDT Level and/or Gas Stripper Level	22
5.13	Performing a Source Check on Process Radiation Monitors	24
5.14	Adjusting VCT Level	25
5.15	Operation of Charging Pump Suction From the RWST	27
5.16	Adjusting RHR Temperature	29
5.17	Operation of Charging Flow	30
5.18	Adjusting S/G Blowdown Flow From the MCR	32
5.19	Placing the Main Turbine in Turbine Manual	34
5.20	Placing the Main Turbine in Operator Auto	37
5.21	Adjusting Seal Injection Flow	40

TABLE OF CONTENTS

Section		Page
5.22	Operation of Unit 1 Containment Vacuum Pumps	41
5.23	Adjusting RCS Pressure	43
5.24	Unsaturating or Taking Manual Control of a Controller Module	45
5.25	Operation of the Source Range NI Counter Scaler and Audio Multiplier	46
5.26	Station Vacuum Priming Pump Bump Check	48
5.27	Filling Unit 1 Recirculation Spray Sump Using Containment Sump	49
5.28	Blender Flow Controller Adjustment	50
ATTACHMENTS		
1	Pressurizer Pressure Control System Outputs	51

1.0 PURPOSE

1.1 To provide guidance for maintaining stable, steady state conditions, other than during startups or shutdowns being performed by procedures intended for plant maneuvers.

2.0 REFERENCES

2.1 Source Documents

2.1.1 UFSAR 3.3.1, Reactivity Control Aspects of the Reactor

2.1.2 UFSAR 3.3.2.7, Summary of Control Rod Requirements

2.1.3 UFSAR 10, Steam and Power Conversion

2.1.4 UFSAR 8.3, System Interconnections

2.1.5 UFSAR 9.2, Boron Recovery System

2.1.6 UFSAR 9.7, Vent and Drain System

2.2 Technical Specifications Surry Power Station Units 1 and 2

None

2.3 Technical References

2.3.1 1-GOP-1.5, Unit Startup, 2% Reactor Power to Max Allowable Power

2.3.2 1-GOP-2.1, Power Decrease from Max Allowable Power to Less Than 30% Reactor Power

2.3.3 1-OPT-RX-001, Reactor Power Calorimetric Using PCS Computer Program

2.3.4 1-OP-26.5, 230 KV Switchyard Voltage

2.3.5 1-DRP-003, Curve Book

2.3.6 DCP 08-007, Feedwater Ultrasonic Flow Meter Installation - PCS / Unit 1

2.4 Commitment Documents

2.4.1 PI-S-2003-5491, INPO AFI Response

2.4.2 CR379270, Noted an Increase in Unit 2 PDTT Level when Unit 1 PDTT was Pumped Down

3.0 INITIAL CONDITIONS

None

4.0 PRECAUTIONS AND LIMITATIONS

______ 4.1 Control Rods shall be maintained greater than the programmed insertion limits at all times.

______ 4.2 Alternate indications of Reactor Power, such as Core ΔT, First Stage Impulse Pressure, Calorimetric, NIS, Condensate and Feedwater performance parameters, and Electrical output, should be reviewed and compared to validate Unit output.

______ 4.3 This procedure shall not be used to exceed any reactor power level that was not previously obtained by an appropriate ramp procedure, e.g. 1-OP-TM-005, Unit Ramping Operations, or 1-GOP-1.5, Unit Startup, 2% Reactor Power to Max Allowable Power.

5.16 Adjusting RHR Temperature

NOTE: The thermal design rated flow for the RHR Heat Exchanger is 4200 gpm.

5.16.1 RHR temperature can be adjusted by performing one or both of the following. Enter N/A for any valves not operated.

- Adjust 1-RH-HCV-1758, RHR HXS FLOW.

  ____ 1 ____ 2
  ____ 3 ____ 4

- Adjust SW outlet valves for 1-CC-E-1A or 1-CC-E-1B as required.
  - 1-SW-39, CC HX A SW Outlet

    ____ 1 ____ 2
    ____ 3 ____ 4

  - 1-SW-35, CC HX B SW Outlet

    ____ 1 ____ 2
    ____ 3 ____ 4

Performed by:	Signature	Initial	Print	Date
	Signature	Initial	Print	Date
	Signature	Initial	Print	Date

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure [KA: 028A4.03 3.1/3.3]

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Place Hydrogen Analyzer in Service Following a LOCA in accordance with 1-E-1, Loss of Reactor or Secondary Coolant.

K/A: 028A4.03, Ability to manually operate and / or monitor in the control room: Location and operation of hydrogen sampling and analysis of containment atmosphere, including alarms and indications (3.1 / 3.3).

Applicability	**Validation Time**	**Actual Time**
RO/SRO(I)/SRO(U)	7 Minutes	_____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.
- A LOCA has occurred from 100% power.
- A determination of Containment Hydrogen concentration is desired.

Standards

- Places XFER CKT UNIT #1 TO UNIT #2 in the UNIT 1 position.
- Places H2 Analyzer (H2A-GW-104) Heat Trace Panel 6, 1-HT-HTP-6, in ON.
- Opens 1-GW-TV-100, 1-GW-TV-101, 1-GW-TV-102, and 1-GW-TV-103.
- Places H2A-GW104 in ANALYZE.

Procedures

- 1-E-1, Attachment 2, Hydrogen Analyzer Operation.

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- Recall IC #385 OR do the following:
- Call up 100% IC, initialize & place simulator in RUN.
- Initiate LBLOCA malfunction. Continue until Recirc Mode Transfer is complete.
- Allow CTMT pressure to increase and return to < 18 psia.
- Place selector switch for H2A-GW104 in the Unit 2 position.
- Verify selector switch for the H_2 ANALYZER (H2A-GW-104) HEAT TRACE PANEL 6, 1-HT-HTP-6, is in the AUTO position & reset SI. Check heat tracing de-energized.
- Freeze simulator.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- *An additional instructor may be needed to silence alarms for the examinee.*
- **START TIME_______:**

STEP 1 NOTES Prior to Step 1 (1-E-1 Attachment 2, Section I) • Containment pressure should be between 9 and 60 PSIA. • Containment temperature should be between 40°F and 290°F. **STANDARD:** • Acknowledges Notes. **EVALUATOR'S NOTE:** **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2 Select Hydrogen Analyzer to be placed in service: (Attachment 2, Step 1) H2A-GW104 or H2A-GW204 **STANDARD:** a) Determines from Initial Conditions that the Unit 1 Hydrogen Analyzer (1-H2A-GW-104) is to be placed in service and checks the applicable block. b) Goes to Step 2. **EVALUATOR'S NOTE:** **If asked,** tell the Candidate this information has already been provided. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 3 (CRITICAL STEP) IF H2A-GW104 is to be placed in service, THEN do the following: (Attachment 2, step 2.a.) **a. Put selector switch XFER CKT UNIT #1 TO UNIT #2 (for H2A-GW104) in the UNIT 1 position.** (Switch is located on Unit 1 PAM Panel.) **STANDARD:** • **Places selector switch "XFER CKT UNIT #1 TO UNIT #2" (for H2A-GW104) to the UNIT 1 position. (CRITICAL STEP)** • Checks WHITE analyzer indicating light for Unit 1 is LIT. **EVALUATOR'S NOTE:** ***This step is also sequence critical; it must be performed before Step 6 of this JPM.*** **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 4 (CRITICAL STEP) ENERGIZE HEAT TRACING (Attachment 2, Step 2.b.) **b. Put selector switch H2 ANALYZER (H2A-GW-104) HEAT TRACE PANEL 6, 1-HT-HTP-6, in ON. Record the time Heat Tracing is energized _________.** **STANDARD:** • **Places selector switch for H_2 ANALYZER (H2A-GW-104) HEAT TRACE PANEL 6, 1-HT-HTP-6, in the ON position. (CRITICAL STEP)** • Checks RED light illuminates after switch is in ON position. • Records time that heat tracing was energized in the appropriate block. **EVALUATOR'S NOTE:** ***This step is also sequence critical; it must be performed before Step 6 of this JPM.*** **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 5 (CRITICAL STEP) ALIGN FLOW PATH (Attachment 2, Steps 2.c., 2.d., 2.e., 2.f.) **c. Open 1-GW-TV-100, H2 ANALYZER VLV.** **d. Open 1-GW-TV-101, H2 ANALYZER VLV.** **e. Open 1-GW-TV-103, H2 ANALYZER VLV.** **f. Open 1-GW-TV-102, H2 ANALYZER VLV.** **STANDARD:** **(a) Places control switch for 1-GW-TV-100 in OPEN. (CRITICAL STEP)** (b) Checks valve open by observing red indicating light lit & green off. **(c) Places control switch for 1-GW-TV-101 in OPEN. (CRITICAL STEP)** (d) Checks valve open by observing red indicating light lit & green off. **(e) Places control switch for 1-GW-TV-103 in OPEN. (CRITICAL STEP)** (f) Checks valve open by observing red indicating light lit & green off. **(g) Places control switch for 1-GW-TV-102 in OPEN. (CRITICAL STEP)** (h) Checks valve open by observing red indicating light lit & green off. . **EVALUATOR'S NOTE:** ***The order of valve operation is NOT sequence critical, but performing this step before Step 6 of this JPM IS sequence critical.*** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 6 (CRITICAL STEP) ENSURES MINIMUM TIME REQUIREMENT MET FOR HEAT TRACING (Attachment 2, Steps 2.g and 2.h.) NOTE: Before the Hydrogen Analyzer is placed in service, the heat tracing circuit must be energized for 20 minutes. g. Check that 20 minutes have elapsed since the time recorded in Step 2b. h. Put selector switch H2 ANALYZER H2A-GW104 in the ANALYZE position. **STANDARD:** (a) Acknowledges NOTE before substep g. (b) Determines the 20 minute period has NOT yet elapsed and a wait period will be required. (c) Following a 20 minute heat tracing warm-up period, proceeds to next step. **(d) Places H2A-GW104 mode select switch to the ANALYZE position. (CRITICAL STEP)** (e) Checks RED and GREEN lights are both illuminated after switch is in ANALYZE position. **EVALUATOR'S NOTE:** **After the Candidate reports a 20 minute wait period is required,** inform them a TIME COMPRESSION has occurred and 20 minutes have elapsed. ***This step is sequence critical.*** **COMMENTS:** **END OF JPM**	**_______ SAT** **_______ UNSAT**

STOP TIME: _______

____

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____

Operator Directions Handout

(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- There has been a Large Break LOCA on Unit 1.

Initiating Cues

- Here is a copy of 1-E-1, Attachment 2, Hydrogen Analyzer Operation. I need you to place Unit 1's hydrogen analyzer in service on Unit 1 Containment.
- When you finish the actions necessary to accomplish this, please inform me.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- There has been a Large Break LOCA on Unit 1.

Initiating Cues

- Here is a copy of 1-E-1, Attachment 2, Hydrogen Analyzer Operation. I need you to place Unit 1's hydrogen analyzer in service on Unit 1 Containment.
- When you finish the actions necessary to accomplish this, please inform me.

NOTE:
- Containment pressure should be between 9 and 60 PSIA.
- Containment temperature should be between 40°F and 290°F.

I. PLACING HYDROGEN ANALYZER IN SERVICE

1. ___ Select Hydrogen Analyzer to be placed in service:

   ___ H2A-GW104 or ___ H2A-GW204

2. ___ IF H2A-GW104 is to be placed in service, THEN do the following:

   ___ a. Put selector switch XFER CKT UNIT #1 TO UNIT #2 in the UNIT 1 position. (Switch is located on Unit 1 Post Accident Monitoring Panel.)

   ___ b. Put selector switch H2 ANALYZER (H2A-GW-104) HEAT TRACE PANEL 6, 1-HT-HTP-6, in ON. Record the time Heat Tracing is energized __________ .

   ___ c. Open 1-GW-TV-100, H2 ANALYZER VLV.

   ___ d. Open 1-GW-TV-101, H2 ANALYZER VLV.

   ___ e. Open 1-GW-TV-103, H2 ANALYZER VLV.

   ___ f. Open 1-GW-TV-102, H2 ANALYZER VLV.

NOTE: Before the Hydrogen Analyzer is placed in service, the heat tracing circuit must be energized for 20 minutes.

   ___ g. Check that 20 minutes have elapsed since the time recorded in Step 2b.

   ___ h. Put selector switch H2 ANALYZER H2A-GW104 in the ANALYZE position.

3. ___ IF H2A-GW204 is to be placed in service, THEN do the following:

___ a. Put selector switch XFER CKT UNIT #2 TO UNIT #1 in the UNIT 1 position. (Switch is located on Unit 2 Post Accident Monitoring Panel.)

___ b. Put selector switch H2 ANALYZER (H2A-GW-204) HEAT TRACE PANEL 7, 1-HT-HTP-7, in ON. Record the time Heat Tracing is energized ___________ .

___ c. Open 1-GW-TV-104, H2 ANALYZER VLV.

___ d. Open 1-GW-TV-105, H2 ANALYZER VLV.

___ e. Open 1-GW-TV-107, H2 ANALYZER VLV.

___ f. Open 1-GW-TV-106, H2 ANALYZER VLV.

NOTE: Before the Hydrogen Analyzer is placed in service, the heat tracing circuit must be energized for 20 minutes.

___ g. Check that 20 minutes have elapsed since the time recorded in Step 3b.

___ h. Put selector switch H2 ANALYZER H2A-GW204 in the ANALYZE position.

II. REMOVING HYDROGEN ANALYZER FROM SERVICE

1. ___ IF H2A-GW104 is to be removed from service, THEN do the following:

___ a. Put selector switch H2 ANALYZER H2A-GW104 in the STANDBY position.

___ b. Close 1-GW-TV-100, H2 ANALYZER VLV.

___ c. Close 1-GW-TV-101, H2 ANALYZER VLV.

___ d. Close 1-GW-TV-103, H2 ANALYZER VLV.

___ e. Close 1-GW-TV-102, H2 ANALYZER VLV.

___ f. De-energize H2A-GW104 Heat Tracing circuit by putting selector switch H2 ANALYZER (H2A-GW-104) HEAT TRACE PANEL 6, 1-HT-HTP-6, to OFF and then back to AUTO.

2. ___ IF H2A-GW204 is to be removed from service, THEN do the following:

___ a. Put selector switch H2 ANALYZER H2A-GW204 in the STANDBY position.

___ b. Close 1-GW-TV-104, H2 ANALYZER VLV.

___ c. Close 1-GW-TV-105, H2 ANALYZER VLV.

___ d. Close 1-GW-TV-107, H2 ANALYZER VLV.

___ e. Close 1-GW-TV-106, H2 ANALYZER VLV.

___ f. De-energize H2A-GW204 Heat Tracing circuit by putting selector switch H2 ANALYZER (H2A-GW-204) HEAT TRACE PANEL 7, 1-HT-HTP-7, to OFF and then back to AUTO.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure [KA 064.A4.06]
[Alternate Path]

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Respond to a Failure of #3 EDG to Start and Load on 1J 4160V Bus.

K/A: 064.A4.06; Manual start, loading, and stopping of the ED/G, RO 3.9 / SRO 3.9

Applicability	**Validation Time**	**Actual Time**
RO	9 Minutes	____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.

Standards

- EMERG GEN NO. 3 ENGINE START pushbutton is depressed.
- AUTO-EXERCISE EMERG GEN 3 switch is placed in AUTO.
- SYNC-ACB-15J3 key switch is placed to ON.
- EMERG GEN NO 3 FIELD FLASH pushbutton is depressed.
- Attempts to raise incoming voltage by placing EMERG GEN NO 3 VOLT ADJ to RAISE.
- EDG 3 secured by depressing both ENGINE STOP pushbuttons simultaneously.

Procedures

- 0-AP-17.05, EDG 3 – Emergency Operations.

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- Call up 100% power IC and initialize (IC386). Place simulator in RUN.
- Load the following Malfunctions/Overrides:
    - EL0501, Loss of reserve Station Service XMFMR A, TRUE T1.
    - ED0503, EDG3 Voltage Regulator Failure, -1, T1.
    - ED0403, EDG 3 Auto Start Failure T1.
    - Remote U2_EGR3_Bypass to U2, T3.
    - Remote SW_25J3_RF to PTL, T3.
- Strip the 1J bus per Attachment 3.
- Place AUTO-EXERCISE EMERG GEN 3 switch to EXERCISE.
- Acknowledge Alarms.
- Freeze and Snap IC until ready for evaluation.

Notes

PERFORMANCE CHECKLIST

Notes to the Evaluator

- This JPM may be **Pre-briefed** as directed by the Chief Examiner.
- Task critical elements are bolded.
- *An additional instructor may be needed to silence and acknowledge alarms for the examinee, and perform actions for Unit 2.*
- **START TIME _____:**

STEP 1**:** **CRITICAL STEP** Check Load Limit at maximum, Start EDG 3, Check #3 EDG Speed at 900 RPM, Place #3 EDG AUTO EXERCISE Switch in Auto. (Step 4, 5, and 6 of Attachment 2) **STANDARD:** **a) Candidate presses the EDG NO. 3 Engine Start pushbutton. CRITICAL STEP.** b) Candidate will check EDG started using RPM indication. **c) Candidate will place the AUTO-EXERCISE Switch for EDG #3 in AUTO position. CRITICAL STEP.** d) Candidate will note that #3 EDG has not energized the 1J Bus. e) Candidate returns to AP-17.05, Step 8. **EVALUATOR'S NOTE:** **COMMENTS:**	
STEP 2**:** CHECK BOTH J BUSES - ENERGIZED BY OFFSITE POWER. (Step 8) **STANDARD:** a) Candidate Identifies 1J Bus is still de-energized. b) Candidate Goes To Step 10. **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 3: Notes prior to Step 10 • If the B DC Bus is deenergized, the EDG output breaker and the J Bus load breakers must be closed manually. • The following conditions must exist for the EDG output breaker to close automatically: • EDG speed greater than 870 rpm • EDG INCOMING voltage greater than 113 volts • J8 breaker open • Control switch for the J3 breaker in AUTO AFTER TRIP • DC control power available to the J3 breaker CHECK EDG 3 - SUPPLYING J BUS. (Step 10) **STANDARD:** a) Acknowledges Notes. b) Candidate Identifies 15J3 – NOT Closed. c) Candidate performs RNO. Identifies that loads are already stripped per Attachment 3. d) Candidate goes to step 15 **EVALUATOR'S NOTE:** • **Evaluator Cue:** Attachment 3 has been completed by another operator. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: **CRITICAL STEP** CHECK EDG 3 INCOMING VOLTAGE GREATER THAN 113 VOLTS. (Step 15) **STANDARD:** **a) Candidate turns SYNC-ACB-15J3 key switch to ON. CRITICAL STEP.** **b) Candidate identifies no generator voltage and momentarily depresses EMERG GEN NO 3 FIELD FLASH pushbutton. Identifies Voltage established. CRITICAL STEP.** **c) Candidate attempts to raise incoming voltage to 120 volts using the EMERG GEN NO 3 VOLT ADJ control switch. CRITICAL STEP.** **d)** Candidate determines there is no Voltage increase, and goes to 15.c RNO. **EVALUATOR'S NOTE:** **Evaluator Note:** Operator may go to 15bRNO because of step 15 b wording. **Evaluator Cue: If asked to check the Field Ckt Breaker**. Report that field operator has checked the Field Ckt Breaker was closed. **Evaluator Cue: If asked to reset the NO FIELD annunciator on the EDG Control panel.** Report that field operator has reset this annunciator. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5: **CRITICAL STEP** SECURES #3 EDG. (Step 15.c RNO) **STANDARD:** a) Candidate notifies Electrical Department. **b) Candidate secures #3 EDG by momentarily pressing the EMERG GEN NO.3 ENGINE STOP pushbuttons. CRITICAL STEP.** c) Candidate notifies Shift Manager. **EVALUATOR'S NOTE:** • If asked to notify the Electrical department: Acknowledge request. • **Both ENGINE STOP pushbuttons must be depressed simultaneously.** • The EDG will go into a cooldown cycle and will shutdown in 9.5-13 minutes. The amber light for the Aux Trip relay is an indication that both pushbuttons were depressed simultaneously and the Diesel is in a cooldown cycle. **COMMENTS:** **JPM ENDS**	_______ **SAT** _______ **UNSAT**

STOP TIME_______:

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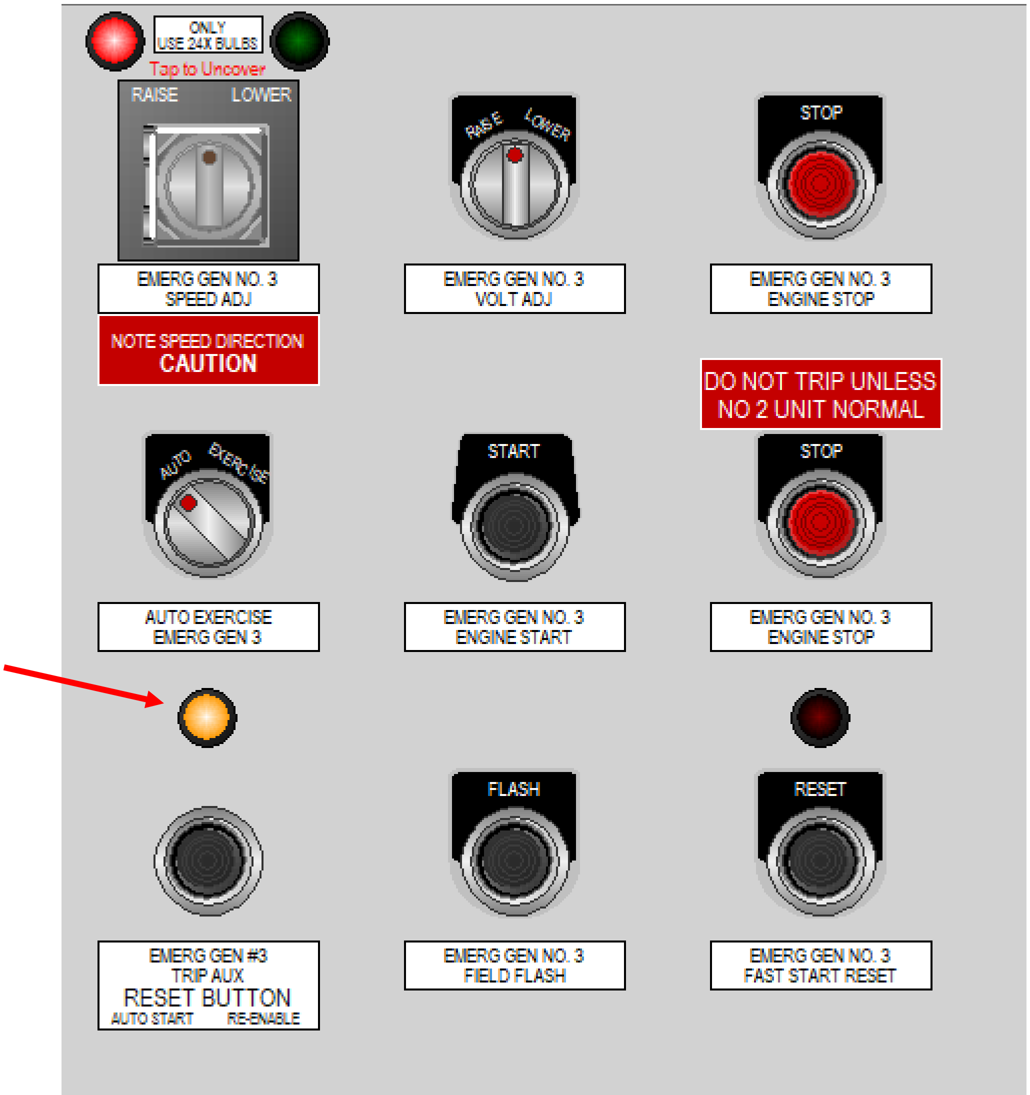
CUTAWAY OF EDG3 PANEL. After <u>BOTH</u> ENGINE STOP PUSHBUTTONS ARE DEPRESSED, THE AUX TRIP RELAY LIGHT WILL LIGHT. There will be no other indications that the EDG has been shutdown because the EDG is in a cooldown cycle.



Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- Unit 1 operating at 100% power.
- The Loss of the “A” RSST has occurred and #3 EDG has failed to start and load on 1J 4160V Bus.
- Starting and loading #3 EDG on the 1J 4160V bus IAW 0-AP-17.05, EDG 3 – Emergency Operations is in progress and is complete through step 3 of Attachment 2.

Initiating Cues

- You are the Unit 1 BOP and are to continue with starting and loading of #3 EDG per 0-AP-17.05, starting with Attachment 2 step 4.
- When you finish the actions necessary to accomplish this, please inform me.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- Unit 1 operating at 100% power.
- The Loss of the "A" RSST has occurred and #3 EDG has failed to start and load on 1J 4160V Bus.
- Starting and loading #3 EDG on the 1J 4160V bus IAW 0-AP-17.05, EDG 3 – Emergency Operations is in progress and is complete through step 3 of Attachment 2.

Initiating Cues

- You are the Unit 1 BOP and are to continue with starting and loading of #3 EDG per 0-AP-17.05, starting with Attachment 2 step 4.
- When you finish the actions necessary to accomplish this, please inform me.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure 015A1.01

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Adjust the PRNIs in accordance with 1-OPT-RX-001

K/A: 015A1.01 Ability to predict and/or monitor changes in parameters to prevent exceeding design limits associated with operating the NIS controls including: NIS calibration by heat balance. (3.5 / 3.8)

Applicability	**Estimated Time**	**Actual Time**
RO/SRO	8 Minutes	____ Minutes

Conditions

- **This JPM to be Pre-briefed with marked up copy of procedure.**
- This JPM is performed in the Simulator.
- Unit 1 operating at 89.5% power. 1-OPT-RX-001 has been completed up to Section 6.2.

Standards

- Places rod control in Manual prior to adusting N44 gain pot.
- Adjusts N44 Gain Potentiometer to a minimum indication of 89.5% IAW 1-OPT-RX-001, Section 6.2 and Attachment 1.
- Places rod control in Auto.

Initiating Cues

- Unit 1 operating at 89.5% power.
- The Unit 1 RO has completed 1-OPT-RX-001, Section 6.1.
- You are to perform 1-OPT-RX-001, Section 6.2.

Terminating Cues

- 1-OPT-RX-001, Attachment 1, has been completed.

Procedures

- 1-OPT-RX-001, Reactor Power Calorimetric Using PCS Computer Program, Rev. 51

Tools and Equipment

Safety Considerations

- None
- None

Simulator Setup

- Recall **IC-387**.

  -OR-

- Call up 90% power IC and initialize.
- Place simulator in RUN.
- Adjust N41, N42, and N43 to 90% indication using drawer gain control.
- Adjust N44 to an indication of 88% power using the drawer gain control.
- Place Simulator in Freeze until JPM performance.

Notes

- The Applicant is given the marked-up copy of 1-OPT-RX-001. This evolution may be pre-briefed.
- When possible place Simulator in RUN prior to the candidate entering the Simulator.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are **bolded**.
- *An additional instructor may be needed to silence alarms for the examinee.*
- **START TIME:**

STEP 1: Reviews Purpose, Initial Conditions, and Precautions and Limitations of 1-OPT-RX-001. **STANDARD:** a) Reviews Purpose 1.1, 1.2, and 1.3. b) Reviews Initial Conditions 3.1 and 3.2. c) Reviews Precautions and Limitations 4.1 through 4.24; noting 4.3, and 4.6. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2: Compare each NI channel percent power indication with the Calcalc Total Thermal Pwr (UFM, Venturi or Normalized Feedwater) or Calcalc 10-Min Avg Pwr (Steam Flow), whichever is the standard. (Each NI should be within + 2% and - 0% of the Calorimetric value if Reactor power is greater than or equal to 90%, OR within + 4% and - 0% of the Calorimetric value if Reactor power is less than 90%.). *(Step 6.2.1)* **STANDARD:** a) Reads and Initials Step 6.2.1. b) Refers to Step 6.1.12 to determine Calcalc Total Thermal Power: 89.5%. c) Locates to PRNI drawers and observes N41 indicating 90%, N42 indicating 90%, N43 indicating 90%, and N44 indicating 88%. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 3: **NOTE**: Gain potentiometer adjustment can cause average flux deviation alarms as well as high flux rod stop alarms. This should be anticipated when adjusting gain potentiometers. (Reference 2.4.6). **STANDARD:** Reviews NOTE prior to Step 6.2.2. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 4: IF the NI Channel is within tolerance but adjustment will better align it with the calorimetric, THEN obtain Shift Supervision concurrence AND adjust NI Channel IAW Attachment 1 to the value recorded in Step 6.1.12 or Step 6.1.13. Record initials on Attachment 1. IF no NI adjustment is made, OR NI is NOT within tolerance, THEN enter N/A. *(Step 6.2.2)* **STANDARD:** Enters N/A and Initials Step 6.2.2. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 5: IF NI channel is NOT within tolerance, THEN obtain Shift Supervision concurrence AND adjust the gain potentiometer on the front panel of each NI Channel IAW Attachment 1 to the value recorded in Step 6.1.12 or Step 6.1.13. Record initials on Attachment 1. IF all NI channels are within tolerance, THEN enter N/A. *(Step 6.2.3)* **STANDARD:** a) Initials Step 6.2.3. b) Reports to Shift Manager (Evaluator) that N44 requires adjustment, and requests authorization to make these adjustments. c) Initiates Attachment 1. **EVALUATOR'S NOTE:** **If asked:** Shift Supervision has concurred with adjustment of PRNIs. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 6: Attachment 1, 1-OPT-RX-001, NI Calibration. **CAUTION**: To prevent introducing non-conservative High Flux Trip and High Flux Rod Stop setpoints, setpoint changes required by the following step must be completed before any associated Gain Potentiometer adjustments are performed. **STANDARD:** Reviews CAUTION Prior to Step 1 of Attachment 1. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: IF Reactor power is less than 90% AND the Gain Potentiometer on any NI will be decreased, THEN before adjusting NIs, have I & C lower the High Flux Trip and High Flux Rod Stop setpoints on all NIs based on current Reactor power level. Otherwise, enter N/A. (Reference 2.4.5). *(Attachment 1, Step 1)* **STANDARD:** Enters N/A and Initials Step 1 of Attachment 1. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 8: N41. (*Attachment 1 Table*) **STANDARD:** a) Enters N/A in Item 3) block, N41 column of the Table. b) Enters N/A in item 4) block, N41 column of the Table. c) Enters N/A in Item 5) block, N41 column of the Table. **EVALUATOR'S NOTE:** A **KEY** is provided on Page 9 of 11, depicting the completed Table on Page 26 of 1-OPT-RX-001. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 9: N42. (*Attachment 1 Table*) **STANDARD:** a) Enters N/A in Item 3) block, N42 column of the Table. b) Enters N/A in item 4) block, N42 column of the Table. c) Enters N/A in Item 5) block, N42 column of the Table. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 10: N43. (*Attachment 1 Table*) **STANDARD:** a) Enters N/A in Item 3) block, N43 column of the Table. b) Enters N/A in item 4) block, N43 Column of the Table. c) Enters N/A in Item 5) block, N43 column of the Table. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 11: CRITICAL STEP	
N44. (*Attachment 1 Table*) **STANDARD:** **a) Places Rod control in manual**, and initials item 2) block, N44 column of the Table**.** b) Enters 88% in Item 3) block, N44 column of the Table. **CRITICAL STEP.** c Checks alternate indications of reactor Power (i.e., N41, N42, N43, Turbine Impulse Pressure, and Calorimetric power) prior to adjustment of N44 IAW P&L 4.6. **d) Adjusts gain control on N44 Drawer to 89.5% indication. (Band: 89.5 – 93.5%). CRITICAL STEP.** e) Enters Initials in item 4) block, N44 Column of the Table. f) Records 89.5% in Item 5) block, N44 column of the Table. h) Allows at least one (1) minute to pass before placing rod control in automatic following gain control manipulation. **i) Places Rod control in Automatic**, and initials item 6) block, N44 column of the Table. **CRITICAL STEP.** **EVALUATOR'S NOTE:** When N44 gain control is adjusted, it will be adjusted in the *clockwise* direction. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 12: NOTIFY NUCLEAR SHIFT MANAGER (EVALUATOR) WITH STATUS OF TASK. Candidate should report completion of N44 gain adjustment and that rod control is in AUTO. **COMMENTS:** ** **JPM COMPLETE** **	_______ **SAT** _______ **UNSAT**

STOP TIME:

KEY
(for Examiner)

	NI-41	NI-42	NI-43	NI-44
2) Place rod control to MANUAL. Enter N/A if NI-44 will NOT be adjusted.				Candidate Initials
3) Record As Found NI power level for each channel to be adjusted. Enter N/A for channel(s) not being adjusted.	N/A	N/A	N/A	88%
4) Adjust the Gain Potentiometer on the front panel of each NI channel to the new Reactor Power value and initial appropriate block(s). Enter N/A for channel(s) not being adjusted.	N/A	N/A	N/A	Candidate Initials
5) Record As Left NI power level for each channel adjusted. Enter N/A for channel(s) not adjusted.	N/A	N/A	N/A	89.5%
6) Allow at least one minute to pass before placing the rod control back to AUTO. Enter N/A if NI-44 was NOT adjusted.				Candidate Initials

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- Unit 1 is operating at 89.5%.
- The Unit 1 RO has completed 1-OPT-RX-001, Section 6.1, Calculating Reactor Power Using Primary Performance Program, and recorded CALCALC Total Thermal Power on Step 6.1.12.

Initiating Cues

- You are to perform 1-OPT-RX-001, Section 6.2, Adjusting NI Channels.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- Unit 1 is operating at 89.5%.
- The Unit 1 RO has completed 1-OPT-RX-001, Section 6.1, Calculating Reactor Power Using Primary Performance Program, and recorded CALCALC Total Thermal Power on Step 6.1.12.

Initiating Cues

- You are to perform 1-OPT-RX-001, Section 6.2, Adjusting NI Channels.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure [KA: 036AA1.01 3.3/3.8]
[Time Critical JPM]

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

MCR pressure boundary verification using 0-AP-22.00, Fuel Handling Abnormal Conditions

K/A: 036AA1.01, Ability to operate and / or monitor the following as they apply to the Fuel Handling Incidents: Reactor building containment purge ventilation system (3.3 / 3.8).

Applicability	**Validation Time**	**Actual Time**
RO/SRO(I)/SRO(U)	10 Minutes	____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.

Standards

- Closes either 1-VS-MOD-103A or -103C.
- Closes either 1-VS-MOD-103B or -103D.
- Opens one of the following MODs: 1-VS-MOD-104A, 2-VS-MOD-204A, 1-VS-MOD-104B, 2-VS-MOD-204B.
- Starts the ONE Supply fan associated with the opened MOD: 1-VS-F-41, 1-VS-F-42, 2-VS-F-41, 2-VS-F-42.
- Places 1-VS-43-VS103X to OFF.

Procedures

- 0-AP-22.00, Fuel Handling Abnormal Conditions.

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- Recall IC 388, or recall 100% IC and initialize.
- Place simulator in RUN.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- The time critical portion of this JPM is from the beginning until MCR Ventilation is isolated cannot exceed 12 minutes.
- **START TIME_______:**

STEP 1 CHECK FUEL REPAIR – IN PROGRESS (0-AP-22.00 step 1) **STANDARD:** a) Recalls from initial conditions or Shift Manager prompt that fuel repair is not in progress. b) Goes to Step 4 **EVALUATOR'S NOTE:** **IF asked**: Fuel repair was not in progress. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2 STOP FUEL HANDLING OPERATIONS (0-AP-22.00 step 4) **STANDARD:** a) Recalls from initial conditions that the Fuel Building has been evacuated, or from Shift Manager prompt that fuel handling operations are secured. b) Goes to Step 5. **EVALUATOR'S NOTE:** **IF asked**: Fuel handling operations are secured. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 3 EVACUATE THE AFFECTED AREA (0-AP-22.00 step 5) • Containment OR • Fuel Building **STANDARD:** a) Recalls from initial conditions that the Fuel Building has been evacuated, or from Shift Manager prompt that fuel handling operations are secured. b) Goes to Step 6. **EVALUATOR'S NOTE:** **IF asked**: The Fuel Building has been evacuated. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4 CHECK MCR EMERGENCY VENTILATION – NOT IN SERVICE (0-AP-22.20 step 6) **STANDARD:** a) Observes on the MCR Ventilation panel that no emergency ventilation fans are running. b) Observes normal MCR ventilation is in service. c) Goes to Step 7. **EVALUATOR'S NOTE:** . **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5 CRITICAL STEP	
SECURE NORMAL VENTILATION (0-AP-3.0 step 7) a) Close 1-VS-MOD-103A b) Close 1-VS-MOD-103B c) Close 1-VS-MOD-103C d) Close 1-VS-MOD-103D **STANDARD:** **a) Turns control switch for 1-VS-MOD-103A to CLOSE.** **b) Turns control switch for 1-VS-MOD-103B to CLOSE.** **c) Turns control switch for 1-VS-MOD-103C to CLOSE.** **d) Turns control switch for 1-VS-MOD-103D to CLOSE.** e) Observes GREEN lights lit for 1-VS-MOD-103A/B/C/D. f) Goes to Step 8. . **EVALUATOR'S NOTE:** • **STOP TIME_________ (Time Critical must be < 12 minutes)** • **NOTE: 1-VS-MOD-103A and -103C are in series. Closing <u>either</u> MOD satisfies the CRITICAL STEP.** • **NOTE: 1-VS-MOD-103B and -103D are in series. Closing <u>either</u> MOD satisfies the CRITICAL STEP.** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

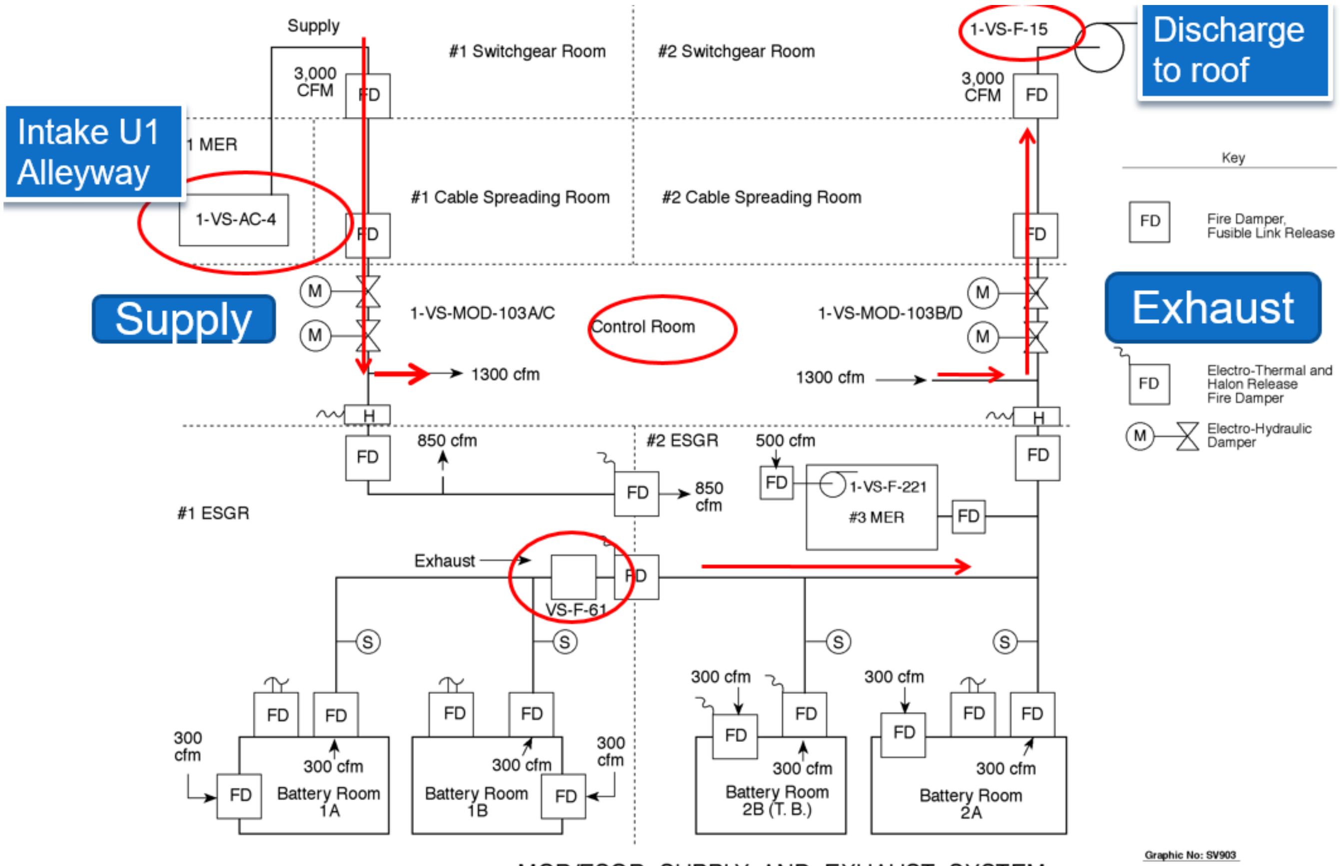
STEP 6 VERIFY STOPPED OR STOP MCR VENTILATION FANS (0-AP-22.00 step 8) • 1-VS-F-15 • 1-VS-AC-4 **STANDARD:** a) Observes GREEN light lit for 1-VS-F-15. b) Observes GREEN light lit for 1-VS-AC-4. c) Goes to Step 9 **EVALUATOR'S NOTE:** NOTE: 1-VS-AC-4 will automatically stop when 1-VS-MOD-103A or -103C are closed. 1-VS-F-15 will automatically stop when either 1-VS-MOD-103B or -103D are closed. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7 CAUTIONS before Step 9. **STANDARD:** a) Acknowledges Cautions concerning Unit 1 and Unit 2 MCR AHU Chilled water flow rates. b) Acknowledges Cautions concerning flowing through a wet filter. c) Acknowledges Cautions concerning the limit of one Emergency Supply fan. **EVALUATOR'S NOTE**: • **Cue: IF asked,** another operator will throttle Chilled water to the in-service MCR Air Handling Units (AHU) **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 8 CRITICAL STEP	
IMMEDIATELY START ONE EMERGECNY SUPPLY FAN IAW THE FOLLOWING (1-VS-F-41 OR 2- VS-F -41 PREFERRED) (0-AP-22.00 step 9) a) Start 1-VS-F-41 IAW the following: 1) Open 1-VS-MOD-104A, CONT RM EMERG SUP MOD 2) Start 1-VS-F-41 OR b) Start 2-VS-F-41 IAW the following: 1) Open 2-VS-MOD-204A, CONT RM EMERG SUP MOD 2) Start 2-VS-F-41 OR c) Start 1-VS-F-42 IAW the following: 1) Open 1-VS-MOD-104B, CONT RM EMERG SUP MOD 2) Start 1-VS-F-42 OR d) Start 2-VS-F-42 IAW the following: 1) Open 2-VS-MOD-204B, CONT RM EMERG SUP MOD 2) Start 2-VS-F-42 e) Adjust Chilled Water flow to MCR AHUs IAW Step 9 Caution **STANDARD:** a) **Opens ONE of the following MODs: CRITICAL STEP** **1-VS-MOD-104A** **2-VS-MOD-204A** **1-VS-MOD-104B** **2-VS-MOD-204B** b) **Starts the Emergency Supply “41” or “42” fan associated with the opened MOD. CRITICAL STEP.** **EVALUATOR’S NOTE:** • **NOTE: Opening ONE Emergency supply MOD and its associated Supply fan satisfies the CRITICAL STEP.** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 9 **CRITICAL STEP** PLACE 1-VS-43-VS103X, MCR ISOLATION SWITCH ON UNIT 2 VS PANEL IN OFF (0-AP-22.00 step 10) **STANDARD:** **a) Places 1-VS-43-VS103X switch in OFF. CRITICAL STEP** **EVALUATOR'S NOTE:** **COMMENTS:** **END OF JPM**	**_______ SAT** **_______ UNSAT**

STOP TIME: _______

Examiner Key



MCR/ESGR SUPPLY AND EXHAUST SYSTEM

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initiating Conditions

- Unit 1 is operating at 100% power; Unit 2 is in Refueling Shutdown. Fuel shuffling was in progress in the Fuel Building.
- There has been a Fuel Handling accident in the Fuel Building.
- The Fuel Handling crew has placed the leaking fuel assembly in the designated storage location and has evacuated the Fuel Building.

Initiating Cues

- Here is a copy of 0-AP-22.00, Fuel Handling Abnormal Conditions. Your task is to isolate the Main Control Room Boundary and place it on Emergency Ventilation by performing steps 1 through 10.
- When you finish the actions necessary to accomplish this, please inform me.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initiating Conditions

- Unit 1 is operating at 100% power; Unit 2 is in Refueling Shutdown. Fuel shuffling was in progress in the Fuel Building.
- There has been a Fuel Handling accident in the Fuel Building.
- The Fuel Handling crew has placed the leaking fuel assembly in the designated storage location and has evacuated the Fuel Building.

Initiating Cues

- Here is a copy of 0-AP-22.00, Fuel Handling Abnormal Conditions. Your task is to isolate the Main Control Room Boundary and place it on Emergency Ventilation by performing steps 1 through 10.
- When you finish the actions necessary to accomplish this, please inform me.

SURRY POWER STATION

ABNORMAL PROCEDURE

NUMBER	PROCEDURE TITLE	REVISION
0-AP-22.00	FUEL HANDLING ABNORMAL CONDITIONS (WITH 2 ATTACHMENTS)	24
		PAGE 1 of 6

PURPOSE

To provide guidance in the event of fuel failure during handling.

TIME CRITICAL ACTIONS

ENTRY CONDITIONS

1) Fuel cladding failure as determined by radiation monitor alarm from any of the following monitors:
   - 1-RM-RM-152, New Fuel Storage Area
   - 1-RM-RM-153, Fuel Pit Bridge
   - 1-VG-RM-131, MGPI Monitor
   - ( )-RM-RM-( )59/( )60, Containment Particulate/Gas
   - ( )-RM-RM-( )62, Manipulator Crane
2) Fuel cladding failure as determined by observation. (bubbles or cloudiness, separation of fuel rod)

CONTINUOUS USE

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1.___	CHECK FUEL REPAIR - IN PROGRESS	☐ GO TO Step 4.
2.___	CHECK LOCAL RADIATION CONDITIONS - NORMAL	☐ GO TO Step 4.
3.___	GO TO STEP 20	
4.___	STOP FUEL HANDLING OPERATIONS	
5.___	EVACUATE THE AFFECTED AREA ☐ • Containment OR ☐ • Fuel Building	
6.___	CHECK MCR EMERGENCY VENTILATION - NOT IN SERVICE	☐ GO TO Step 10.
7.___	SECURE NORMAL MCR VENTILATION ☐ a) Close 1-VS-MOD-103A ☐ b) Close 1-VS-MOD-103B ☐ c) Close 1-VS-MOD-103C ☐ d) Close 1-VS-MOD-103D	
8.___	VERIFY STOPPED OR STOP MCR VENTILATION FANS ☐ • 1-VS-F-15 ☐ • 1-VS-AC-4	

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

* *

CAUTION:
- Chilled water flow to the in-service Unit 1 MCR AHU must be throttled to at least 15 gpm when the Emergency Supply fan is started.
- Chilled water flow to the in-service Unit 2 MCR AHU must be throttled to at least 25 gpm when the Emergency Supply fan is started.
- An Emergency Supply Fan must not be started if the filter is wet.
- Only one Emergency Supply Fan must be started.

* *

9.___ IMMEDIATELY START ONE EMERGENCY SUPPLY FAN IAW THE FOLLOWING: (1-VS-F-41 OR 2-VS-F-41 PREFERRED)

a) Start 1-VS-F-41 IAW the following:

☐ 1) Open 1-VS-MOD-104A, CONT RM EMERG SUP MOD

☐ 2) Start 1-VS-F-41

OR

b) Start 2-VS-F-41 IAW the following:

☐ 1) Open 2-VS-MOD-204A, CONT RM EMERG SUP MOD

☐ 2) Start 2-VS-F-41

OR

(STEP 9 CONTINUED ON NEXT PAGE)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
9.	IMMEDIATELY START ONE EMERGENCY SUPPLY FAN IAW THE FOLLOWING: (1-VS-F-41 OR 2-VS-F-41 PREFERRED) (Continued)	
	c) Start 1-VS-F-42 IAW the following:	
☐	1) Open 1-VS-MOD-104B, CONT RM EMERG SUP MOD	
☐	2) Start 1-VS-F-42	
	OR	
	d) Start 2-VS-F-42 IAW the following:	
☐	1) Open 2-VS-MOD-204B, CONT RM EMERG SUP MOD	
☐	2) Start 2-VS-F-42	
☐	e) Adjust Chilled Water flow to MCR AHUs IAW Step 9 Caution	
10.___	PLACE 1-VS-43-VS103X, MCR ISOLATION SWITCH ON UNIT 2 VS PANEL IN OFF	
11.___	INITIATE ATTACHMENT 1	
12.___	CHECK ANY MAIN STATION BATTERY - FRESHENING CHARGE IN PROGRESS	☐ GO TO Step 14.
13.___	NOTIFY ELECTRICAL DEPARTMENT THAT BATTERY ROOM MUST BE MONITORED FOR EXPLOSIVE CONCENTRATION	
14.___	NOTIFY THE FOLLOWING:	
☐	• Shift Supervision	
☐	• Health Physics	

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure APE003 AA1.02 (3.6,3.4)
Alternate Path

Applicant________________________________ Start Time___________________

Examiner_______________________________ Stop Time___________________

Date ___________________________________ SAT _________ UNSAT ________

Title

RECOVER A DROPPED ROD

K/A: APE003 AA1.02 (3.6,3.4), Ability to operate and / or monitor the following as they apply to the Dropped Control Rod: Controls and components necessary to recover rod.

Applicability	**Estimated Time**	**Actual Time**
RO/SRO(I)/SRO(U)	15 Minutes	____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.

Standards

1. Rotates ROD CONT MODE SEL SWITCH from the MANUAL to the CBA position.
2. Places all disconnect switches for affected bank in "disconnect".
3. Places switch for P-10 in "connect".
4. Resets the GROUP 2 step counter to zero for CBA.
5. Places SHUTDN AND CONT ROD CONT SWITCH to the OUT position.
6. Fully withdraws the affected rod.
7. Places all disconnect switches for affected bank in "CONNECT".
8. Momentarily depresses ROD CONT SYS INTERNAL ALARM RESET pushbutton

Procedures

- 0-AP-1.01, Control Rod Misalignment.

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- ☐ Reset to IC ____. OR Call up 70% power IC.
- ☐ Call up “CERPI_MTP_F_KEY” using remotes RD system.
- ☐ Enter the following malfunction:
  - ☐ RD1224, DROPPED RCCA, P-10 CONTROL BANK A, INSERT
- ☐ Enter the following REMOTE:
  - ☐ CBA_MAN_POS, CERPI CB A Demand Position Manual Input, FINAL VALUE to 0, TRIGGER 3, INSERT.
- ☐ Put the following variable on InSight:
  - ☐ CERPI_MTP_F_KEY
- ☐ Perform 0-AP-1.00 through step 23 and transition to 0-AP-1.01 step 5, perform through step 13 and stabilize plant.
- ☐ Sign off copy of 0-AP-1.01, Control Rod Misalignment, from step 5 through step 13.
- ☐ Set up trend recorder for Tave and Tref to **wide range** indication.
- ☐ REMOVE MALFUNCTION (RD1224) & freeze simulator until ready to perform JPM.
- ☐ Place a Pink Magnet next to the Control Bank ‘A’ Rod Position Recorder.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- *An additional instructor may be needed to silence and acknowledge alarms for the examinee.*
- **START TIME_______**

STEP 1: 0-AP-1.01 – CAUTIONS prior to step 14: • This procedure is NOT valid for realignment of a control rod if Reactor is subcritical. • Realignment SHALL be performed with Reactor power held less than or equal to 75%. **STANDARD:** Candidate acknowledges cautions. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2: **CRITICAL STEP** 0-AP-1.01 – STEP 14 TRANSFER ROD CONT MODE SEL SWITCH TO AFFECTED BANK **STANDARD:** a. **Rotates ROD CONT MODE SEL SWITCH from the MANUAL to the CBA position [CRITICAL STEP]**. b. Verifies rod speed indication of 48 spm on ROD SPEED SI-1-408. c. Records Rod P-10 in CBA affected. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 3: 0-AP-1.01 – STEP 15 RECORD AFFECTED ROD AND ROD BANK: • Rod:___________ • Rod Bank:___________ **STANDARD:** a) Enters P-10 for affected rod b) Enters CBB for affected rod bank **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: **CRITICAL STEP** 0-AP-1.01 – STEP 16 ALIGN LIFT COIL DISCONNECT SWITCHES FOR AFFECTED BANK: a) Place all disconnect switches to DISCONNECTED/DOWN position b) Place affected rod disconnect switch to CONNECTED/UP position c) Have alignment of disconnect switches independently checked **STANDARD:** a) Proceeds behind Vertical Board 1-2 to Lift Coil Disconnect Switch Panel and opens panel door. b) Notes sign requiring removal of jewelry prior to entry. **c) Places all disconnect switches for affected bank in "disconnect".** • **F-2 [CRITICAL STEP]** • **B-10 [CRITICAL STEP]** • **K-14 [CRITICAL STEP]** • **P-6 [CRITICAL STEP]** • **K-2 [CRITICAL STEP]** • **B-6 [CRITICAL STEP]** • **F-14 [CRITICAL STEP]** **d) Places switch for P-10 in "connect" [CRITICAL STEP].** e) Requests alignment of Lift Coil Disconnect Switches to be independently verified. **EVALUATOR'S NOTE/CUE:** • If asked: Lift Coil Disconnect Switches have been independently verified. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5: 0-AP-1.01 – STEP 17 RECORD BANK POSITION OF AFFECTED ROD. (ENTER N/A FOR NON-AFFECTED GROUP): • Group 1 Step Counter:___________ • Group 2 Step Counter:___________ **STANDARD:** (a) Enters N/A for Group 1 Step Counter (b) Enters 229 for Group 2 Step Counter **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 6: 0-AP-1.01 - CAUTIONS prior to step 18: • The affected withdrawal rate during realignment is limited to 2/P (P=fraction of Core Power where 100% power is equal to 1.0) steps per hour (if not a whole number, round down to the whole number) if affected rod remains misaligned for more than 12 hours or the duration of misalignment can NOT be determined. • The withdrawal rate limitation may be relaxed with authorization from the Reactor Engineer or Nuclear Analysis and Fuels. **STANDARD:** a) Acknowledges CAUTIONS b) Recalls from initial conditions that rod dropped 1 hour ago and these cautions are NOT applicable. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 7: 0-AP-1.01 – STEP 18 RECORD THE FOLLOWING: • Reactor power:____________ • Withdrawal rate:__________ **STANDARD:** a) Candidate records current reactor power (approximately 70%) b) Candidate records withdrawal rate at 48 steps/minute. **EVALUATOR'S NOTE/CUE:** **If asked**: Do not exceed 75% power, a 1 dpm SUR, or temperature >569°F during dropped rod recovery. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 8: 0-AP-1.01 - NOTE prior to step 19: Refer to Attachment 2 before resetting Group Step Counter. **STANDARD:** Candidate refers to attachment 2 for assistance in resetting group step counters. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 9: 0-AP-1.01 – STEP 19 CHECK AFFECTED ROD - ON BOTTOM **STANDARD:** Candidate verifies P10 at 0 (zero) steps. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 10: 0-AP-1.01 – STEP 20 REFER TO TECH SPEC 3.12.E. **STANDARD:** Candidate directs the Shift Manager to review Tech Specs. **EVALUATOR'S NOTE/CUE:** **If asked**: The shift manager review of Tech Spec 3.12.E is complete and continue with the task. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 11: 0-AP-1.01 - NOTE prior to step 21: If only one dropped rod, then only one Group Step Counter and one Bank Demand will be reset. **STANDARD:** Candidate acknowledges the NOTE. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 12 **CRITICAL STEP** 0-AP-1.01 – STEP 21 RESET AFFECTED GROUP STEP COUNTER TO 0. **STANDARD:** Utilizing attachment 2 as guidance**, the candidate resets the GROUP 2 step counter to zero for CBA [CRITICAL STEP].** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 13 0-AP-1.01 – STEP 22 HAVE I&C RESET AFFECTED BANK DEMAND TO 000. **STANDARD:** Candidate contacts I&C to reset CBA bank demand to 000. **BOOTH NOTES:** When asked to reset affected bank as IC, report that 1G-E2 will be received as part of the resetting of the affected bank demand. ☐ On InSight set CERPI_MTP_F_KEY to T(RUE) ☐ Initiate TRIGGER 3 to reset affect bank demand to 0 (zero) ☐ On InSight CERPI_MTP_F_KEY to F(alse) ☐ Report back to candidate that the “A” control bank demand has been reset to zero. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 14 0-AP-1.01 - NOTE prior to step 21: Annunciator ( )G-A6, ROD CONT SYS URGENT FAILURE, will alarm when the affected rod is withdrawn indicating that the lift coils of the remaining rods in the bank are deenergized.. **STANDARD:** Candidate acknowledges NOTE **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 15 CRITICAL STEP	
0-AP-1.01 – STEP 23 REALIGN AFFECTED ROD TO ITS BANK POSITION RECORDED IN STEP 17. **STANDARD:** a) **Places SHUTDN AND CONT ROD CONT SWITCH to the OUT position [CRITICAL STEP]**. b) Verifies outward rod motion indicated by observing affected rod IPRI. c) Acknowledges annunciator 1G-A6 (ROD CONT SYS URGENT FAILURE). d) **Withdraws affected rod to required position (229 steps) [CRITICAL STEP]**. e) Continuously monitors SUR, PR NI's, IR NI's, ΔT, Tave, group step counters, IRPI, rod speed, out indication light and TR-1-409A. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 16 CRITICAL STEP	
0-AP-1.01 – STEP 24 PLACE AFFECTED BANK LIFT COIL DISCONNECT SWITCHES TO THE CONNECTED/UP POSITION **STANDARD:** a) Proceeds behind Vertical Board 1-2 to Lift Coil Disconnect Switch Panel and opens panel door. b) Notes sign requiring removal of jewelry prior to entry. **c) Places all disconnect switches for affected bank in "CONNECT".** • **F-2 [CRITICAL STEP]** • **B-10 [CRITICAL STEP]** • **K-14 [CRITICAL STEP]** • **P-6 [CRITICAL STEP]** • **K-2 [CRITICAL STEP]** • **B-6 [CRITICAL STEP]** • **F-14 [CRITICAL STEP]** d) Requests alignment of Lift Coil Disconnect Switches to be independently verified. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

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Step 17

0-AP-1.01 – STEP 25 HAVE ALIGNMENT OF DISCONNECT SWITCHES INDEPENDENTLY CHECKED

STANDARD:
Candidate requests independent verification of disconnect switch positions.

EVALUATOR’S NOTE/CUE:

- If asked: Lift Coil Disconnect Switches have been independently verified.

COMMENTS:

</td><td>

_______ **SAT**

_______ **UNSAT**

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Step 18 **CRITICAL STEP**

0-AP-1.01 – STEP 26 RESET ROD CONTROL URGENT FAILURE

- Depress ROD CONT SYS INTERNAL ALARM RESET pushbutton

STANDARD:

a) **Momentarily depresses ROD CONT SYS INTERNAL ALARM RESET pushbutton [CRITICAL STEP].**
b) Verifies annunciator 1G-A6 (ROD CONT SYS URGENT FAILURE) clears.

COMMENTS:

</td><td>

_______ **SAT**

_______ **UNSAT**

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Step 19

0-AP-1.01 – STEP 27 TRANSFER ROD CONT MODE SEL SWITCH TO MANUAL

STANDARD:
Rotates ROD CONT MODE SELECT Switch from the CBA position to the MANUAL position.

COMMENTS:

</td><td>

_______ **SAT**

_______ **UNSAT**

</td></tr>
</table>

Step 20 CRITICAL STEP	
REPORTS TO SHIFT MANAGER (EVALUATOR). **STANDARD:** Verbal status report made that rod withdrawn and rod control in manual. **COMMENTS:** **JPM END**	_______ **SAT** _______ **UNSAT**

STOP TIME:

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- Control Rod P-10 dropped about 1 hour ago due to a blown fuse. The unit has been stabilized and the Instrument Techs have repaired the fuse. A pre-job brief has been held and we are now ready to withdraw the rod. IC is standing by for your instructions.
- All required briefings have been completed.

Initiating Cues

- Here's a copy of AP-1.01, I want you to recover the dropped control rod IAW steps 14 through and including step 27.
- When you finish the actions necessary to accomplish this and return the rods to MANUAL, please inform me.

.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- Control Rod P-10 dropped about 1 hour ago due to a blown fuse. The unit has been stabilized and the Instrument Techs have repaired the fuse. A pre-job brief has been held and we are now ready to withdraw the rod. IC is standing by for your instructions.
- All required briefings have been completed.

Initiating Cues

- Here's a copy of AP-1.01, I want you to recover the dropped control rod IAW steps 14 through and including step 27.
- When you finish the actions necessary to accomplish this and return the rods to MANUAL, please inform me.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure
[Alternate Path]

Applicant________________________________ Start Time___________________

Examiner_______________________________ Stop Time___________________

Date ___________________________________ SAT _________ UNSAT ________

Title

RESPOND TO RCP SEAL FAILURE IAW 1-AP-9.00 (ALTERNATE PATH)

K/A: 004A2.05, RCP Seal Failures (4.0 / 4.3)

Applicability	**Validation Time**	**Actual Time**
RO/SRO(I)/SRO(U)	XX Minutes	_____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.
- ARP 1C-C4, RCP 1C SEAL LEAKOFF HI FLOW， has directed initiation of 1-AP-9.00

Standards

- Depresses Reactor Trip pushbutton.
- After 5 minutes closes 1-RC-PCV-1455B Spray Valve.
- Stops 1-RC-P-1C.

Procedures

- 1-AP-9.00 - RCP ABNORMAL CONDITIONS

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- ☐ Reset to IC 362 OR Call up 100% power IC and initialize. Place simulator in RUN.
- ☐ Malfunctions, RC1203 (Failure of RCP Seal #1), Final Value = 100%, Insert.
- ☐ Malfunctions, RC1303 (Failure of RCP Seal #2), Final Value = 50%, Event 1, Insert

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- *An additional instructor may be needed to silence and acknowledge alarms for the examinee.*
- **START TIME_______:**

STEP 1: OBSERVES THE CAUTIONS AND NOTES PRIOR TO STEP 1. **STANDARD:** a) Reads the CAUTION regarding RCP seal injection loss b) Reads NOTE regarding if an RCP needs to be tripped with the Reactor critical c) Reads NOTE regarding Attachment 1 and Attachment 6 d) Reads NOTE for RCP temperature monitoring without PCS **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 2: STEP 1 – * CHECK SEAL INJECTION - FLOW INDICATED **STANDARD:** Uses Vertical Board meter and observes Seal Injection flows to all RCPs. • 1-CH-FI-1130A – “A” RCP Seal Injection Flow • 1-CH-FI-1127A – “B” RCP Seal Injection Flow • 1-CH-FI-1124A – “C” RCP Seal Injection Flow **EVALUATOR’S NOTE:** The (*) denotes a continuous action step. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 3: STEP 2 - CHECK RCS PRESSURE – LESS THAN 2100 PSIG **STANDARD:** Determines RCS Pressure is NOT less than 2100 PSIG and goes to Step 4 per Step 2 RNO. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: STEP 4 – *CHECK RCP SEAL WATER OUTLET TEMPERATURE-LESS THAN 200°F • PCS Point T0181A - RCP A • PCS Point T0182A - RCP B • PCS Point T0183A - RCP C **STANDARD:** a) Checks PCS Point T0183A – for RCP C less than 200°F. b) May check the other RCP Seal Water Outlet Temperatures as well. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 5: OBSERVES THE NOTE PRIOR TO STEP 5. **STANDARD:** Reads the NOTE regarding First, Second, And Third Stage Seal ΔP. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 6: Step 5 - *CHECK RCP SEAL STAGES – NOT FAILED • ∆P across each seal stage – LESS THAN 2000 PSID **STANDARD:** Checks differential across each seal stage less than 2000 psid on PCS. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: OBSERVES THE NOTE PRIOR TO STEP 6. **STANDARD:** Reads the NOTE regarding multiple seal stage failures. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 8: STEP 6 – *CHECK RCP SEAL STAGES – LESS THAN ONE SEAL STAGE FAILED**.** • ∆P across each seal stage – LESS THAN 1440 PSID **STANDARD:** Checks differential across each seal stage less than 1440 psid on PCS. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 9: OBSERVES THE CAUTION AND NOTES PRIOR TO STEP 7. **STANDARD:** Checks differential across each seal stage less than 1440 psid on PCS. **BOOTH NOTE:** **When the operator is reading the CAUTION and NOTES before Step 7, insert TRIGGER 1 to fail the second stage.** **EVALUATOR'S NOTE:** a) Identifies Seal stage #3 is > 2000 PSID. b) Returns to Step 5 RNO. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 10: **CRITICAL STEP** STEP 5 RNO: Do the following: a) Check open or open RCP SEAL LKOFF ISOL VV, on affected RCP(s): • 1-CH-HCV-1303A • 1-CH-HCV-1303B • 1-CH-HCV-1303C b) IF ΔP across any seal stage rises to greater than or equal to 2000 psid, THEN do the following: 1) Trip the Reactor. 2) Initiate 1-E-0, Reactor Trip or Safety Injection. **STANDARD:** a) Identifies 1-CH-HCV-1303C is OPEN b) Observes that ΔP across stage 3 is greater than 2000 psid c) Informs the Shift Manager of the need to trip the reactor and initiate 1-E-0 d) **Depresses a Reactor Trip pushbutton [CRITICAL STEP]** e) Identifies that All Rods on Bottom Light – is LIT, Rx Trip and Bypass Breakers – OPEN, Neutron Flux Lowering. f) Manually trips turbine. g) Checks all Turbine Stop Valves – CLOSED. h) Isolates the MSR Steam Supply by closing 1-MS-SOV-104. i) Checks generator output breakers - OPEN j) Checks both AC Emergency Buses - ENERGIZED. k) Verifies SI is not actuated or required: LHSI Pumps not running A-F-3/4 not LIT and no issues with PZR pressure, CTMT pressure, Steamline differential or High Steam flow. l) Recommends transition to 1-ES-0.1, Rx Trip Response. **EVALUATOR'S NOTE:** a) Direct the Operator to initiate 1-E-0 when informed of the requirement to trip the reactor. b) Following completion of immediate actions, inform the candidate that another operator will perform ES-0.1 actions. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 11: CRITICAL STEP	
STEP 5 RNO (CONTINUED): 3) WHEN approximately five minutes have elapsed since Reactor Trip, THEN do the following: a. IF RCP A affected, THEN close 1-RC-PCV-1455A, Pressurizer Spray Valve From Loop A. b. IF RCP C affected, THEN close 1-RC-PCV-1455B, Pressurizer Spray Valve From Loop C. c. Stop the affected RCP(s). • 1-RC-P-1A • 1-RC-P-1B • 1-RC-P-1C d. GO TO Step 7. **STANDARD:** a) **After 5 minutes (time compressed), places 1-RC-PCV-1455B in MANUAL and lowers demand to 0% [CRITICAL STEP]. Note there are multiple ways** b) **Stops 1-RC-P-1C [CRITICAL STEP]** c) GOES TO Step 7 **EVALUATOR'S NOTE:** • Inform the operator that a five minute time compression has occurred and they are to continue performing 1-AP-9.00. Another operator will perform 1-ES-0.1. • If the operator continues to Step 7, inform them the JPM is complete. • Operator may close Spray valve by taking 1-RC-43-1455B, SOV HS to CLOSE. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STOP TIME: _____________

NOTES:

____

____

____

____

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- ARP 1C-C4, RCP 1C SEAL LEAKOFF HI FLOW, has been received.
- Step 1 of the ARP has been performed and step 2 directs initiating 1-AP-9.00, RCP ABNORMAL CONDITIONS.

Initiating Cues

- You are to perform 1-AP-9.00, RCP ABNORMAL CONDITIONS.
- Another Operator will monitor the rest of the plant
- When you finish the actions necessary to accomplish this, please inform me

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- ARP 1C-C4, RCP 1C SEAL LEAKOFF HI FLOW, has been received.
- Step 1 of the ARP has been performed and step 2 directs initiating 1-AP-9.00, RCP ABNORMAL CONDITIONS.

Initiating Cues

- You are to perform 1-AP-9.00, RCP ABNORMAL CONDITIONS.
- Another Operator will monitor the rest of the plant
- When you finish the actions necessary to accomplish this, please inform me

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure EPE.E02.EK3.3 (3.9/3.9)
Alternate Path

Applicant________________		Start Time________________	
Examiner________________		Stop Time________________	
Date ________________		SAT ________	UNSAT ________

Title

RE-ESTABLISH NORMAL LETDOWN FOLLOWING SI

K/A: EPE.E02.EK3.3, Manipulations of controls required to obtain desires operating results during abnormal, and emergency situations. 3.9 / 3/9

Applicability	**Estimated Time**	**Actual Time**
RO/SRO(I)/SRO(U)	40 Minutes	____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.

Standards

- Places 1-CH-HCV-1389 to the PDTT position.
- Opens 1-CH-HCV-1201.
- Opens either 1-RC-HCV-1557A, or B, or C Loop Drain valves.
- Opens 1-CH-HCV-1137.
- Places 1-CH-HCV-1389 to the VCT position.

Procedures

- 1-ES-1.1, SI Termination, Rev. 52.
- 1-OP-CH-006, Shifting or Increasing/Decreasing Letdown Flow, Rev.22.

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- Reset to IC 363. OR Call up 100% power IC and initialize.
- Run through the following steps:
    - Initiate SI.
    - Perform E-0 and attachment 1
    - Reduce AFW flow to 200 gpm to each SG
    - Transition to ES-1.1 and perform it through Step 14.
- Insert the following overrides:
    - CHLCV460B_CLOSE, Override to ON, INSERT
    - CHLCV460B_OPEN, Override to OFF, INSERT
- Close 1-CH-LCV-1460A & B.
- Open 1-CC-TV-109B.
- Turn ON all pressurizer heaters.
- Press Green Pushbutton on 1-DG-TV-108A/B and pump down the PDTT until pump secures.
- Set seal injection at 8 gpm.
- Allow simulator until SR energize, place in freeze and snap until ready to run JPM.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- *An additional instructor may be needed to silence and acknowledge alarms for the examinee.*
- **START TIME_______**

STEP 1: 1-ES-1.1 – STEP 15 ESTABLISH LETDOWN: a) Adjust CHG line flow to establish greater than 40 gpm **STANDARD:** Candidate establishes at least 40 gpm of charging flow using 1-CH-FCV-1122 (1-CH-FC-1122C in MANUAL). **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2: 1-ES-1.1 – STEP 15 ESTABLISH LETDOWN: b) Open letdown line pressure control valve: • 1-CH-PCV-1145 **STANDARD:** a. Places 1-CH-PCV-1145 controller into MANUAL. b. Adjusts demand increase button until 1-CH-PCV-1145 indicates open (zero demand indicated). **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 3: 1-ES-1.1 – STEP 15 ESTABLISH LETDOWN: c) Check closed or close letdown orifice isolation valves: • 1-CH-HCV-1200A • 1-CH-HCV-1200B • 1-CH-HCV-1200C **STANDARD:** a) Checks 1-CH-HCV-1200A closed. b) Checks 1-CH-HCV-1200B closed. c) Checks 1-CH-HCV-1200C closed. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 4: 1-ES-1.1 – STEP 15 ESTABLISH LETDOWN: d) Open letdown isolation valves: • 1-CH-TV-1204A • 1-CH-TV-1204B • 1-CH-LCV-1460A • 1-CH-LCV-1460B **STANDARD:** a) Opens 1-CH-TV-1204A. b) Opens 1-CH-TV-1204B. c) Opens 1-CH-TV-1460A. d) Attempts to open 1-CH-LCV-1460B, and identifies that valve will not open. This is the ALTERNATE PATH start. e) Goes to Step 15 RNO, Establish excess letdown IAW 1-OP-CH-006, SHIFTING OR INCREASING/DECREASING LETDOWN FLOW. **EVALUATOR'S NOTE/CUE:** • The Operator should determine the letdown isolation valve 1-CH-LCV-1460B has failed and perform the RNO for placing excess letdown in service IAW 1-OP-CH-006. • **Direct the operator to close 1-CH-FCV-1122 (to prevent Pzr fill) and initiate 1-OP-CH-006.** **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 5: 1-OP-CH-006 – PRECAUTIONS AND LIMITATIONS. **STANDARD:** (a) Reviews initial conditions, precautions and limitations. (b) Determines Section 5.8 (Placing Excess Letdown in Service with Normal Letdown Isolated) is to be used. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 6: 1-OP-CH-006 - STEP 5.8.1 Close or check closed the following: • 1-CH-LCV-1460A, LETDOWN LINE ISOL • 1-CH-LCV-1460B, LETDOWN LINE ISOL **STANDARD:** a) Candidate closes 1-CH-LCV-1460A (if left open in ES-1.1). **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: 1-OP-CH-006 - STEP 5.8.2 Check all of the following Loop Drain header isolation valves are closed. • 1-RC-HCV-1557A, LOOP A DRAIN • 1-RC-HCV-1557B, LOOP B DRAIN • 1-RC-HCV-1557C, LOOP C DRAIN **STANDARD:** Candidate verifies all listed valves are CLOSED **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 8: 1-OP-CH-006 - STEP 5.8.3 Check 1-CH-HCV-1201, EXCESS LETDOWN HX ISOL, valve is closed. **STANDARD:** Candidate verifies 1-CH-HCV-1201 is CLOSED **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 9: 1-OP-CH-006 - STEP 5.8.4 Check 1-CH-HCV-1137, EXCESS LETDOWN FLOW, setpoint is zero. **STANDARD:** Candidate verifies 1-CH-HCV-1137 demand is at ZERO. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 10: 1-OP-CH-006 - STEP 5.8.5 Check 1-CH-HCV-1389, EXCESS LETDOWN DIVERT, valve is in the VCT position. **STANDARD:** Candidate verifies 1-CH-HCV-1389 is in the VCT position. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 11: 1-OP-CH-006 - STEP 5.8.6 Check open or open 1-CH-MOV-1381, RCP SEAL RETURN. **STANDARD:** Candidate verifies 1-CH-MOV-1381 open. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 12 1-OP-CH-006 - STEP 5.8.7 Check running at least one CC pump. **STANDARD:** Candidate verifies 1-CC-P-1A in service (RED bkr postion light and/or pump amps) **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 13 1-OP-CH-006 - STEP 5.8.8 Check 1-CC-FI-109, LETDOWN HX OUTLT FLOW, is indicating approximately 150 gpm. **STANDARD:** Candidate verifies required flow as indicated on 1-CC-FI-109. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 14 1-OP-CH-006 – NOTE prior to step 5.8.9 - The reset switch located on the RHR flats must be held in the open position until 1-CC-HCV-108, Excess Ldn HX CC Outlet Hand Cont Valve, opens fully. **STANDARD:** Candidate acknowledges NOTE **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 15 1-OP-CH-006 - STEP 5.8.9 IF flow NOT indicated on 1-CC-FI-109, THEN locally reset and open 1-CC-HCV-108. Otherwise, enter N/A. **STANDARD:** Candidate enters N/A for this step as flow is established. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 16 1-OP-CH-006 - STEP 5.8.10 Check 1-CC-TI-108, LETDOWN HX OUTLT TEMP, is indicating ambient. **STANDARD:** Candidate verifies ambient temperature indication on 1-CC-TI-108. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 17 1-OP-CH-006 - STEP 5.8.11 Check 1-CH-PI-1138, EXCESS LETDOWN HX OUTLET PRESS, is indicating approximately 50 psig. **STANDARD:** Candidate verifies pressure indication on 1-CH-PI-1138 approximately 50 psig. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 18 1-OP-CH-006 - STEP 5.8.12 Check 1-CH-TI-1139, EXCESS LETDOWN HX OUTLET TEMP, is indicating ambient. **STANDARD:** Candidate verifies ambient temperature indication on 1-CH-TI-1139. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 19 1-OP-CH-006 – NOTES prior to step 5.8.13 • The first 50 gallons of Excess Letdown flow should be directed to the Primary Drain Transfer Tank (PDTT) so that the Excess Letdown flow is not returned to the RCS. • PCS points Y4020A and U0911 for PDTT level can be found on the Pressurizer & Primary Relief Tank screen. **STANDARD:** Candidate acknowledges NOTES **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 20 **CRITICAL STEP** 1-OP-CH-006 - STEP 5.8.13 Place 1-CH-HCV-1389, EXCESS LETDOWN DIVERT, in the PDTT position to flush the Excess Letdown Heat Exchanger. **STANDARD:** **Candidate places 1-CH-HCV-1389 in the PDTT position [CRITICAL STEP]** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 21 1-OP-CH-006 - STEP 5.8.14 Check 1-CH-PI-1138, EXCESS LETDOWN HX OUTLET PRESS, indicates approximately 10 psig. **STANDARD:** Candidate verifies approximately 10 psig indicated on 1-CH-PI-1138. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 22 **CRITICAL STEP** 1-OP-CH-006 - STEP 5.8.15 Open 1-CH-HCV-1201, EXCESS LETDOWN HX ISOL. **STANDARD:** **Candidate opens 1-CH-HCV-1201 [CRITICAL STEP]** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 23 1-OP-CH-006 – NOTE prior to step 5.8.16 - Letdown flow from the loops is not accounted for in the calorimetric while on Excess Letdown. **STANDARD:** Candidate acknowledges NOTE **EVALUATOR'S NOTE:** Reactor is tripped so calorimetric is not utilized at this time. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 24 1-OP-CH-006 - STEP 5.8.16 IF a calorimetric is being performed, THEN check initiated or initiate 1-OPT-RX-007, Shift Average Power Calculation. **STANDARD:** Candidate enters N/A for this step. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 25 1-OP-CH-006 – CAUTIONS prior to step 5.8.17: • There are several potential leak points downstream of the loop drain valves. • Only one loop drain valve may be open above 200°F, to prevent the possibility of bypassing SI flow to the two intact loops in a Design Basis Accident, due to loop cross-connect through the drain header. (Ref. 2.3.6) **STANDARD:** Candidate acknowledges CAUTIONS. **EVALUATOR'S NOTE:** Candidate may ask for assistance in monitoring for RCS leakage. If asked, report that another operator will perform requested monitoring. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 26 **CRITICAL STEP** 1-OP-CH-006 - STEP 5.8.17 Open one of the following Loop Drain header isolation valves. (✓) • 1-RC-HCV-1557A, LOOP A DRAIN • 1-RC-HCV-1557B, LOOP B DRAIN • 1-RC-HCV-1557C, LOOP C DRAIN **STANDARD:** **Candidate opens <u>ONE</u> of the listed valves [CRITICAL STEP]** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 27 1-OP-CH-006 – NOTE prior to step 5.8.18: • An Excess Letdown flow rate can be calculated by using 1-DG-LI-107, PDTT LEVEL (2.5% level change is approximately 15 gallons), and/or change in Charging Flow. • Attachment 1 may be used to lower Pressurizer Level if required. **STANDARD:** Candidate acknowledges NOTES. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 28 **CRITICAL STEP** 1-OP-CH-006 - STEP 5.8.18 Slowly open 1-CH-HCV-1137, EXCESS LETDOWN FLOW, until Pressurizer level is stable or lowering. **STANDARD:** **Candidate opens 1-CH-HCV-1137 [CRITICAL STEP]** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 29 1-OP-CH-006 - STEP 5.8.19 Check 1-CC-TI-108, EXCESS LETDOWN HX OUTLT TEMP, indicates less than 150°F. **STANDARD:** Candidate verifies 1-CC-TI-108 indicating less than 150°F **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 30 1-OP-CH-006 - STEP 5.8.20 Check 1-CH-TI-1139, EXCESS LETDOWN HX OUTLET TEMP, indicates less than 195°F. **STANDARD:** Candidate verifies 1-CH-TI-1139 indicating less than 195°F **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 31 1-OP-CH-006 – NOTES prior to step 5.8.21: • An RCS temperature change should be anticipated when placing Excess Letdown in service. (Ref. 2.4.3) • Reactor Coolant Pump seal leakoff flow may become erratic when rapid changes to seal injection and seal leakoff occur. Providing a slow, steady transition when affecting charging or seal leakoff flows should keep seal leakoff flow steady. If seal leakoff flow becomes erratic, seal injection flow should be stabilized and management consulted to determine course of action. (Ref. 2.4.4) **STANDARD:** Candidate acknowledges NOTES **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 32 **CRITICAL STEP** 1-OP-CH-006 - STEP 5.8.21 WHEN the PDTT level has risen at least 10% as indicated on 1-DG-LI-107, THEN transfer flow from the PDTT to the VCT by placing 1-CH-HCV-1389, EXCESS LETDOWN DIVERT, to the VCT position. **STANDARD:** **Candidate places 1-CH-HCV-1389 to the VCT position [CRITICAL STEP]** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 33 1-OP-CH-006 - STEP 5.8.22 Check that RCP Seal Leakoff flow is maintained within normal band. IF NOT, THEN initiate 1-AP-9.00, RCP Abnormal Conditions. **STANDARD:** Candidate verifies adequate seal leakoff flow on 1-CH-FR-1190. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 34 1-OP-CH-006 - STEP 5.8.23 Check 1-CH-PI-1138, EXCESS LETDOWN HX OUTLET PRESS, indicates approximately 65 psig. **STANDARD:** Candidate verifies 1-CH-PI-1138 indicates approximately 65 psig. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 35 1-OP-CH-006 - STEP 5.8.24 Check 1-CC-TI-108, EXCESS LETDOWN HX OUTLT TEMP, indicates less than 150°F. **STANDARD:** Candidate verifies 1-CC-TI-108 indicates less than 150°F. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 36 1-OP-CH-006 - STEP 5.8.25 Check 1-CH-TI-1139, EXCESS LETDOWN HX OUTLET TEMP, indicates less than 195°F. **STANDARD:** Candidate verifies 1-CH-TI-1139 indicates less than 195°F. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 37 1-OP-CH-006 - STEP 5.8.26 Monitor Containment radiation monitors and Containment sump level for indications of leakage on Excess Letdown. **STANDARD**: Candidate monitors parameters for indication of RCS leakage. **EVALUATOR'S NOTE:** When candidate reaches this step, inform them that another operator will complete this procedure and that the TASK IS COMPLETE. **COMMENTS**: **JPM END**	_______ SAT _______ UNSAT

STOP TIME:

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- Plant was initially at 100% power with all systems operating normal and in automatic.
- The crew is currently recovering from a spurious SI initiation.
- 1-E-0, Reactor Trip or Safety Injection, was performed and the team transitioned to 1-ES-1.1.
- 1-ES-1.1, SI Termination has been completed up to Step 15.

Initiating Cues

- You are to re-establish letdown by performing step 15 of 1-ES-1.1.
- When you finish the actions necessary to accomplish this, please inform me.

.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- Plant was initially at 100% power with all systems operating normal and in automatic.
- The crew is currently recovering from a spurious SI initiation.
- 1-E-0, Reactor Trip or Safety Injection, was performed and the team transitioned to 1-ES-1.1.
- 1-ES-1.1, SI Termination has been completed up to Step 15.

Initiating Cues

- You are to re-establish letdown by performing step 15 of 1-ES-1.1.
- When you finish the actions necessary to accomplish this, please inform me.

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
15.___	ESTABLISH LETDOWN:	☐ Establish excess letdown IAW 1-OP-CH-006, SHIFTING OR INCREASING/DECREASING LETDOWN FLOW.

☐ a) Adjust CHG line flow to establish greater than 40 gpm

b) Open letdown line pressure control valve:

- ☐ 1-CH-PCV-1145

c) Check closed or close letdown orifice isolation valves:

- ☐ 1-CH-HCV-1200A
- ☐ 1-CH-HCV-1200B
- ☐ 1-CH-HCV-1200C

d) Open letdown isolation valves:

- ☐ 1-CH-TV-1204A
- ☐ 1-CH-TV-1204B
- ☐ 1-CH-LCV-1460A
- ☐ 1-CH-LCV-1460B

☐ e) Open letdown orifice isolation valve(s)

f) Adjust letdown line pressure control valve to maintain letdown pressure:

- ☐ 1-CH-PCV-1145

g) Adjust NRHX outlet temperature control valve to control letdown temperature, if necessary:

- ☐ 1-CC-TCV-103

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure
[Alternate Path]

Applicant________________________________ Start Time___________________

Examiner_______________________________ Stop Time___________________

Date ___________________________________ SAT _________ UNSAT ________

Title

RESPOND TO A CONDENSATE PUMP AND REACTOR TRIP FAILURE [FR-S.1] (ALTERNATE PATH)

K/A:

- **056A2.04, Loss of Condensate Pumps (2.6,2.8)**
- **029EA1.09, Manual Rod Control (4.0, 3.6)**
- **029EA1.13, Manual Trip of Main Turbine (4.1,3.9)**

Applicability	Validation Time	Actual Time
RO/SRO(I)/SRO(U)	XX Minutes	_____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.
- Unit at 100% power with Rod Control in MANUAL due to rods hunting with Tave/Tref matched.

Standards

- Starts Condensate pump, 1-CN-P-1B.
- Secures Condensate pump, 1-CN-P-1C.
- Attempts to trip the reactor.
- Places ROD CONT MODE SEL sw in AUTO.
- Manually trips the Turbine.

Procedures

- 1-OP-CN-001 - CONDENSATE SYSTEM OPERATION
- 1-AP-21.00 – LOSS OF MAIN FEEDWATER FLOW
- 1-FR-S.1 – RESPONSE TO NUCLEAR POWER GENERATION/ATWS

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- Reset to IC 365, OR Call up 100% power IC and initialize.
- Ensure 1-CN-P-1B is secured in AUTO
- Place ROD CONT MODE SEL switch in MAN
- Insert the following Malfunctions:
    - Malfunctions, RD17 (ATWS, with manual Rx Trip PB Defeated), Insert.
    - Malfunction CN0103 (Main CN Pump CN-P-1C Trips: Ovr-Current), Event 3, Insert
    - Malfunction CN1403 (CN Pump CN-P-1C Discharge Check Valve Failure), Event 3, Insert
- Create Event 3:
    - Events (on the toolbar)
    - Select Event 003
    - Edit Event
    - Event Code (the "|" below is the 'Operators" just to the right of the "&" button)
        - CNP1C_STOP | CNP1C_LOCK
    - OK

PRIOR TO JPM:

- Place the TAVE control magnet near the rod control switch
- Place a pink circle around the ROD CONT MODE SEL switch
- Pre-brief the applicant for swapping Condensate pumps per 1-OP-CN-001, Section 5.4.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- *An additional instructor may be needed to silence alarms for the examinee.*
- **START TIME_______:**

STEP 1: 1-OP-CN-001 – Initial Conditions & Precautions and Limitations. **STANDARD:** a) Reviews Initial Conditions b) Reviews Precautions and Limitations **EVALUATOR'S NOTE (If Asked):** • IC 3.2 - Makeup water is available to fill the condenser • P&L 4.13 – adequate CP demineralizers are in service to support the pump swap **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 2: 1-OP-CN-001 – STEP 5.4.1 Check the following conditions exist for condensate pump to be started. • Seal water in service. • Bearing Cooling water flow indicated to pump and motor. • Oil level in reservoir sight glass is mid-range.(one of six motors may have two sight glasses) **STANDARD:** Refers to Candidate Brief Sheet and determines these verifications are complete. **EVALUATOR'S NOTE (If Asked):** • All required conditions are MET **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 3: NOTE prior to step 5.4.2 - When Condensate Pump is started, HP Heater Drain Pump flow will be affected. The system should be monitored for proper response. **STANDARD:** Candidate acknowledges the NOTE. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: 1-OP-CN-001 – STEP 5.4.2 Check CALCALC 30 Minute Avg Power is less than or equal to 99.95%. IF CALCALC non-functional, THEN check Reactor Power is less than or equal to 100%. IF starting a Condensate Pump due to a secondary transient, THEN enter N/A. **STANDARD:** Trainee verifies CALCALC 30 minute average power $\leq$99.95% on PCS. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 5: **CRITICAL STEP** 1-OP-CN-001 – STEP 5.4.3 Start condensate pump selected to be started. (✓) • 1-CN-P-1B **STANDARD:** **Candidate starts 1-CN-P-1B [CRITICAL STEP].** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 6: 1-OP-CN-001 – STEP 5.4.4 Check condensate pump discharge pressure, indicated on the local discharge pressure gauge, is between 550 psig and 650 psig, and LI-CN-103, CNDSR HOTWELL LVL, is stable. **STANDARD:** Contacts field operator to verify proper discharge pressure indication. **BOOTH NOTE:** • Local discharge pressure indicates 595 psig **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: **CRITICAL STEP** 1-OP-CN-001 – STEP 5.4.5 - Stop condensate pump to be removed from service and place control switch in AUTO or PTL. (✓) • 1-CN-P-1C **STANDARD:** a) **Secures 1-CN-P-1C [CRITICAL STEP].** b) Identifies significant drop in Main Feedwater Flow c) Candidate at this point can either elect to: • Continue in 1-OP-CN-001 • Transition to 1-AP-21.00. (AP-21 actions commence at step 10) • Go to 1-E-0 (E-0 actions commence at step 12). **EVALUATOR'S NOTE:** • This step commences the alternate path of this task (check valve failure). **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 8: NOTE prior to step 5.4.6 - A stuck open check valve could cause the condensate pump to rotate backwards and result in a loss of feed. Do not attempt to start a pump that is rotating backwards. (Reference 2.4.12) **STANDARD:** a) Candidate acknowledges note b) Candidate may contact the turbine building operator to determine status of 1-CN-P-1C shaft rotation. c) IF candidate contacts the turbine building operator and identifies shaft rotation as a failed check valve, candidate may transition to AP-21.00 or 1-E-0. **BOOTH NOTE:** • If contacted, report that the shaft is turning on 1-CN-P-1C but direction cannot be determined. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 9: 1-OP-CN-001 – STEP 5.4.6 Check Main Feed Pump suction pressure is normal. IF pressure NOT normal, THEN perform the following. IF pressure normal, THEN enter N/A. a. Start or check started the pump stopped in Step 5.4.5. (✓) • 1-CN-P-1C **STANDARD:** a) Candidate determines that pump should not be started based on previous NOTE. b) Candidate may transition to AP-21.00 or 1-E-0. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 10: 1-AP-21.00 – [STEP 1] CHECK MAIN FEED PUMP STATUS: a) Check Reactor Power – GREATER THAN 80% b) Check Main Feed Pumps – TWO RUNNING **STANDARD:** a) Verifies reactor power >80% b) Identifies two main feed pumps in service **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 11: 1-AP-21.00 – [STEP 2] START AN ADDITIONAL CONDENSATE PUMP **STANDARD:** a) Candidate attempts to start 1-CN-P-1C b) Candidate identifies failure of pump to start c) Candidate recognizes that reactor trip is imminent and goes to 1-E-0. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 12: **CRITICAL STEP** 1-E-0 – [STEP 1] – CHECK REACTOR TRIP a) Manually trip reactor b) Check the following: • All rods on bottom light – LIT • Reactor trip and bypass breakers – OPEN • Neutron flux – LOWERING **STANDARD:** a) **Candidate depresses a reactor trip pushbutton and determines no reactor trip occurred. Critical Step.** b) Candidate depresses 2nd reactor trip pushbutton c) Candidate goes to RNO for step 1 **EVALUATOR'S NOTE:** • When the candidate depresses the 1st Reactor Trip pushbutton, a 30 second time critical operator action commences to manually trip the turbine. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 13: 1-E-0 – [STEP 1 RNO] – IF reactor will not trip, THEN GO TO 1-FR-S.1, RESPONSE TO NUCLEAR POWER GENERATION/ATWS **STANDARD:** Candidate transitions to 1-FR-S.1 **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 14: 1-FR-S.1 – [STEP 1] – CHECK REACTOR TRIP a) Manually trip reactor b) Check the following: • All rods on bottom light – LIT • Reactor trip and bypass breakers – OPEN • Neutron flux – LOWERING **STANDARD:** a) Candidate identifies that a reactor trip has NOT occurred b) Candidate performs RNO actions **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 15: **CRITICAL STEP** 1-FR-S.1 – [STEP 1 RNO] – Check or place rods in Auto. **STANDARD:** **Candidate places ROD CONT MODE SEL switch in AUTO [CRITICAL STEP].** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 16: **CRITICAL STEP** 1-FR-S.1 – [STEP 2] – MANUALLY TRIP THE TURBINE: • Check all turbine stop valves - CLOSED **STANDARD:** a) **Candidate manually trips the turbine (2/2 turbine trip pushbuttons [CRITICAL STEP]** b) Candidate verifies all stop valves indicate CLOSED. **EVALUATOR'S NOTE:** • When the candidate manually trips the turbine, the time critical operator action to trip the turbine is COMPLETE. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 17:	
1-FR-S.1 – [STEP 3] – CHECK CONTROL RODS – INSERTING IN AUTO AT GREATER THAN 48 STEPS/MINUTE **STANDARD:** a) Candidate verifies inward rod motion at >48 steps/minute and reports immediate actions are complete. b) Candidate may report that if rod motion lowers below 48 steps/minute that they will take manual control and insert rods at 48 steps/minute. **COMMENTS:** **JPM END**	_______ **SAT** _______ **UNSAT**

STOP TIME: ______________

NOTES:

____

____

____

____

____

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- Unit 1 is at 100% with all systems in AUTO with the exception of ROD CONTROL which is in MANUAL due to rods stepping with Tave and Tref matched. I&C troubleshooting is scheduled for tomorrow DAYS
- Maintenance is scheduled for 1-CN-P-1C which is currently in service.

Initiating Cues

- You are to start 1-CN-P-1B and secure 1-CN-P-1C in accordance with 1-OP-CN-001 section 5.4.
- The following has been verified on 1-CN-P-1B
    - Seal water has been verified in service
    - BC water flow is indicated to pump and motor
    - Oil level in reservoir sight glass is mid-range
- An operator has been briefed and stationed in the turbine building near the condensate pumps.
- When you finish the actions necessary to accomplish this, please inform me.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- Unit 1 is at 100% with all systems in AUTO with the exception of ROD CONTROL which is in MANUAL due to rods stepping with Tave and Tref matched. I&C troubleshooting is scheduled for tomorrow DAYS
- Maintenance is scheduled for 1-CN-P-1C which is currently in service.

Initiating Cues

- You are to start 1-CN-P-1B and secure 1-CN-P-1C in accordance with 1-OP-CN-001 section 5.4.
- The following has been verified on 1-CN-P-1B
    - Seal water has been verified in service
    - BC water flow is indicated to pump and motor
    - Oil level in reservoir sight glass is mid-range
- An operator has been briefed and stationed in the turbine building near the condensate pumps.
- When you finish the actions necessary to accomplish this, please inform me

.

Dominion Energy SURRY POWER STATION					PROCEDURE NO: 1-OP-CN-001	
					REVISION NO: 39	
PROCEDURE TYPE: OPERATING PROCEDURE					UNIT NO: 1	
PROCEDURE TITLE: CONDENSATE SYSTEM OPERATION						
REACT MGT						

REVISION SUMMARY:

Revised to incorporate FBOP 2021-015083:

- Added Commitment Document 2.4.12 for CR1168494.
- Changed Note before Step 5.4.6.

PROCEDURE USED:	☐ Entirely	☐ Partially	**Note:** If used partially, note reasons in remarks.
PROBLEMS ENCOUNTERED:	☐ NO	☐ YES	**Note:** If YES, note problems in remarks.

REMARKS: ____

____

____

____

____ (Use back for additional remarks.)

SHIFT SUPERVISION:	DATE:

CONTINUOUS USE

TABLE OF CONTENTS

Section		Page
1.0	PURPOSE	3
2.0	REFERENCES	3
3.0	INITIAL CONDITIONS	6
4.0	PRECAUTIONS AND LIMITATIONS	6
5.0	INSTRUCTIONS	9
5.1	Condenser Hotwell Cleanup	9
5.2	Placing the Condensate System in Service	27
5.3	Feedwater System Fill	46
5.4	Shifting Condensate Pumps with One or Two Condensate Pumps Running	47
5.5	Deoxygenation of Condensate Storage Tank 1-CN-TK-2 Using Ecolochem Mobileflow Trailer	51
5.6	Condensate System Shutdown	59
ATTACHMENTS		
1	1-CN-TK-2 Deoxygenation Flowpath	67

1.0 PURPOSE

1.1 To provide instructions for the startup of the Condensate System and individual condensate pumps.

1.2 To provide instructions for the fill of the Main Feedwater System.

1.3 To provide instructions for shifting condensate pumps.

1.4 To provide instructions for providing a deoxygenated makeup source to 1-CN-TK-1, Emergency Condensate Storage Tank, using an Ecolochem Mobileflow Trailer.

1.5 To provide instructions for Condensate System shutdown. **(Reference 2.4.6)**

2.0 REFERENCES

2.1 Source Documents

2.1.1 UFSAR, Section 10.3.5, Condensate and Feedwater

2.1.2 UFSAR, Section 4.3.2, System Design Evaluation

2.2 Technical Specifications

None

2.3 Technical References

2.3.1 11448-FM-067A, Condensate System

2.3.2 11448-FM-067B, Condensate System

2.3.3 11448-FM-067C, Condensate System

2.3.4 11448-FM-068A, Feedwater System

2.3.5 11448-FM-069A, Moisture Separator & HP Htr Dr &V

2.3.6 13058-FM-157B, Condensate Polishing System

2.3.7 Westinghouse Drawing 5975 DO7

2.3.8 VPDES Permit No VA0004090

2.3.9 1-OP-CN-001A, Condensate System Alignment

2.3.10 1-OP-30.3, Condensate Polishing System Startup

2.3.11 1-OP-30.3A, Condensate Polishing System Common Alignment

2.3.12 1-OP-36.0, Establishing Main Condenser Vacuum

2.3.13 Westinghouse Electric Corporation Information, CT-24033, Turbine Operation with Feedwater Heaters Out of Service

2.3.14 EWR 89-770, Condensate Pump Recirc Control

2.3.15 REA 94-0352, CN Pump Vent Line Check Valves

2.3.16 CH-98.200, VPDES Permit Sampling Guidelines

2.3.17 DCP 94-046, Steam Generator Blowdown System Improvement

2.3.18 DCP 99-068, FW Pump Suction Vent Installation

2.3.19 ET S-01-0048, Rev. 0, Restoration of Proper Seal Water Pressure to HP Heater Drain Pumps

2.3.20 DCP 02-076, High Pressure Drain Pump Quench Line Modification

2.3.21 DCP 07-012, Main Feed Pump Recirculation Piping Modification

2.3.22 DC SU-09-00042, Modifications to Support Installation of Spare Condensate Pump Motor

2.3.23 DCP 07-023, Reactor Startup on Auxiliary Feedwater

2.3.24 DC SU-10-01050-000, U1 Startup on AFW Without Condenser Vacuum

2.3.25 CA203669, Smoke from seal area of 2-CN-P-1B

2.3.26 DC SU-10-01055, Permanent Temperature Monitoring Secondary Piping

2.3.27 DC-SU-14-01125, Replacement of 1/2-SD-LCV-1/206, HP Heater Drain Discharge Valve

2.3.28 DCP 06-037, CN Air In-leakage Modification

2.4 Commitment Documents

2.4.1 CTS 2949, Add reference to CH-98.200

2.4.2 CTS 4692, Loss of Condenser Waterbox Integrity

2.4.3 DR S-1999-2746, Loss of Air Ejector Loop Seals

2.4.4 PI S-2000-2534, S/G BD Cooler Air Bound

2.4.5 CTS-2949, Add reference to CH-98.200

2.4.6 CR095926, Unexpected Water Hammer on Secondary Piping During Shutdown

2.4.7 CR025478, 1-FW-P-1B Inboard Seal Leak

2.4.8 CA068057, SOER 7-1 Review Actions

2.4.9 ACE014041, Secondary Water Hammer Event

2.4.10 CR331419, RCE 977, Water Hammer in Unit 1 Secondary when Last Condensate Pump Secured

2.4.11 CR1135368, ETE SU 2019-0043, Evaluation of 1-CN-P-1B Pump Can Indications

2.4.12 CR1168494, Process Changes for Potential Condensate Pump Check Valve Failures

Init Verif

3.0 INITIAL CONDITIONS

______ 3.1 Check Bearing Cooling Water System is operable or in operation to support the operation of Condensate System and associated Condensate subsystems.

______ 3.2 Check makeup water is available to fill the condenser.

4.0 PRECAUTIONS AND LIMITATIONS

______ 4.1 Bearing Cooling water shall be in service.

______ 4.2 The recirculation line flow restrictions do not permit sustained two condensate pump operation with the Condensate System on recirculation.

4.3 The restarts for the 4160 VAC condensate pump motor shall be limited to the following:

______ • One restart attempt is permissible provided that the motor has coasted to a complete stop before a restart is attempted.

______ • A second restart attempt is permissible when the motor windings and core have been cooled sufficiently by either running for a period of 45 minutes or by standing idle for a period of 60 minutes.

4.4 A condensate pump will automatically start, unless the idle pump(s) are in PTL, when either of the following conditions exist.

______ • Condensate discharge header pressure is less than 350 psig.

______ • Less than 2 condensate pumps are running.

4.5 Load reductions associated with the removal from service of selected extraction point heaters in each train are: (Reference 2.3.13)

______ • A 10 percent MWe load reduction will result from bypassing the 5th and 6th point heaters and the drain cooler, as a group, with higher pressure heaters remaining in service.

______ • A 20 percent MWe load reduction will result from bypassing the 4th, 3rd, and 2nd point heaters, as a group, with the 1st point heaters remaining in service.

______ • No MWe load reduction will result from the removal of the 1st point heaters, as a pair, provided the maximum output of the unit is not exceeded.

______ 4.6 An Operator shall be stationed in the Turbine Building Basement to monitor condensate pump starts and to walk down the Condensate System after the pump start.

______ 4.7 Chemistry shall check the Sodium content of all water to be transferred from trucks to either the Unit 1 or the Unit 2 Condensate Storage Tanks.

______ 4.8 Chemistry samples for Carbohydrazide / Hydrazine must be taken before any condensate is discharged to the river.

______ 4.9 Condensate recirculation valve flow greater than 3600 gpm could cause serious piping erosion/corrosion and valve damage.

______ 4.10 Minimum Condensate recirculation valve flow should be maintained greater than 2500 gpm.

______ 4.11 The condensate recirculation valve, 1-CN-FCV-107, will fail closed with all three condensate pump breakers open. This valve should be throttled to 30 percent open as soon as possible after starting the first condensate pump.

______ 4.12 Before placing the Condensate System in service, hotwell chemistry must be verified acceptable. (**Reference 2.4.2**)

_____ 4.13 Condensate Polishing Building demineralizers must be operated to maintain flow between 1750 to 2800 gpm per vessel.

_____ 4.14 Prior to Main Condensate Shutdown, both HP Heater Drain Pumps discharge piping, both First Point Feedwater Heater bypass lines, and the Fourth through Second Point Feedwater Heater bypass line must be cooled to less than 205°F. (**Reference 2.4.10**) (Reference 2.3.26)

_____ 4.15 The Main Feed Pump breakers, if in CONNECT or TEST, will trip when the last Condensate Pump is shut down.

_____ 4.16 Evolutions that affect Feedwater flow or Feedwater temperature may affect RCS temperature and Reactor Power. This effect will be greater at BOL due to a lower value of ITC. (**Reference 2.4.8**)

_____ 4.17 To minimize Iron transport to the Steam Generators, a Condensate pump should not be continuously operated for greater than 48 hours without Main Condenser vacuum established and chemical injection in service. Expected continuous operation greater than 48 hours without these conditions satisfied requires Station Management and Chemistry consultation.

_____ 4.18 Degradation of the Condensate pump cans may occur if water which is drained into the Condensate pump suction piping pit is allowed to flow over the 6” dike wall into the Condensate pump can pit or make contact with the Condensate pump can. These actions must not be allowed without Shift Manager approval and notification to Engineering. (**Reference 2.4.11**)

5.4 Shifting Condensate Pumps with One or Two Condensate Pumps Running

5.4.1 Check the following conditions exist for condensate pump to be started.

______ • Seal water in service.

______ • Bearing Cooling water flow indicated to pump and motor.

______ • Oil level in reservoir sight glass is mid-range.
(one of six motors may have two sight glasses)

NOTE: When Condensate Pump is started, HP Heater Drain Pump flow will be affected. The system should be monitored for proper response.

______ 5.4.2 Check CALCALC 30 Minute Avg Power is less than or equal to 99.95%. IF CALCALC non-functional, THEN check Reactor Power is less than or equal to 100%. IF starting a Condensate Pump due to a secondary transient, THEN enter N/A.

______ 5.4.3 Start condensate pump selected to be started. (✓)

____ 1-CN-P-1A

____ 1-CN-P-1B

____ 1-CN-P-1C

______ 5.4.4 Check condensate pump discharge pressure, indicated on the local discharge pressure gauge, is between 550 psig and 650 psig, and LI-CN-103, CNDSR HOTWELL LVL, is stable.

______ 5.4.5 Stop condensate pump to be removed from service and place control switch in AUTO or PTL. (✓)

____ 1-CN-P-1A

____ 1-CN-P-1B

____ 1-CN-P-1C

NOTE: A stuck open check valve could cause the condensate pump to rotate backwards and result in a loss of feed. Do not attempt to start a pump that is rotating backwards. (**Reference 2.4.12**)

5.4.6 Check Main Feed Pump suction pressure is normal. IF pressure NOT normal, THEN perform the following. IF pressure normal, THEN enter N/A.

______ a. Start or check started the pump stopped in Step 5.4.5. (✓)

____ 1-CN-P-1A

____ 1-CN-P-1B

____ 1-CN-P-1C

______ b. Stop pump started in Step 5.4.3. (✓)

____ 1-CN-P-1A

____ 1-CN-P-1B

____ 1-CN-P-1C

______ c. Submit Condition Report for failed check valve.

______ d. Enter N/A for Steps 5.4.7, 5.4.8, and 5.4.12.

______ 5.4.7 Close condensate pump discharge vent valve of condensate pump started in Step 5.4.3. (Reference 2.3.15) (✓)

____ 1-CN-34 1-CN-P-1A

____ 1-CN-46 1-CN-P-1B

____ 1-CN-58 1-CN-P-1C

______ 5.4.8 Open condensate pump discharge vent valve of condensate pump stopped in Step 5.4.5. (Reference 2.3.15) (✓)

____ 1-CN-34 1-CN-P-1A

____ 1-CN-46 1-CN-P-1B

____ 1-CN-58 1-CN-P-1C

NOTE: Check valves in the Condensate Air In-leakage Subsystem prevent system back flow when shifting or stopping Condensate Pumps.

5.4.9 IF aligning Condensate Air In-leakage Subsystem following a Condensate System startup, THEN perform the following. IF shifting Condensate Pumps with two pumps already running, THEN enter N/A.

a. Close or check the following valves are closed and install configuration control device.

______ • 1-CN-608, CN Pump 1A Suct Test Isol

______ • 1-CN-609, CN Pump 1B Suct Test Isol

______ • 1-CN-610, CN Pump 1C Suct Test Isol

b. Close or check the following valves are closed.

______ • 1-CN-620, CN-FG-3A Low Range Flow Isol Valve

______ • 1-CN-621, CN-FG-3B High Range Flow Isol Valve

c. Open or check the following valves are open.

______ • 1-CN-29, CN Pump 1A Suction Line Instrument Root Valve

______ • 1-CN-41, CN Pump 1B Suction Line Instrument Root Valve

______ • 1-CN-53, CN Pump 1C Suction Line Instrument Root Valve

d. Open or check the following valves are open and install configuration control devices.

______ • 1-CN-613, CN Pump 1A Suct FG Isol Valve

______ • 1-CN-616, CN Pump 1B Suct FG Isol Valve

______ • 1-CN-619, CN Pump 1C Suct FG Isol Valve

NOTE: The range of the Air In-leakage Subsystem Flowmeters are:

- Low Range Flowmeter 1-CN-FG-3A (0.012 to 0.12 SCFM)
- High Range Flowmeter 1-CN-FG-3B (0.09 to 0.9 SCFM)

______ CHEM 5.4.10 Contact Chemistry and request Air In-leakage flowrate to establish required Dissolved Oxygen Concentration.

__________________________ SCFM

______ 5.4.11 Adjust CN Air In-leakage Subsystem metering valves to establish the flowrate determined by Chemistry. (✓)

____ 1-CN-620, CN-FG-3A Low Range Flow Isol Valve

____ 1-CN-621, CN-FG-3B High Range Flow Isol Valve

______ 5.4.12 Monitor condensate pump just started until pump and motor temperatures stabilized.

Performed by:

Signature	Initial	Print	Date

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure WE14EA1.3

Applicant________________________________ Start Time___________________

Examiner_______________________________ Stop Time___________________

Date ___________________________________ SAT _________ UNSAT ________

Title

PERFORM 1-E-0 ATTACHMENT 4

K/A: WE14EA1.3 Ability to operate and/ or monitor the following as they apply to the (High Containment Pressure): Desired operating results during abnormal and emergency situations. (3.3 / 3.8)

Applicability	**Estimated Time**	**Actual Time**
RO/SRO	10 Minutes	_____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.

Standards

- Closes 1-RM-TV-100B.
- Closes 1-IA-TV-101A.
- Secures Fan 1-VS-F-1B.
- Opens 1-SW-MOV-104B.
- Opens 1-SW-MOV-105C.

Procedures

- 1-E-0, Attachment 4 – CLS Component Verification (Rev 78)

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- ☐ Reset to IC 366. OR Call up 100% power IC and initialize.
- ☐ Enter Malfunctions:
  - ☐ CA03, Disable IA-TV-101A Auto Closure; Active
  - ☐ EL01, Loss of Offsite Power, **Trigger 1**
  - ☐ RC0101, RCS Cold Leg A Pipe Rupture; final value = 50, **Trigger 1**
  - ☐ RM1002, Disable RM-TV-100B Auto Close; Active
  - ☐ SW05, Disable SW-MOV-104B AUTO Open, INSERT
  - ☐ SW10, Disable SW-MOV-105C AUTO Open, INSERT
  - ☐ FP0301, FPS FACP07 ALARM HORN FAILURE, INSERT
  - ☐ FP0302, FPS PC SPEAKER FAILURE, INSERT
  - ☐ VS0802, Disable Cntmnt Recirc Fan VS-F-1B Auto Trip, INSERT
- ☐ Place Simulator in Run. Insert **Trigger 1**.
- ☐ Throttle AFW to 200 gpm per SG
- ☐ Perform 1-E-0 actions up to Attachment 1, Step 8e.
- ☐ Place Simulator in Freeze until JPM performance.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- *An additional instructor may be needed to silence alarms for the examinee.*
- **START TIME: ________**

STEP 1: **CRITICAL STEP** Check Phase II and Phase III Containment Isolation Valves are closed. **STANDARD:** a) Locates to the Vertical Board. b) Checks Phase II and Phase III Containment Isolation Valves Closed / Green lights lit. **c) For valves out of position, closes the valves:** • **1-RM-TV-100B [CRITICAL STEP]** • **1-IA-TV-101A [CRITICAL STEP]** d) Applicant annotates Attachment. Applicant may also place “pink magnets” on valves out of position. **EVALUATOR’S NOTE:** **If asked**: Acknowledge components out of position. Tell Applicant to continue performing attachment. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 2: **CRITICAL STEP** Checks Containment Air Recirculation Fans tripped. a) Checks Containment Air Recirculation Fans OFF (green & amber lights lit): • 1-VS-F-1A • 1-VS-F-1B **STANDARD:** a) Locates to the Unit 1 Ventilation Panel. b) Checks Containment Air Recirculation Fans OFF (green & amber lights lit) **c) Identifies 1-VS-F-1B in service and secures the fan [CRITICAL STEP]** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 3: **CRITICAL STEP** Checks Recirculation Spray Service Water in operation by verifying the following valves OPEN: • 1-SW-MOV-103A-D • 1-SW-MOV-104A-D • 1-SW-MOV-105A-D **STANDARD:** a) Locates to the Bench Board. b) Checks SW MOVs for all RSHXs Open / Red Lights lit: • **Identifies 1-SW-MOV-104B closed and opens the valve [CRITICAL STEP]** • **Identifies 1-SW-MOV-105C closed and opens the valve [CRITICAL STEP]** c) Checks SW flow by observing SW flow through 1-SW-FI-106A through-106D between 6,000 and 12,500 gpm. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: Checks RSHX SW RM Sample Pumps running. **STANDARD:** a) Locates to Radiation Monitoring Panel. b) Checks RSHX SW RM Sample Pumps running (*time delayed – 1 minute*). Red lights lit. **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5: Checks RSHX RM Pump No-Flow annunciators clear. **STANDARD:** a) Locates to Vertical Board. b) Verifies all RSHX SW RM Pump alarms clear. c) Acknowledges NOTE that CLS must be reset to allow RM pumps to be secured from MCR. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 6: Checks Containment Spray and Recirc Spray Systems valve positions. **STANDARD:** a) Locates to Bench Board. b) Checks CS and RS System Valves Open / Red lights lit. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: Checks Circulating and Service Water Systems isolation due to Hi-Hi CLS with LOOP. **STANDARD:** a) Recalls from Initial Conditions that a Loss of Offsite Power has also occurred. b) Checks CW isolation valves for Main Condenser Closed / Green lights lit. c) Checks SW isolation valves for BC and CC Heat Exchangers Closed / Green lights lit. **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 8: Notify Nuclear Shift Manager (Evaluator) Status of Task. Applicant should report completion of task. Applicant should also notify the SM (Evaluator) of components found out of position and actions taken. **COMMENTS:** **JPM END**	_______ **SAT** _______ **UNSAT**

STOP TIME: _______

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- A LBLOCA has occurred on Unit 1 concurrent with a loss of offsite power.
- The Operating Team is currently performing 1-E-1, Loss of Reactor or Secondary Coolant.

Initiating Cues

- You are to perform 1-E-0, Attachment 4 – CLS Component Verification.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- A LBLOCA has occurred on Unit 1 concurrent with a loss of offsite power.
- The Operating Team is currently performing 1-E-1, Loss of Reactor or Secondary Coolant.

Initiating Cues

- You are to perform 1-E-0, Attachment 4 – CLS Component Verification.

LOCATION: Vertical Board

VALVE POSITION: CLOSED
LIGHTS: GREEN

__ 1-RM-TV-100C

__ 1-RM-TV-100B

__ 1-RM-TV-100A

__ 1-CC-TV-105A

__ 1-CC-TV-105B __ 1-CC-TV-140A __ 1-CC-TV-110A

__ 1-CC-TV-105C __ 1-CC-TV-140B __ 1-CC-TV-110B __ 1-CC-TV-110C __ 1-IA-TV-100

__ 1-SV-TV-102 __ 1-IA-TV-101A __ 1-IA-TV-101B

LOCATION: Unit 1 Vent Panel

RECIRC FAN STATUS: OFF
LIGHTS: AMBER

__ 1-VS-F-1A __ 1-VS-F-1B

LOCATION: Bench Board

VALVE POSITION: OPEN
LIGHTS: RED

__ 1-SW-MOV-105A __ 1-SW-MOV-105B __ 1-SW-MOV-105C __ 1-SW-MOV-105D

__ 1-SW-MOV-104A __ 1-SW-MOV-104B __ 1-SW-MOV-104C __ 1-SW-MOV-104D

__ 1-SW-MOV-103A __ 1-SW-MOV-103B __ 1-SW-MOV-103C __ 1-SW-MOV-103D

Check SW Outlet flow from RS HXs between 6,000 gpm and 12,500 gpm:

- 1-SW-FI-106A, RS HX A
- 1-SW-FI-106B, RS HX B
- 1-SW-FI-106C, RS HX C
- 1-SW-FI-106D, RS HX D

LOCATION: Radiation Monitoring Panel

PUMPS: RUNNING (Time delayed)

__ 1-SW-P-5A __ 1-SW-P-5B __ 1-SW-P-5C __ 1-SW-P-5D

LOCATION: Annunciator Panel A ALARMS: CLEAR

__ A-D-6 RS HX 1A RAD MON PP NO FLOW

__ A-E-6 RS HX 1B RAD MON PP NO FLOW

__ A-F-6 RS HX 1C RAD MON PP NO FLOW

__ A-G-6 RS HX 1D RAD MON PP NO FLOW

NOTE: CLS must be reset to allow securing rad monitor pumps from the MCR.

☐ IF alarm is LIT, THEN stop associated rad monitor pump AND monitor SW activity using RI-SW-120.

LOCATION: Bench Board VALVE POSITION: OPEN
LIGHTS: RED

__ 1-CS-MOV-102A __ 1-CS-MOV-102B

__ 1-RS-MOV-156A __ 1-RS-MOV-156B

__ 1-CS-MOV-101B __ 1-CS-MOV-101D

__ 1-CS-MOV-101A __ 1-CS-MOV-101C

__ 1-RS-MOV-155A __ 1-RS-MOV-155B __ 1-CS-MOV-100A __ 1-CS-MOV-100B

----------- IF EVENT - CLS HI HI AND LOSS OF RSS -----------

LOCATION: Bench Board VALVE POSITION: CLOSED
LIGHTS: GREEN

__ 1-CW-MOV-100A __ 1-CW-MOV-100B __ 1-CW-MOV-100C __ 1-CW-MOV-100D

__ 1-CW-MOV-106A __ 1-CW-MOV-106B __ 1-CW-MOV-106C __ 1-CW-MOV-106D

__ 1-SW-MOV-101A __ 1-SW-MOV-101B __ 1-SW-MOV-102A __ 1-SW-MOV-102B

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure 056AK3.02 (4.4 / 4.7)
TIME CRITICAL

Applicant________________________________ Start Time___________________

Examiner_______________________________ Stop Time___________________

Date ___________________________________ SAT _________ UNSAT ________

Title

LOAD THE AAC DIESEL ON THE UNIT ONE J BUS

K/A:056 AK3.02, Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power: Actions contained in EOP for loss of offsite power.

Applicability	**Time Critical**	**Actual Time**
RO	10 Minutes	____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.

Standards

- Place 0-AAC-43-15J8 in AAC position.
- Place the following components in PTL; 1-VS-F-1B, Pzr Heater Group A, 1-CH-P-1B, 1-FW-P-3B.
- Resets AMSAC by taking the AMSAC BYPASS switch to BYPASS.
- Rotates synch switch for 15J8 to the “ON” position.
- Closes breaker 15J8 by rotating 15J8 breaker HS clockwise to the CLOSE position for 5 seconds.

Procedures

- 0-AP-17.06, AAC Diesel Generator – Emergency Operations (Rev 31)

Tools and Equipment

- None

Safety Considerations

- None

<u>Simulator Setup</u>

- Call up 100% IC and initialize.
- Insert the following MALFUNCTIONS:
    - ED0201, EDG 1 AIR START SYSTEM FAILURE, INSERT
    - ED0203, EDG 3 AIR START SYSTEM FAILURE, INSERT
    - EL01, LOSS OF OFFSITE POWER, Delay 1 sec, INSERT
    - FW3102, FW-P-3B BKR 15J4 SPURIOUS TRIP, EVENT 3, INSERT
    - FP0301, FPS FACP07 ALARM HORN FAILURE, INSERT
    - FP0302, FPS PC SPEAKER FAILURE, INSERT
- Using InSight, set SA_223 to 1.
- Place the simulator in run, implement all malfunctions, and perform the ECA-0.0 to Step 5c RNO step 1.
- Freeze the simulator and save this condition.

NOTES:

<u>Time Critical Operator Action Background</u>

0-DRP-049 lists event "E11" operator action to "Align the AAC Diesel to respective emergency bus" with an action time of 10 minutes in accordance with ECA-0.0 and 0-AP-17.06. The DRP references training job aid 017, which contains the following for Plant Conditions:

- Loss of offsite power has occurred results in a loss of emergency busses. – OR – Offsite power is available and a loss of emergency busses has occurred.
- EDGs fail to auto start or auto load resulting in a loss of all emergency AC power.
- AAC DG is available to manually start and load.

These conditions are replicated in this JPM.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are Bolded.
- *An additional instructor may be needed to silence alarms for the examinee.*
- **START TIME:**

STEP 1: 0-AP-17.06 – NOTES prior to step 1 • A one-line diagram showing the AAC Electrical distribution is provided in Attachment 1. • The AAC Diesel Generator should automatically start when Transfer Buses D and F OR E and F are deenergized. **STANDARD:** Candidate acknowledges NOTES **EVALUATOR'S NOTE:** JPM is **TIME CRITICAL**. 0-DRP-049, Time Critical Operator Actions, E11, allows ***10 minutes*** to Align the AAC Diesel to respective emergency bus. Time starts when Simulator placed in RUN; Time Stops when breaker 15J8 closed and 1J bus energized. **If asked:** Unit 2 Transfer buses are de-energized, #2 EDG is supplying 2H emergency bus. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 2: 0-AP-17.06 – STEP 1 - CHECK EMERGENCY BUSES 1J and 2H - EITHER <u>OR</u> BOTH DE-ENERGIZED. **STANDARD:** a) Identifies 1J Bus is de-energized by observing zero (0) volts indicated on 1J bus. b) Identifies from instructions or Unit 2 inquiry that 2H energized. . **EVALUATOR'S NOTE:** **If asked:** "2H" Bus is energized from the #2 EDG. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 3:	

0-AP-17.06 – CAUTION prior to step 2 **STANDARD:** Candidate acknowledges CAUTION. **EVALUATOR'S NOTE:** **If asked:** Temporary Air Compressor is in service **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: 0-AP-17.06 – STEP 2 - GO TO APPROPRIATE STEP BASED ON DESIRED USE OF THE AAC DIESEL GENERATOR. **STANDARD:** a) Identifies 1J to be re-energized from the AAC Diesel from initial task briefing or Evaluator query. **EVALUATOR'S NOTE:** **If asked:** Load the AAC on 1J Bus. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 5: 0-AP-17.06 – STEP 3 - CHECK AAC DIESEL GENERATOR - AVAILABLE AND RUNNING. • Annunciator 0-WD-C2, AAC SYSTEM AVAILABLE BUS 1D – LIT AND • Annunciator 0-WD-D1, AAC GENERATOR TRIP - NOT LIT **STANDARD:** a) Observes 0-WD-C2, AAC SYSTEM AVAILABLE BUS 1D, is lit. b) Observes 0-WD-D1, AAC GENERATOR TRIP, is not lit. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 6: 0-AP-17.06 – CAUTION AND NOTE PRIOR TO STEP 4. • **CAUTION:** An overcurrent fault on 15D1 will prevent 0-AAC-BKR-05L3 from closing. • **NOTE**: Annunciator 0-WD-C2, AAC SYSTEM AVAILABLE BUS 1D, should go out when 0-AAC-BKR-05L3 closes. **STANDARD:** Candidate acknowledges CAUTION and NOTE **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: **CRITICAL STEP** 0-AP-17.06 – STEP 4 - ENERGIZE TRANSFER BUS D BY CLOSING 0-AAC-BKR-05L3. a) At Unit 1 EDG 3 Control Panel, place Transfer Switch NORMAL/AAC, 0-AAC-43-15J8, in AAC position b) Check Annunciator 1K-D3, BUS 1D UNDERVOLT - NOT LIT **STANDARD:** a) **Candidate places 0-AAC-43-15J8, in AAC position [CRITICAL STEP]** b) Check Annunciator 1K-D3, BUS 1D UNDERVOLT - NOT LIT. c) Candidate may check annunciator 0-WD-C2, AAC SYSTEM AVAILABLE BUS 1D extinguished (from NOTE prior to step). **COMMENTS:**	_______ **SAT** _______ **UNSAT**

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STEP 8: **CRITICAL STEP**

0-AP-17.06 – STEP 5a - CHECK OR PLACE THE FOLLOWING LOADS IN PTL.

a) Put the following switches in PTL / LOCKOUT:

- **1-VS-F-1B (14J7)**
- **1-SI-P-1B (14J3)**
- 1-RS-P-2B (14J8)
- 1-RS-P-1B (14J4)
- 1-CS-P-1B (14J5)
- **PRZR Heater Group A (14J9)**
- **1-CH-P-1B (15J5)**
- 1-CH-P-1C (15J2, ALT)
- **1-FW-P-3B (15J4)**
- 1-CC-P-1B (15J10)
- 1-VS-F-58B, if powered from Alternate source, 14J13

STANDARD:

- Candidate places the above components in PTL / LOCKOUT with the exception of 1-VS-F-58B which is not powered from the Alternate Source
- **The following components MUST be in PTL: [CRITICAL STEP]**
  - **1-VS-F-1B**
  - **PRZR Heater Group A (14J9)**
  - **1-CH-P-1B (15J5)**
  - **1-FW-P-3B (15J4)**

EVALUATOR'S NOTE: **Loads not listed as CRITICAL STEP are components that will not receive an AUTO START signal based on event in progress.**

COMMENTS:

</td><td>

_______ **SAT**

_______ **UNSAT**

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STEP 9:

0-AP-17.06 – STEP 5b - CHECK OR PLACE THE FOLLOWING LOADS IN PTL.

b) Check breakers open by locally checking breaker position indicating lights – RED LIGHTS NOT LIT

- 1-CS-P-1B (1-EP-BKR-14J5)
- 1-RS-P-1B (1-EP-BKR-14J4)

STANDARD: Candidate verifies RED LIGHTS are not lit on listed components.

COMMENTS:

</td><td>

_______ **SAT**

_______ **UNSAT**

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STEP 10: 0-AP-17.06 – STEP 5b - CHECK OR PLACE THE FOLLOWING LOADS IN PTL. c) Check breakers open by locally checking breaker position indicating lights – RED LIGHTS NOT LIT • 1-FW-P-3B (1-EP-BKR-15J4) **STANDARD:** Candidate identifies that the RED LIGHT is LIT on 1-FW-P-3B and goes to the RNO. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 11: **CRITICAL STEP** 0-AP-17.06 – STEP 5b RNO - CHECK OR PLACE THE FOLLOWING LOADS IN PTL. c) Do the following: • Reset AMSAC. OR • Locally open MD AFW pump breaker: • 1-FW-P-3B (1-EP-BKR-15J4) **STANDARD:** • **Candidate resets AMSAC by taking the AMSAC BYPASS switch to BYPASS [CRITICAL STEP – Option 1]** • **Candidate may elect to locally open the associated breaker by contacting a field operator [CRITICAL STEP – Option 2].** **BOOTH NOTE:** If contacted to locally open 1-FW-P-3B breaker, actuate **Trigger 3**, inform Candidate that a time compression has occurred and 15J4 open. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 12: CRITICAL STEP	
0-AP-17.06 – STEP 6 - ENERGIZE EMERGENCY BUS 1J. a) Place the Sync switch for 1-EP-BKR-15J8 in ON b) Check breaker 1-EP-BKR-15J3 is OPEN c) Close breaker 1-EP-BKR-15J8 by holding control switch in the Closed position for at least five seconds d) Place the Sync switch for 1-EP-BKR-15J8 in OFF **STANDARD:** a) Locates the generator synch switch and places it in 15J8. b) **Rotates the synch switch for 15J8 in the clockwise direction to the "ON" position [CRITICAL STEP].** c) Verifies breaker 15J3 is open (green light on red light off). d) **Rotates 15J8 breaker control switch in the clockwise direction to the close position** and holds for 5 seconds**, releases switch and verifies rotation back to 12:00 position [CRITICAL STEP].** **NOTE: TIME CRITICAL ACTION COMPLETE; TIME _________.** e) Verifies 15J8 breaker closed (Red light on, green light off). f) Verifies 1J Bus energized (frequency at approximately 60 HZ and voltage approximately 4200V). g) Rotates the synch switch for 15J8 in the counterclockwise direction to the "OFF" position. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 13: REPORTS TO SHIFT MANAGER (EVALUATOR) **<u>Standards</u>** Candidate reports AP-17.06 is completed up to Steps 1-6 are complete **STOP TIME: ______** **COMMENTS:** **JPM END**	_______ **SAT** _______ **UNSAT**

STOP TIME: _____

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- Unit 1 has a station blackout.
- The team is in ECA-0.0, Loss of all AC Power, Step 5c RNO step 1.

Initiating Cue

- **This JPM is **TIME CRITICAL**.**
- Unit 1 has sustained a loss of all AC power and Unit 2 has only the "H" Bus energized from #2 EDG.
- The Operating Team is performing ECA-0.0.
- Here is a copy of 0-AP-17.06, AAC Diesel Generator - Emergency Operations.
- I need you to restore power to Unit 1 "J" Bus with the AAC Diesel Generator by performing steps 1-6 of 0-AP-17.06, AAC Diesel Generator – Emergency Operations.
- When you finish the actions necessary to accomplish this, please inform me so I can have the Operating Team restore loads on the Unit 1 "J" Bus.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- Unit 1 has a station blackout.
- The team is in ECA-0.0, Loss of all AC Power, Step 5c RNO step 1.

Initiating Cue

- **This JPM is **TIME CRITICAL**.**
- Unit 1 has sustained a loss of all AC power and Unit 2 has only the "H" Bus energized from #2 EDG.
- The Operating Team is performing ECA-0.0.
- Here is a copy of 0-AP-17.06, AAC Diesel Generator - Emergency Operations.
- I need you to restore power to Unit 1 "J" Bus with the AAC Diesel Generator by performing steps 1-6 of 0-AP-17.06, AAC Diesel Generator – Emergency Operations.
- When you finish the actions necessary to accomplish this, please inform me so I can have the Operating Team restore loads on the Unit 1 "J" Bus.

Dominion Energy

SURRY POWER STATION

ABNORMAL PROCEDURE

NUMBER	PROCEDURE TITLE	REVISION
0-AP-17.06	AAC DIESEL GENERATOR - EMERGENCY OPERATIONS (WITH 12 ATTACHMENTS)	30
		PAGE 1 of 28

PURPOSE

To provide guidance for starting, loading, and securing the AAC Diesel Generator.

TIME CRITICAL ACTIONS

ENTRY CONDITIONS

Shift Supervision direction OR

Transition from any of the following procedures.

- 1-ECA-0.0, LOSS OF ALL AC POWER
- 2-ECA-0.0, LOSS OF ALL AC POWER
- 1-AP-10.07, LOSS OF UNIT 1 POWER
- 2-AP-10.07, LOSS OF UNIT 2 POWER
- 0-AP-17.04, EDG 1 OR 2 - EMERGENCY OPERATIONS
- 0-AP-17.05, EDG 3 - EMERGENCY OPERATIONS
- 0-FCA-1.00, LIMITING MCR FIRE
- 1-FCA-2.00, UNIT 1 CONTAINMENT FIRE
- 2-FCA-2.00, UNIT 2 CONTAINMENT FIRE
- 1-FCA-3.00, LIMITING CABLE VAULT AND CABLE TUNNEL FIRE
- 2-FCA-3.00, LIMITING CABLE VAULT AND CABLE TUNNEL FIRE
- 1-FCA-4.00, LIMITING ESGR NUMBER 1 FIRE
- 2-FCA-4.00, LIMITING ESGR NUMBER 2 FIRE
- 0-FCA-7.00, LIMITING MER 3 FIRE
- 0-FCA-8.00, LIMITING AUXILIARY BUILDING FIRE

CONTINUOUS USE

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE:
- A one-line diagram showing the AAC Electrical distribution is provided in Attachment 1.
- The AAC Diesel Generator should automatically start when Transfer Buses D and F OR E and F are deenergized.

1.___ CHECK EMERGENCY BUSES 1J AND 2H - EITHER OR BOTH DEENERGIZED

Check the following conditions:

- ☐ • Emergency Bus 1J - ENERGIZED BY EDG 3
- ☐ • Emergency Bus 2J - DEENERGIZED
- ☐ • Swapping of EDG 3 to Emergency Bus 2J - DESIRED
- ☐ IF all of the above conditions met, THEN GO TO Attachment 2.
- ☐ IF NOT, THEN RETURN TO procedure and step in effect.

* *

CAUTION: Loading of the AAC Diesel should consider availability of Instrument Air from 1-IA-C-1 or the Temporary Diesel Air Compressor.

* *

2.___ GO TO THE APPROPRIATE STEP BASED ON DESIRED USE OF THE AAC DIESEL GENERATOR

- ☐ • Step 3, Only Bus 1J to be energized
- ☐ • Step 16, Only Bus 2H to be energized
- ☐ • Step 28, Both 1J and 2H buses to be energized

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3. ___	CHECK AAC DIESEL GENERATOR - AVAILABLE AND RUNNING ☐ • Annunciator 0-WD-C2, AAC SYSTEM AVAILABLE BUS 1D - LIT <u>AND</u> ☐ • Annunciator 0-WD-D1, AAC GENERATOR TRIP - NOT LIT	Do the following: a) Perform Annunciator Response procedure(s) as necessary: ☐ • 0-WD-D1, AAC GENERATOR TRIP ☐ • 0-WD-D2, AAC SYSTEM ALARM ☐ • 0-WD-D3, AAC BUS 0L TROUBLE ☐ b) <u>WHEN</u> problem corrected, <u>OR</u> if no AUTO Start signal exists, <u>THEN</u> perform Attachment 3. ☐ c) <u>WHEN</u> the AAC Diesel Generator supplying Bus 0L, <u>THEN</u> GO TO Step 4.

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED

* *

CAUTION: An overcurrent fault on 15D1 will prevent 0-AAC-BKR-05L3 from closing.

* *

NOTE: Annunciator 0-WD-C2, AAC SYSTEM AVAILABLE BUS 1D, should go out when 0-AAC-BKR-05L3 closes.

4.___ ENERGIZE TRANSFER BUS D BY CLOSING 0-AAC-BKR-05L3:

☐ a) At Unit 1 EDG 3 Control Panel, place Transfer Switch NORMAL/AAC, 0-AAC-43-15J8, in AAC position

☐ b) Check Annunciator 1K-D3, BUS 1D UNDERVOLT - NOT LIT

b) Do the following:

1) Locally investigate breakers:

☐ • 15D1

☐ • 0-AAC-BKR-05L3

☐ 2) IF breakers normal, THEN locally turn on synch switch AND close (AAC BLDG) 0-AAC-BKR-05L3.

☐ 3) Contact the Electrical Department for assistance as necessary.

☐ 4) WHEN Transfer Bus D energized, THEN GO TO Step 5.

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5.___	CHECK OR PLACE THE FOLLOWING LOADS IN PTL	
	a) Put the following switches in PTL / LOCKOUT: ☐ • 1-VS-F-1B (14J7) ☐ • 1-SI-P-1B (14J3) ☐ • 1-RS-P-2B (14J8) ☐ • 1-RS-P-1B (14J4) ☐ • 1-CS-P-1B (14J5) ☐ • PRZR Heater Group A (14J9) ☐ • 1-CH-P-1B (15J5) ☐ • 1-CH-P-1C (15J2, ALT) ☐ • 1-FW-P-3B (15J4) ☐ • 1-CC-P-1B (15J10) ☐ • 1-VS-F-58B, if powered from Alternate source, 14J13	
	b) Check breakers open by checking breaker position indicating lights - RED LIGHTS NOT LIT ☐ • 1-CS-P-1B (14J-5) ☐ • 1-RS-P-1B (14J-4)	b) Locally open CS and ISRS pump breakers: ☐ • 1-CS-P-1B (14J-5) ☐ • 1-RS-P-1B (14J-4)
	c) Check breaker open by checking breaker position indicating lights - RED LIGHTS NOT LIT ☐ • 1-FW-P-3B (15J4)	c) Do the following: ☐ • Reset AMSAC. OR • Locally open MD AFW pump breaker: ☐ • 1-FW-P-3B (15J4)

STEP	ACTION/ EXPECTED RESPONSE	RESPONSE NOT OBTAINED
6.___	ENERGIZE EMERGENCY BUS 1J	
	☐ a) Place the Sync switch for 15J8 in ON	
	☐ b) Check breaker 15J3 is OPEN	☐ b) IF breaker 15J3 is closed, THEN notify Shift Supervision.
	☐ c) Close breaker 15J8 by holding control switch in the Closed position for at least five seconds	
	☐ d) Place the Sync switch for 15J8 in OFF	

* *

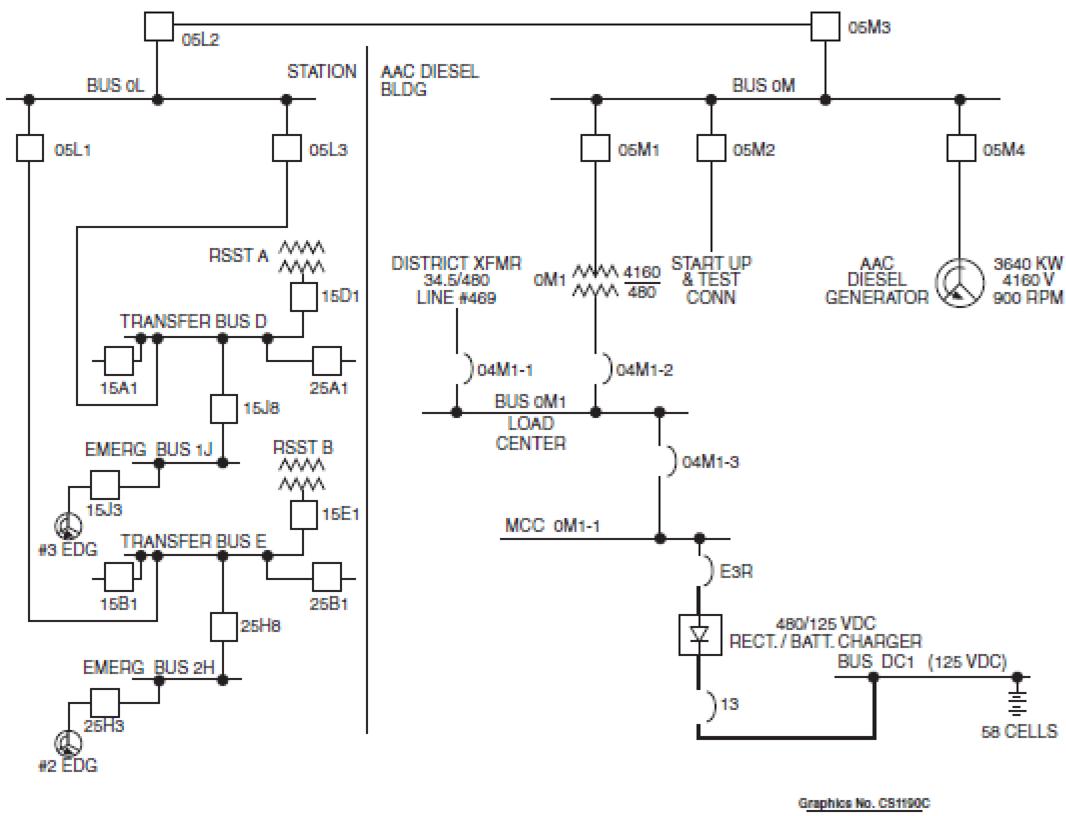
CAUTION: If all RCP seal cooling has been previously lost, a charging pump should NOT be started until the RCP seals are isolated.

* *

NOTE:
- The AAC Diesel Generator has a 4.0 hour fuel supply when operating at rated load of 3640 KW.
- The approximate power required for J bus loads are as follows:
  - CC pump, 450 KW
  - AFW pump, 310 KW
  - RHR pump, 215 KW
  - ISRS pump, 225 KW
  - CS pump, 170 KW
  - CTMT Air Recirc Fan, 100 KW
  - CHG pump, 430 KW
  - PRZR Heaters, 200 KW
  - OSRS pump, 245 KW
  - LHSI pump, 190 KW
  - Filtered Exhaust Fan, 125 KW

7.___ START LOADS ON EMERGENCY BUS 1J IAW SHIFT SUPERVISION DIRECTION

NUMBER 0-AP-17.06	ATTACHMENT TITLE	ATTACHMENT 1
REVISION 30	AAC ELECTRICAL DISTRIBUTION (ONE LINE DIAGRAM)	PAGE 1 of 1



SURRY POWER STATION
STATION BLACKOUT EDG DISTRIBUTION

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Simulator Job Performance Measure
[Alternate Path]

Applicant________________________________	Start Time___________________
Examiner_______________________________	Stop Time___________________
Date ___________________________________	SAT _________ UNSAT ________

Title

SWAP SGWLCS INPUTS (ALTERNATE PATH)

K/A: 016A2.01, Detector Failure (3.0,3.1)

Applicability	**Validation Time**	**Actual Time**
RO/SRO(I)/SRO(U)	5 Minutes	_____ Minutes

Conditions

- Task is to be PERFORMED in the simulator.
- "A" S/G SF & FF channels were aligned to Channel 4 to support channel III maintenance.
- Maintenance is complete and it is now desired to swap "A" S/G SF and FF to channel III IAW 1-OP-RP-001 steps 5.4.4 and 5.4.5.

Standards

- Correct performance of 1-OP-RP-001 to swap SF and FF channels.
- Correct response to subsequent instrumentation failure to prevent a reactor trip.

Initiating Cues

- You are to align the "A" Steam Flow and Feed Flow channels to channel III in accordance with 1-OP-RP-001 steps 5.4.4 and 5.4.5.
- When you finish the actions necessary to accomplish this, please inform me

Terminating Cues

- Candidate completes immediate actions of 0-AP-53.00 with "A" S/G level under their control.

Procedures

- 1-OP-RP-001 - ALIGNING CONTROL SYSTEM FOR PERFORMANCE OF CHANNEL I, II, III, AND IV PROCESS AND PROTECTION TESTING
- 0-AP-53.00 - LOSS OF VITAL INSTRUMENTATION / CONTROLS

Tools and Equipment

- None

Safety Considerations

- None

Simulator Setup

- ☐ Call up 100% power IC and initialize.
- ☐ Align “A” S’G SF and FF channels to channel IV (YELLOW)
- ☐ Insert malfunction FW1801, A S/G MN FD FLOW XMTR FT-1477 FAILS, Final Value +1.0, Event 1, Insert
- ☐ Create the following EVENT
  - EVENTS
  - Event 001
  - Edit Event
  - Event code – “FWFC478F_AUTO & FWFC478F_WHITE & FWSEL_CH476_477” – *copy code within the quotes*.
  - OK

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- *An additional instructor may be needed to silence alarms for the examinee.*
- **START TIME_______:**

STEP 1: 1-OP-RP-001 – CAUTION and NOTES prior to step 5.4.4. • CAUTION Due to the sensitivity of the Calorimetric Program to changes in Feed Flow while using the UFM, consideration should be given to proactively reducing Turbine load to raise the available margin to Maximum Allowable Power limit. • NOTE: With Shift Supervision permission, steps within a subsection may be performed concurrently to limit the time a Feed Regulator valve is placed in MANUAL (i.e.; all three FRVs placed in MANUAL to allow swapping of SF/FF and Turbine First Stage Impulse Channels). • NOTE: The Feedwater Regulator valve(s) should not be placed in MANUAL unless maintenance or testing will be performed on Channel IV of the particular valve. • NOTE: Cycling Feed Flow / Steam Flow Channel select switches twice helps to ensure proper switch makeup. **STANDARD:** Candidate acknowledges CAUTION and NOTES **EVALUATOR'S NOTE (If Asked):** • Power reduction is not required for this task. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2: 1-OP-RP-001 – STEP 5.4.4 - Check the following switch positions. Do not manipulate switches. • STM GEN A - FW FLOW CH SEL SWITCH ☐ CH 477 position ☐ CH 476 position • STM GEN A - STM FLOW CH SEL SWITCH ☐ CH 474 position ☐ CH 475 position **STANDARD:** Candidate records AS-FOUND switch positions (CH476 / CH475). **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 3: **CRITICAL STEP** 1-OP-RP-001 – STEP 5.4.5 IF both switches are in CH 477 and CH 474 position, THEN enter N/A. IF either switch is NOT in the correct position, THEN perform the following: a. Place 1-FW-FCV-1478, SG A FEED REG, in MAN position. b. Cycle STM GEN A - FW FLOW CH SEL SWITCH at least twice and leave in CH-477 position. c. Cycle STM GEN A - STM FLOW CH SEL SWITCH at least twice and leave in CH-474 position. d. Check proper switch makeup by checking indications normal for plant conditions on 1-FW-FR-1478, SG A FLOW. e. Place 1-FW-FCV-1478, SG A FEED REG, in AUTO position. **STANDARD:** a. **Places 1-FW-FCV-1478 in MAN position. [CRITICAL STEP]** b. **Places STM GEN A - FW FLOW CH SEL SWITCH in CH-477 position [CRITICAL STEP – to leave in 477 position].** c. **Places STM GEN A - STM FLOW CH SEL SWITCH in CH-474 position [CRITICAL STEP – to leave in 474 position]**. d. Check proper switch makeup by checking indications on SF/FF recorder (1-FW-FR-1478). e. **Place 1-FW-FCV-1478 in AUTO position [CRITICAL STEP].** f. Upon restoration to AUTO, candidate identifies Feed Flow channel failure (1-FW-FI-1477 fails high) and commences the immediate actions of 0-AP-53.00. **EVALUATOR'S NOTE (If Asked):** • Another operator will monitor 1-FW-FCV-1478 while channel swap is performed. • Concurrent verifications have been performed. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: 0-AP-53.00 – [STEP 1] CHECK REDUNDANT INSTRUMENT CHANNEL(S) INDICATION - NORMAL **STANDARD:** Candidate identifies normal feedwater flow on channel IV (1-FW-FI-1476). **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5: **CRITICAL STEP** 0-AP-53.00 – [STEP 2] PLACE AFFECTED CONTROL(S)/COMPONENT(S) IN MANUAL CONTROL AND STABILIZE PARAMETER USING REDUNDANT INDICATION **STANDARD:** a. **Candidate places the "A" FRV in MANUAL (1-FW-FCV-1478) and controls demand to restore and stabilize at the proper S/G level (approximately 44%) [CRITICAL STEP].** b. Candidate reports the immediate actions of 0-AP-53.00 are complete. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 6: TASK COMPLETE	

STOP TIME: ______________

NOTES:

____

____

____

____

____

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- I am the Unit Supervisor and you are the Reactor Operator.
- Task is to be PERFORMED in the simulator.
- “A” S/G SF & FF channels were aligned to Channel 4 to support channel III maintenance.
- Maintenance is complete and it is now desired to swap “A” S/G SF and FF to channel III IAW 1-OP-RP-001 step 5.4.4 and 5.4.5.

Initiating Cues

- You are to align the “A” Steam Flow and Feed Flow channels to channel III in accordance with 1-OP-RP-001 steps 5.4.4 and 5.4.5.
- When you finish the actions necessary to accomplish this, please inform me

Operator Directions Handout

(TO BE GIVEN TO APPLICANT)

Initial Conditions

- I am the Unit Supervisor and you are the Reactor Operator.
- Task is to be PERFORMED in the simulator.
- “A” S/G SF & FF channels were aligned to Channel 4 to support channel III maintenance.
- Maintenance is complete and it is now desired to swap “A” S/G SF and FF to channel III IAW 1-OP-RP-001 step 5.4.4 and 5.4.5.

Initiating Cues

- You are to align the “A” Steam Flow and Feed Flow channels to channel III in accordance with 1-OP-RP-001 steps 5.4.4 and 5.4.5.
- When you finish the actions necessary to accomplish this, please inform me

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Administrative Job Performance Measure G2.1.7

Applicant________________________________	Start Time___________________
Examiner_______________________________	Stop Time___________________
Date ___________________________________	SAT _________ UNSAT ________

Title

Perform a Quadrant Power Tilt Calculation.

K/A: G.2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. [4.4/4.7]

Applicability	**Validation Time**	**Actual Time**
RO	30 Minutes	_____ Minutes

Conditions

- Task is to be PERFORMED in the classroom.

Standards

- Divides Maximum Upper channel current by the Average Upper Detector currents to determine the Upper Excore Quadrant Power Tilt Ratio (1.0754).
- Divides Maximum Lower channel current by the Average Lower Detector currents to determine the Lower Excore Quadrant Power Tilt Ratio (1.0950).
- Calculates Tilt % for Upper channels between 7.5% – 7.6%.
- Calculates Tilt % for Lower channels between 9.45% – 9.55%.

Initiating Cues

- A dropped rod has occurred on Unit 1.
- A Quadrant Power Tilt Calculation needs to be performed as directed by 0-AP-1.00. Rod Control System Malfunction.

Terminating Cues

- Applicant has completed the QPTR calculation.

Procedures

- 0- AP-1.00, Rod Control System Malfunction

Tools and Equipment

- Calculator
- NIS Setpoints and Power Range Currents Data Sheet. (Included in JPM)
- Laptop

Safety Considerations

- None

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are **bolded** and denoted as a **CRITICAL STEP**.
- **START TIME_______:**

STEP 1: Step 1 NOTE: Calculations for QPTR should be carried out to four places to the right of the decimal place to provide for accuracy and consistency of results. **STANDARD:** a) Acknowledges NOTE. **EVALUATOR'S NOTE:** **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2: RECORD THE FOLLOWING DATA *(Step 2)* Reactor Power___________% Date____________ Time____________ **STANDARD:** a) Enters 100% for Reactor power. b) Enters today's date. c) Enters current time. **EVALUATOR'S NOTE:** **If Asked**: Current Reactor Power is 100%. **If Asked**: Use todays date. **If Asked**: Use current time. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 3: RECORD THE FOLLOWING EXCORE DETECTOR DATA. *(Step 2)* • Actual Excore Detector Readings. • Expected Excore Detector Readings. **STANDARD:** a) Places PR NI currents and Normalized Currents in appropriate location on Calculation of Excore Quadrant Power Tilt Ratios. **EVALUATOR'S NOTE:** **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 4: NORMALIZE THE UPPER DETECTOR READINGS. *(Step 3)* **STANDARD:** a) Divides Upper Detector currents by Normalized currents for each detector. **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) . **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 5: SUM OF NORMALIZED VALUES FOR THE UPPER DETECTORS. *(Step 3)* **STANDARD:** a) Adds Upper Detector Normalized values for all Upper detectors. **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 6: NORMALIZE THE LOWER DETECTOR READINGS. *(Step 3)* **STANDARD:** a) Divides Lower Detector currents by Normalized currents for each detector. **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) . **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: SUM OF NORMALIZED VALUES FOR THE LOWER DETECTORS. *(Step 3)* **STANDARD:** a) Adds Lower Detector Normalized values for all Lower detectors. **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 8: RECORD THE NUMBER OF DETECTORS IN USE. *(Step 4)* **STANDARD:** a) Records “4” **EVALUATOR’S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 9: CALCULATE AVERAGE UPPER AND LOWER DETECTOR CURRENT VALUES. *(Step 5)* **STANDARD:** a) Transcribes Upper and Lower detector Sum of Normalized Values from Step 3 of Attachment 6. b) Divides each sum by the number of Detectors in use. **EVALUATOR’S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 10: RECORD THE MAXIMUM NORMALIZED UPPER AND LOWER DETECTOR CURRENTS. *(Step 6)* **STANDARD:** a) Records the Maximum Normalized Upper Detector Current from Step 3 (N42 value of 1.0135). b) Records the Maximum Normalized Lower Detector Current from Step 3 (N42 value of 1.0176). **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 11: CALCULATE MAXIMUM UPPER AND LOWER EXCORE QUADRANT POWER TILT RATIOS. *(Step 7)* **STANDARD:** a) Divides Maximum Upper channel current by the Average Upper Detector currents to determine the Upper Excore Quadrant Power Tilt Ratio (1.0754). b) Divides Maximum Lower channel current by the Average Lower Detector currents to determine the Lower Excore Quadrant Power Tilt Ratio (1.0950). **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 12: **CRITICAL STEP** CALCULATE TILT%. *(Step 8)* **STANDARD:** a) **Calculates Tilt % for Upper channels between 7.5% – 7.6% (7.54%). CRITICAL STEP** b) **Calculates Tilt % for Lower channels between 9.45% – 9.55% (9.50%). CRITICAL STEP** **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 13: **CRITICAL STEP** DETERMINES IF A TECH SPEC LCO IS IN EFFECT. **STANDARD:** a) Determines QPT exceeds the 2% limit in Tech Specs. **b) Reports a Tech Spec LCO IS in effect. CRITICAL STEP** **EVALUATOR'S NOTE:** **If Asked**: Inform the Candidate another operator will be responsible for Step 10. **COMMENTS:**	
STEP 14: NOTIFY UNIT SUPERVISOR. *(Step 9)* **STANDARD:** c) Turns in Attachment 1. **EVALUATOR'S NOTE:** **If Asked**: Inform the Candidate another operator will be responsible for Step 10. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STOP TIME:

EXAMINER KEY

NUMBER 0-AP-1.00	ATTACHMENT TITLE CALCULATION OF EXCORE QUADRANT POWER TILT RATIOS	ATTACHMENT 6
REVISION 29		PAGE 1 of 2

NOTE: Calculations for QPTR should be carried out to four places to the right of the decimal place to provide for accuracy and consistency of results.

1. ___ Record the following data:

   Reactor Power_____100%_________% Date_[TODAY]___ Time___[NOW]_____

2. ___ Record the following Excore Detector Data:

Actual Excore Detector Readings				Expected Excore Detector Readings at 100% Power			
Upper		Lower		Upper		Lower	
N41U	94.0	N41L	89.5	$N41U_{100}$	118.1	$N41L_{100}$	119.5
N42U	120.1	N42L	121.4	$N42U_{100}$	118.5	$N42L_{100}$	119.3
N43U	115.3	N43L	114.0	$N43U_{100}$	119.1	$N43L_{100}$	119.5
N44U	118.7	N44L	119.1	$N44U_{100}$	119.1	$N44L_{100}$	119.5

3. ___ Normalize the Actual Excore Detector Readings to the expected Excore Detector readings at 100% power, and sum the normalized values for both the upper and lower detectors.

Upper Detector Fraction	Upper Detector Fraction Values	Normalized Value (I_U)	Lower Detector Fraction	Lower Detector Fraction Values	Normalized Value (I_L)
$\frac{N41U}{N41U_{100}}$	$\frac{94.0}{118.8}$ =	0.7912	$\frac{N41L}{N41L_{100}}$	$\frac{89.5}{119.5}$ =	0.7490
$\frac{N42U}{N42U_{100}}$	$\frac{120.1}{118.5}$ =	1.0135	$\frac{N42L}{N42L_{100}}$	$\frac{121.4}{119.3}$ =	1.0176
$\frac{N43U}{N43U_{100}}$	$\frac{115.3}{119.1}$ =	0.9681	$\frac{N43L}{N43L_{100}}$	$\frac{114.0}{119.5}$ =	0.9540
$\frac{N44U}{N44U_{100}}$	$\frac{118.7}{119.1}$ =	0.9966	$\frac{N44L}{N44L_{100}}$	$\frac{119.1}{119.5}$ =	0.9967
Sum of Normalized Values = ΣI_U=		3.7694	Sum of Normalized Values = ΣI_L=		3.7173

4. ___ Record N = the No. of Detectors in use = 4

5. ___ Calculate the average upper and lower detector current values.

$$\text{Average } I_U = \frac{\Sigma I_U}{N} = \frac{3.7694}{4} = 0.9424$$

$$\text{Average } I_L = \frac{\Sigma I_L}{N} = \frac{3.7173}{4} = 0.9293$$

6. ___ From Step 3, record the following values.

Maximum Normalized Upper Detector Current = I_{Umax} = 1.0135

Maximum Normalized Lower Detector Current = I_{Lmax} = 1.0176

7. ___ Calculate the maximum upper and lower Excore Quadrant Power Tilt Ratios.

☐ a. Upper Excore Quadrant Power Tilt Ratio = $\frac{I_{Umax}}{\text{Average} I_U}$ = 1.0754

☐ b. Lower Excore Quadrant Power Tilt Ratio = $\frac{I_{Lmax}}{\text{Average} I_L}$ = 1.0950

8. ___ Calculate tilt%:

☐ a. Subtract 1 from Step 7.a and multiply by 100 for Upper Tilt %: 7.54% (7.50-7.60%)

☐ b. Subtract 1 from Step 7.b and multiply by 100 for Lower Tilt %: 9.50 % (9.45-9.55%)

9. ___ Notify Unit Supervisor.

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions:

- Unit 1 was operating at 100% power.
    - Control Rod K-4, Control Bank B, dropped and is currently indicating 0 steps.
    - The team is performing 0-AP-1.00, Rod Control Malfunction.

Initiating Cues

- Perform the Quadrant Power Tilt (QPT) Calculation in accordance with Steps 1 through 9 of 0-AP-1.00, Attachment 6, Calculation of Excore Quadrant Power Tilt Ratios.
- You are provided a copy of the Power Range Currents from the NIS Data Book providing Normalized Values.
- When you have performed Steps 1 through 9, answer the following questions:
    - What is the calculated Upper Tilt %?
    - What is the calculated Lower Tilt %?
    - Based on these results, is a Tech Spec LCO in effect? (Yes / No)
- Report your results to the examiner.

Actual current detector currents taken from the Power Range NIs:

N-41 Upper Detector Current	94.0
N-41 Lower Detector Current	89.5
N-42 Upper Detector Current	120.1
N-42 Lower Detector Current	121.4
N-43 Upper Detector Current	115.3
N-43 Lower Detector Current	114.0
N-44 Upper Detector Current	118.7
N-44 Lower Detector Current	119.1

Surry Unit 1 NI Calibration Data

Power Range Currents

	N41		N42		N43		N44	
DELTA FLUX @ 100%	I (Top) μamps	I (Bottom) μamps	I (Top) μamps	I (Bottom) μamps	I (Top) μamps	I (Bottom) μamps	I (Top) μamps	I (Bottom) μamps
0	118.8	119.5	118.5	119.3	119.1	119.5	119.1	119.5
DELTA FLUX @ 120%	I (Top) μamps	I (Bottom) μamps	I (Top) μamps	I (Bottom) μamps	I (Top) μamps	I (Bottom) μamps	I (Top) μamps	I (Bottom) μamps
0	142.5	143.4	142.2	143.1	142.9	143.5	142.9	143.4
8	148.6	137.2	148.3	137.0	149.1	137.3	149.1	137.2
- 24	124.2	161.8	123.9	161.5	124.5	161.9	124.6	161.9

Computer and Recorder Constants
Recorder = K0411 = K0412 = K0413 = K0414 = 18.647

Performed / Verified By: Agnew / Bray Date: 9/21/21

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions:

- Unit 1 was operating at 100% power.
  - Control Rod K-4, Control Bank B, dropped and is currently indicating 0 steps.
  - The team is performing 0-AP-1.00, Rod Control Malfunction.

Initiating Cues

- Perform the Quadrant Power Tilt (QPT) Calculation in accordance with Steps 1 through 9 of 0-AP-1.00, Attachment 6, Calculation of Excore Quadrant Power Tilt Ratios.
- You are provided a copy of the Power Range Currents from the NIS Data Book providing Normalized Values.
- When you have performed Steps 1 through 9, answer the following questions:
  - What is the calculated Upper Tilt %?
  - What is the calculated Lower Tilt %?
  - Based on these results, is a Tech Spec LCO in effect? (Yes / No)
- Report your results to the examiner.

Actual current detector currents taken from the Power Range NIs:

N-41 Upper Detector Current 94.0
N-41 Lower Detector Current 89.5

N-42 Upper Detector Current 120.1
N-42 Lower Detector Current 121.4

N-43 Upper Detector Current 115.3
N-43 Lower Detector Current 114.0

N-44 Upper Detector Current 118.7
N-44 Lower Detector Current 119.1

Surry Unit 1 NI Calibration Data

Power Range Currents

	N41		N42		N43		N44	
DELTA FLUX @ 100%	I (Top) µamps	I (Bottom) µamps	I (Top) µamps	I (Bottom) µamps	I (Top) µamps	I (Bottom) µamps	I (Top) µamps	I (Bottom) µamps
0	118.8	119.5	118.5	119.3	119.1	119.5	119.1	119.5
DELTA FLUX @ 120%	I (Top) µamps	I (Bottom) µamps	I (Top) µamps	I (Bottom) µamps	I (Top) µamps	I (Bottom) µamps	I (Top) µamps	I (Bottom) µamps
0	142.5	143.4	142.2	143.1	142.9	143.5	142.9	143.4
8	148.6	137.2	148.3	137.0	149.1	137.3	149.1	137.2
- 24	124.2	161.8	123.9	161.5	124.5	161.9	124.6	161.9

Computer and Recorder Constants
Recorder = K0411 = K0412 = K0413 = K0414 = 18.647

Performed / Verified By: Agnew / Bray Date: 9/21/21

NOTE: Calculations for QPTR should be carried out to four places to the right of the decimal place to provide for accuracy and consistency of results.

1. ___ Record the following data:

Reactor Power______________% Date_______________ Time_______________

2. ___ Record the following Excore Detector Data:

Actual Excore Detector Readings				Expected Excore Detector Readings at 100% Power			
Upper		Lower		Upper		Lower	
N41U		N41L		$N41U_{100}$		$N41L_{100}$	
N42U		N42L		$N42U_{100}$		$N42L_{100}$	
N43U		N43L		$N43U_{100}$		$N43L_{100}$	
N44U		N44L		$N44U_{100}$		$N44L_{100}$	

3. ___ Normalize the Actual Excore Detector Readings to the expected Excore Detector readings at 100% power, and sum the normalized values for both the upper and lower detectors.

Upper Detector Fraction	Upper Detector Fraction Values	Normalized Value (I_U)	Lower Detector Fraction	Lower Detector Fraction Values	Normalized Value (I_L)
$\frac{N41U}{N41U_{100}}$	---------------=		$\frac{N41L}{N41L_{100}}$	-------------- =	
$\frac{N42U}{N42U_{100}}$	---------------=		$\frac{N42L}{N42L_{100}}$	-------------- =	
$\frac{N43U}{N43U_{100}}$	-------------- =		$\frac{N43L}{N43L_{100}}$	---------------=	
$\frac{N44U}{N44U_{100}}$	-------------- =		$\frac{N44L}{N44L_{100}}$	---------------=	
Sum of Normalized Values = ΣI_U=			Sum of Normalized Values = ΣI_L=		

4. ___ Record N = the No. of Detectors in use = ________________

5. ___ Calculate the average upper and lower detector current values.

Average $I_U = \frac{\Sigma I_U}{N} =$ ---------------------- = ________________

Average $I_L = \frac{\Sigma I_L}{N} =$ ---------------------- = ________________

6. ___ From Step 3, record the following values.

Maximum Normalized Upper Detector Current = I_{Umax} = ________________

Maximum Normalized Lower Detector Current = I_{Lmax} = ________________

7. ___ Calculate the maximum upper and lower Excore Quadrant Power Tilt Ratios.

☐ a. Upper Excore Quadrant Power Tilt Ratio = $\frac{I_{Umax}}{\text{Average}I_U}$ = ________________

☐ b. Lower Excore Quadrant Power Tilt Ratio = $\frac{I_{Lmax}}{\text{Average}I_L}$ = ________________

8. ___ Calculate tilt%:

☐ a. Subtract 1 from Step 7.a and multiply by 100 for Upper Tilt %: ________________

☐ b. Subtract 1 from Step 7.b and multiply by 100 for Lower Tilt %: ________________

9. ___ Notify Unit Supervisor.

10. ___ <u>IF</u> additional Quadrant Power Tilt Ratio Calculations are required, <u>THEN</u> 0-NPT-RX-011, Quadrant Power Tilt Ratio Calculations and Corrective Actions, Attachment 2, should be used.

Completed by: ____ Date: __________

Reviewed by: ____ Date: __________

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
In Plant Job Performance Measure 062A2.05 2.9/3.3

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Transfer Semi-Vital bus power supply.

K/A: SYS062A2.05, Methods for energizing a dead bus, 2.9/3.3

Applicability	**Estimated Time**	**Actual Time**
RO/SRO(I)	12 Minutes	____ Minutes

Conditions

- Task is to be SIMULATED in the Plant.

Standards

- Places 1-EP-1H1-1-2A1 breaker switch in the "OPEN" position.
- Contacts MCR and has the Unit 1 SVB manual transfer switch placed in the 1J1 position.
- Closes 1-EP-1J1-1-7D1 breaker.

Procedures

- 1-AP-10.05, Loss of Semi-Vital Bus, Revision 36.

Tools and Equipment

- None

Safety Considerations

- Standard Personal Safety Equipment

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are **bolded** and denoted as **CRITICAL STEP**.
- This task is to be SIMULATED. Do NOT allow the Candidate to manipulate controls, operate switches or reposition valves
- **START TIME: ______**

1-AP-10.05, Step 11 STEP 1: Acknowledge NOTE Prior to Step 11. **STANDARD:** a) Reviews NOTE: If the Semi-Vital Bus has been deenergized for greater than 30 minutes, the SG PORV controllers will return to Remote/Manual control when power is restored. **EVALUATOR'S NOTE:** **If asked:** Unit 1 SVB has been deenergized for 15 minutes. **If asked:** Unit 1 SVB powered from the 1H bus supply prior to the power loss. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
1-AP-10.05, Step 11 **CRITICAL STEP** Step 2 Locally open Semi-Vital Bus feeder breakers. **STANDARD:** (a) Locates to Unit 1 ESGR and Locates breaker 1-EP-1H1-1-2A1 on MCC 1H1-1. **(b) Simulates placing 1-EP-1H1-1-2A1 breaker switch in the "OPEN" position – CRITICAL STEP.** c) Locates breaker 1-EP-1J1-1-7D1 on MCC 1J1-1. d) Checks breaker 1J1-1-7D1 in "open" position. **EVALUATOR'S NOTE:** **If asked:** Point to "Closed" position on breaker 1H1-1-2A1. **If asked:** Point to the "Open" position on breaker 1J1-1-7D1. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

1-AP-10.05, Step 11 **CRITICAL STEP** Step 3: Operate manual transfer switch to the desired power supply. **STANDARD:** a) **Contacts MCR (Evaluator) and requests Unit 1 SVB manual transfer switch to be placed in the 1J1 position. CRITICAL STEP.** **EVALUATOR'S NOTE:** **When asked to transfer state**: "A time compression has occurred, the SVB manual transfer switch has been swapped to the 1J1 position." **Acceptable for the Candidate to go to the MCR to simulate placing the manual transfer switch in the "1J" position.** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
1-AP-10.05, Step 11 **CRITICAL STEP** Step 4: Locally close the selected Semi-Vital Bus feeder breaker. **STANDARD:** a) Locates to breaker 1-EP-1J1-1-7D1 on MCC 1J1-1. **b) Simulates closing 1-EP-1J1-1-7D1 breaker. CRITICAL STEP.** c) Checks Semi-Vital Bus Energized by contacting MCR (Evaluator) to determine if SVB is energized. **EVALUATOR'S NOTE:** **If asked:** Inform Candidate that Unit 1 SVB has been reenergized. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

Step 5: Inform Shift Manager (Evaluator) of Task Completion. **STANDARD:** Informs Evaluator task has been completed, **EVALUATOR'S NOTE:** NONE **COMMENTS:** **END OF JPM**	_______ **SAT** _______ **UNSAT**

STOP TIME:

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- This task is to be SIMULATED. Do NOT turn switches, manipulate controls or reposition valves.
- A loss of Unit 1's Semi-Vital Bus has occurred.

Initiating Cues

- Here is a copy of 1-AP-10.05, completed up through Step 10. I need you to transfer the Unit 1 Semi-Vital Bus to the 1J Bus power supply by performing step 11 of 1-AP-10.05. When you inform me that the bus has been re-energized, I will have the Unit RO perform the required instrumentation evaluation.
- When you finish the actions necessary to accomplish this Task, please inform me.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- This task is to be SIMULATED. Do NOT turn switches, manipulate controls or reposition valves.
- A loss of Unit 1's Semi-Vital Bus has occurred.

Initiating Cues

- Here is a copy of 1-AP-10.05, completed up through Step 10. I need you to transfer the Unit 1 Semi-Vital Bus to the 1J Bus power supply by performing step 11 of 1-AP-10.05. When you inform me that the bus has been re-energized, I will have the Unit RO perform the required instrumentation evaluation.
- When you finish the actions necessary to accomplish this Task, please inform me.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE: If the Semi-Vital Bus has been deenergized for greater than 30 minutes, the SG PORV controllers will return to Remote/Manual control when power is restored.

11.___ RESTORE POWER TO THE SEMI-VITAL BUS

a) Locally open or check open Semi-Vital Bus feeder breakers:

- ☐ 1-EP-BKR-1H1-1-2A1

AND

- ☐ 1-EP-BKR-1J1-1-7D1

☐ b) Operate manual transfer switch to the desired power supply

c) Locally close the selected Semi-Vital Bus feeder breaker:

- ☐ 1-EP-BKR-1H1-1-2A1

OR

- ☐ 1-EP-BKR-1J1-1-7D1

☐ d) Check Semi-Vital Bus - ENERGIZED

RESPONSE NOT OBTAINED: d) Do the following:

☐ 1) Coordinate with Electrical Department to restore Semi-Vital Bus to service.

☐ 2) GO TO Step 13.

☐ e) Review Attachment 2 to evaluate Main Control Board instrumentation powered from Foxboro racks MB-5, 6, 7, and 8

☐ f) Review Attachment 3 to check for failed indications, components, and shifted controllers

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
In Plant Job Performance Measure 086A2.04, (3.3,3.9)
[ALTERNATE PATH]

Applicant________________________________ Start Time___________________

Examiner________________________________ Stop Time___________________

Date ___________________________________ SAT _________ UNSAT ________

Title

INITIATE CO2 EDG CARDOX [ALTERNATE PATH]

K/A: 086A2.04, (3.3,3.9), Ability to (a) predict the impacts of the following malfunctions or operations on the Fire Protection System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Failure to actuate the FPS when required, resulting in fire damage.

Applicability	**Validted Time**	**Actual Time**
RO/SRO(I)/SRO(U)	XX Minutes	____ Minutes

Conditions

- Task is to be SIMULATED in the plant.
- A fire has been reported in #2 EDG room and attempts to actuate CO2 from the MCR were unsuccessful.

Standards

1. Rotate EMPC throw-over lever at the local panel 180 degrees at the local panel for #2 EDG room.
2. Rotate EMPC throw-over lever at the Cardox supply tank 180 degrees.

Procedures

- 0-OP-FP-006, OPERATION OF FIRE PROTECTION SYSTEMS, Section 5.1.

Tools and Equipment
- None

Safety Considerations
- None

PERFORMANCE CHECKLIST

Notes to the Evaluator

- This task is to be SIMULATED. Do NOT allow the operator to manipulate controls, operate switches or reposition valves.
- Task critical elements are bolded.
- **START TIME: ________**

STEP 1: **CRITICAL STEP** **0-OP-FP-006 – STEP 5.1.1 Determine hazard area(s) which require CO2.** **STANDARD:** **a)** **Operator recalls that fire is in #2 EDG room.** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 2: 0-OP-FP-006 – STEP 5.1.2 Initiate CO2 at manual actuation station by pulling down cover and depressing pushbutton. **STANDARD:** a) Proceeds to CO2 control panel just outside #2 EDG room. b) Simulates pulling down cover and depressing actuation button. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

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STEP 3:

0-OP-FP-006 – STEP 5.1.3 Check CO2 initiation and notify Main Control Room. IF CO2 fails to initiate THEN enter N/A AND GO TO Step 5.1.4.
Green “System Normal” light NOT LIT
Frost on CO2 supply piping
Red “Fire Indication” light LIT
STANDARD:

a) Candidate identifies that CO2 actuation did NOT occur and continues with step 5.1.4.

EVALUATOR’S NOTE/CUE:
CUE: Report that Green “System Normal” light is LIT
CUE: There is no Frost on CO2 supply piping
CUE: Fire Indication” light is NOT LIT
COMMENTS:
</td><td>_______ SAT

_______ UNSAT</td></tr>
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STEP 4:

0-OP-FP-006 – STEP 5.1.4 IF CO2 fails to initiate, THEN break the glass AND open the door at the local panel for affected hazard(s).

STANDARD:

a) Simulates breaking access glass and opening door at the local panel.

EVALUATOR’S NOTE: Lever can be accessed without opening door.

COMMENTS:
</td><td>_______ SAT

_______ UNSAT</td></tr>
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STEP 5:

0-OP-FP-006 – CAUTION prior to step 5.1.5: If CO2 is released using the Electro-Mechanical Pilot Controller (EMPC) manual throw-over lever, the operator must terminate the release by placing the throw-over lever in CLOSE after a predetermined time. The time is posted on the EMPC for the affected hazard area.

STANDARD:

a) Candidate acknowledges CAUTION

COMMENTS:
</td><td>_______ SAT

_______ UNSAT</td></tr>
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STEP 6: **CRITICAL STEP** 0-OP-FP-006 – STEP 5.1.5 Rotate EMPC throw-over lever at the local panel 180 degrees for the time specified on affixed instruction placard. **STANDARD:** **a) Candidate simulates rotation of the throw-over lever 180° [CRITICAL STEP].** **EVALUATOR'S NOTE/CUE:** **CUE**: **If asked**: Report that conditions did not change following rotation of throw-over lever (*or conditions are "as you see them"*). **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: 0-OP-FP-006 – STEP 5.1.6 Check CO2 initiation and notify Main Control Room. IF CO2 fails to initiate, THEN enter N/A AND GO TO Step 5.1.7. **STANDARD:** a) Candidate determines that CO2 failed to initiate and goes to step 5.1.7 **EVALUATOR'S NOTE/CUE:** **CUE**: **If asked**: Report that conditions did not change following rotation of throw-over lever (or conditions are "as you see them". **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 8: **CRITICAL STEP** 0-OP-FP-006 – STEP 5.1.7 IF CO2 fails to initiate, THEN leave EMPC throw-over lever in the OPEN position AND open the Master Control Valve (valve is located next to the Cardox supply tank outside of Unit 2 track-bay). **STANDARD:** a) Candidate relocates to just outside U2 track bay near the CO2 tank. **b) Candidate simulates breaking access glass and rotation of the throw-over lever 180° [CRITICAL STEP].** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 9: 0-OP-FP-006 – STEP 5.1.8 Check CO2 initiation and notify Main Control Room **STANDARD:** a) Candidate contacts the MCR. b) Candidate may relocated back to just outside #2 EDG room to verify CO2 discharge. **EVALUATOR'S NOTE/CUE:** **CUE**: **If asked**: CO2 line from the tank is frosted. **If asked**: Just outside #2 EDG room, CO2 line is frosted. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 10: 0-OP-FP-006 – STEP 5.1.9 Return EMPC throw-over lever to the CLOSE position when directed by Main Control Room. **STANDARD:** **a)** Candidate awaits cue from MCR to terminate CO2 discharge. **EVALUATOR'S NOTE/CUE:** **CUE**: Another operator will terminate CO2 discharge at the appropriate time. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
Step 11: REPORTS TO SHIFT MANAGER (EVALUATOR). **STANDARD:** Verbal status report made that CO2 discharge has been initiated to #2 EDG room. **COMMENTS:** **JPM END**	_______ **SAT** _______ **UNSAT**

STOP TIME:

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- This task is to be SIMULATED. Do NOT turn switches, manipulate controls or reposition valves.
- A fire has been reported in #2 EDG room and attempts to discharge CO2 from the control room have been unsuccessful.

Initiating Cues

- You are to locally discharge CO2 to #2 EDG room in accordance with 0-OP-FP-006, OPERATION OF FIRE PROTECTION SYSTEMS, section 5.1.
- When you finish the actions necessary to accomplish this please inform me.

.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- This task is to be SIMULATED. Do NOT turn switches, manipulate controls or reposition valves.
- A fire has been reported in #2 EDG room and attempts to discharge CO2 from the control room have been unsuccessful.

Initiating Cues

- You are to locally discharge CO2 to #2 EDG room in accordance with 0-OP-FP-006, OPERATION OF FIRE PROTECTION SYSTEMS, section 5.1.
- When you finish the actions necessary to accomplish this please inform me.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR16301
Administrative Job Performance Measure G2.1.19

Applicant________________________________ Start Time___________________

Examiner________________________________

Date ___________________________________ Stop Time___________________

Title

Perform calculation of reactor power using 1-OPT-RX-003, Reactor Power Calorimetric using Feed Flow and PCS Computer Points (Manual).

K/A: G2.1.19, Ability to use plant computers to evaluate system or component status. (3.9 / 3.8)

Applicability	**Validation Time**	**Actual Time**
RO	45 Minutes	

Conditions

- Task is to be PERFORMED in the classroom.
- Unit 1 is at 90% power.
- Feedwater Ultrasonic Flow Measurement (UFM) is non-functional.

Standards

- Determines Steam enthalpy for each loop within acceptable band (step 6.2.6).
- Determines Feedwater enthalpy for each loop within acceptable band (step 6.2.7).
- Calculates Delta h_{fw} for each loop within acceptable band (step 6.2.8).
- Calculates Blowdown flow for each loop within acceptable band (step 6.2.9).
- Determines blowdown enthalpy for each loop within acceptable band (step 6.2.10).
- Calculate Delta h_{bd} for each loop within acceptable band (step 6.2.11).
- Determines Q loop for each loop within acceptable band (step 6.2.12).
- Convert Pressurizer Heat input from KW to BTU/hr within acceptable band (step 6.2.13).
- Calculates Qtotal within acceptable band (step 6.2.14).
- Calculate Reactor power in MWth within acceptable limits (step 6.2.15).
- Calculate Reactor power in % within acceptable band (step 6.2.16).

Initiating Cues

- Nuclear Shift Manager direction.

Terminating Cues

- 1-OPT-RX-003, Sections 6.1 and 6.2 completed.

Procedures

- 1-OPT-RX-003, Reactor Power Calorimetric using Feed Flow and PCS Computer Points (Manual)
- 1-DRP-003, Curve Book (Unit 1)

Tools and Equipment

- Calculator

Safety Considerations

- None

Notes

- A marked-up copy of 1-OPT-RX-003 should be given to the Applicant.
- A copy of 1-DRP-003, Unit 1 Curve Book, shall be made available.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are **bolded**.
- **START TIME: ________**

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STEP 1

Obtain the values for SG Pressure, FW Temperature, and Main Feedwater Flow for each loop from the PCS computer. Record the computer point values in the appropriate boxes below and on Attachment 3, Page 1. *(Step 6.2.1)*

- U9171 SG A Corrected Stm Press __*829.98*__ psia
- U9172 SG B Corrected Stm Press __*828.62*__ psia
- U9173 SG C Corrected Stm Press __*827.66*__ psia

- T0418A SG A FW Temp (RTD-111A) __*431.16*_ °F
- T0438A SG B FW Temp (RTD-111B) __*431.16*_ °F
- T0458A SG C FW Temp (RTD-111C) __*431.16*_ °F

U9174 SG A Filtered Average Feed Flow ___*3391.24*___ x 10^3 lbm/hr

U9175 SG B Filtered Average Feed Flow ___*3392.67*___ x 10^3 lbm/hr

U9176 SG C Filtered Average Feed Flow ___*3392.99*___ x 10^3 lbm/hr

STANDARD:

Using JPM Attachment 1 (PP Output Summary), Applicant fills in numbers for this step and on procedure Attachment 3.

EVALUATOR'S NOTE:

A completed table is attached at the end of this JPM showing all data.

COMMENTS:

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_______ **SAT**

_______ **UNSAT**

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STEP 2 IF Feedwater temperature for any loop is greater than 443°F, THEN notify Reactor Engineering. Otherwise, enter N/A. *(Step 6.2.2)* **STANDARD:** a) Applicant notes that Feedwater temperature is 431.16°F. b) Applicant places N/A in initial block. **EVALUATOR'S NOTE:** A completed table is attached at the end of this JPM showing all data. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 3 IF Step 6.1.3 was performed, THEN return the Feed Reg Bypass HCVs to desired position. Otherwise, enter N/A. *(Step 6.2.3)* **STANDARD:** a) Applicant recalls that the Feed Reg Bypass HCVs were not manipulated. b) Enters N/A in initial block. **EVALUATOR'S NOTE:** **If asked**: Feed Reg Valve bypasses were not manipulated. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

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STEP 4

Obtain pressurizer heater input by using the computer point listed below.
Record this value in the appropriate box on Attachment 3, Page 2.
(Enter 0 KW if computer point inoperable) *(Step 6.2.4)*

- Q0400A Pressurizer Heater Power __*850.7*__ KW

STANDARD:

a) Applicant references attached PP Output Summary from PCS.
b) Notes that PZR Heater Power is 850.7 KW.
c) Records 850.7 KW in the step block and on page 2 of Attachment 3.

EVALUATOR'S NOTE:

A completed table is attached at the end of this JPM showing all data.

COMMENTS:

</td>
<td>

_______ **SAT**

_______ **UNSAT**

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STEP 5

NOTE: • Blowdown flow must be maintained as constant as possible. The most accurate data will be obtained by isolating blowdown, but isolation is not required.

• PCS points for automatic Blowdown flow are the preferred inputs for the following step.
(NOTE prior to Step 6.2.5)

STANDARD:

Applicant acknowledges NOTE.

COMMENTS:

</td>
<td>

_______ **SAT**

_______ **UNSAT**

</td>
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STEP 6 Obtain loop blowdown flow by using the PCS points or indicators listed below. Circle PCS point (preferred) or indicator used. Record these values in the appropriate boxes on Attachment 3, Page 1. *(Step 6.2.5)* • (F2551A) FPP0001K, FI-BD-103A or FI-BD-104A SG A BD Flow ___*57.540*__ gpm • (F2552A) FPP0002K, FI-BD-103B or FI-BD-104B SG B BD Flow ___*62.593*__ gpm • (F2553A) FPP0003K, FI-BD-103C or FI-BD-104C SG C BD Flow ___*58.400*__ gpm **STANDARD:** a) Applicant refers to attached PP Output Summary from PCS for blowdown flows. b) Circles the PCS point (F2551A, etc.) and records value in step and on Attachment 3. **EVALUATOR'S NOTE:** **If asked**: Blowdown is in AUTO mode for PCS. A completed table is attached at the end of this JPM showing all data. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7 **CRITICAL STEP** Find the enthalpy of steam, h_s, for each loop using Corrected Steam Pressure from Attachment 3 and the Enthalpy Steam Table (100% Quality) in 1-DRP-003. Record values in the appropriate boxes on Attachment 3, Page 1. *(Step 6.2.6)* **STANDARD:** a) Applicant locates Enthalpy Steam Table (100% Quality) in 1-DRP-003 (Attachment 72). b) Determines h_s for each loop. Applicant may interpolate exact values or round to the nearest psia. • **Loop A – 1198.54 BTU/lbm *(band 1198.51 – 1198.57 BTU/lbm)*** • **Loop B – 1198.57 BTU/lbm *(band 1198.54 – 1198.60 BTU/lbm)*** • **Loop C – 1198.60 BTU/lbm *(band 1198.57 – 1198.63 BTU/lbm)*** c) Records values on Attachment 3. **EVALUATOR'S NOTE:** The listed band was developed by rounding steam pressure to the nearest psia, then taking the enthalpy value for ±1 psia. A completed table is attached at the end of this JPM showing all data. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 8 **CRITICAL STEP** **NOTE:** Using a FW pressure of 800 psia in the next step will be conservative for all Reactor Power levels. Find the enthalpy of feedwater, h_f, for each loop, using Feedwater Temperature from Attachment 3 and the Enthalpy Compressed Liquid Table (800 psia) in 1-DRP-003. Record values in the appropriate boxes on Attachment 3, Page 1. *(Step 6.2.7)* **STANDARD:** a) Acknowledges NOTE prior to step that using FW pressure of 800 psia is conservative. b) Applicant locates Enthalpy Compressed Liquid Table (800 psia) in 1-DRP-003 (Attachment 74). c) Determines h_f for each loop. Applicant may interpolate exact values or round to the nearest tenth of a degree. • **Loop A – 409.61 BTU/lbm *(band 409.50 – 409.72 BTU/lbm)*** • **Loop B – 409.61 BTU/lbm *(band 409.50 – 409.72 BTU/lbm)*** • **Loop C – 409.61 BTU/lbm *(band 409.50 – 409.72 BTU/lbm)*** d) Records values on Attachment 3. **EVALUATOR'S NOTE:** The listed band was developed by rounding feedwater temperature to the nearest tenth of a degree, then taking the enthalpy value for ±1/10th of a degree. A completed table is attached at the end of this JPM showing all data. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 9 **CRITICAL STEP** Calculate $\Delta h_1 = h_s - h_f$ for each loop and record results in appropriate boxes on Attachment 3, Page 1. *(Step 6.2.8)* **STANDARD:** Applicant calculates Δh_1 and records values. • **Loop A – 788.93 BTU/lbm *(band 788.79 – 789.07 BTU/lbm)*** • **Loop B – 788.96 BTU/lbm *(band 788.82 – 789.10 BTU/lbm)*** • **Loop C – 788.99 BTU/lbm *(band 788.82 – 789.13 BTU/lbm)*** **EVALUATOR'S NOTE:** A completed table is attached at the end of this JPM showing all data. Listed band was developed by taking each respective loop $h_{s(max)} – h_{f(min)}$ for one limit, and $h_{s(min)} – h_{f(max)}$ for the other limit. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 10 CRITICAL STEP	
Calculate Blowdown Flow M_{bd} (lbm/hr) = BD (gpm) x 496.6563 $\frac{lbm/hr}{gpm}$. Record values in the appropriate boxes on Attachment 3, Page 1. *(Step 6.2.9)* **STANDARD:** Applicant calculates M_{bd} and records values. • **Loop A – 28577.60350 lbm/hr *(band 28577 – 28578 lbm/hr)*** • **Loop B – 31087.20779 lbm/hr *(band 31087 – 31088 lbm/hr)*** • **Loop C – 29004.72792 lbm/hr *(band 29004 – 29005 lbm/hr)*** **EVALUATOR'S NOTE:** The listed band was developed by rounding up or down to the nearest whole number. A completed table is attached at the end of this JPM showing all data. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 11 CRITICAL STEP Find the enthalpy of the blowdown, h_{bd}, for each loop, using the Corrected Steam Pressure from Attachment 3 and the Enthalpy Saturated Liquid Table in 1-DRP-003. Record values in the appropriate boxes on Attachment 3, Page 1. *(Step 6.2.10)* **STANDARD:** a) Applicant locates Enthalpy Saturated Liquid Table in 1-DRP-003 (Attachment 73). b) Determines h_{bd} for each loop. Applicant may interpolate exact values or round to the nearest psia. • **Loop A – 515.00 BTU/lbm *(band 514.83 – 515.17 BTU/lbm)*** • **Loop B – 514.83 BTU/lbm *(band 514.66 – 515.00 BTU/lbm)*** • **Loop C – 514.66 BTU/lbm *(band 514.49 – 514.83 BTU/lbm)*** c) Records values on Attachment 3. **EVALUATOR'S NOTE:** The listed band was developed by rounding steam pressure to the nearest psia, then taking the enthalpy value for ±1 psia. A completed table is attached at the end of this JPM showing all data. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 12 CRITICAL STEP	
Calculate $\Delta h_2 = h_s - h_{bd}$ for each loop and record results in appropriate boxes on Attachment 3, Page 1. *(Step 6.2.11)* **STANDARD:** Applicant calculates Δh_2 and records values. • **Loop A – 683.54 BTU/lbm *(band 683.34 – 683.74 BTU/lbm)*** • **Loop B – 683.74 BTU/lbm *(band 683.54 – 683.94 BTU/lbm)*** • **Loop C – 683.94 BTU/lbm *(band 683.74 – 684.14 BTU/lbm)*** **EVALUATOR'S NOTE:** A completed table is attached at the end of this JPM showing all data. Listed band was developed by taking each respective loop $h_{s(max)} - h_{bd(min)}$ for one limit, and $h_{s(min)} - h_{bd(max)}$ for the other limit. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 13 **CRITICAL STEP**

_______ **SAT**

_______ **UNSAT**

Perform the following for each loop: *(Step 6.2.12)*

a. Calculate (M_f x Δh_1) and (M_{bd} x Δh_2) for each loop and record results in appropriate boxes on Attachment 3, Page 1

b. Calculate Q_{loop} = (M_f x Δh_1) - (M_{bd} x Δh_2) for each loop and record results in appropriate boxes on Attachment 3, Page 1.

STANDARD:

a) Applicant calculates (M_f x Δh_1) and (M_{bd} x Δh_2) for each loop and record results in appropriate boxes on Attachment 3.

(M_{bd} x Δh_2)

- **Loop A – 19,533,935.10 BTU/hr *(band 19,527,807.18 – 19,539,921.72 BTU/hr)***
- **Loop B – 21,255,567.45 BTU/hr *(band 21,249,207.98 – 21,262,326.72 BTU/hr)***
- **Loop C – 19,837,493.61 BTU/hr *(band 19,831,194.96 – 19,843,480.70 BTU/hr)***

(M_f x Δh_1)

- **Loop A – 2,675,450,973 BTU/hr *(band 2,674,976,200 – 2,675,925,747 BTU/hr)***
- **Loop B – 2,676,680,923 BTU/hr *(band 2,676,205,949 – 2,677,155,897 BTU/hr)***
- **Loop C – 2,677,035,180 BTU/hr *(band 2,676,560,162 – 2,677,510,199 BTU/hr)***

b) Applicant calculates Q_{loop} = (M_f x Δh_1) - (M_{bd} x Δh_2) for each loop and record results in appropriate boxes on Attachment 3.

- **Loop A – 2,655,917,038 BTU/hr *(band 2,655,436,278 – 2,656,397,940 BTU/hr)***
- **Loop B – 2,655,425,356 BTU/hr *(band 2,654,943,622 – 2,655,906,689 BTU/hr)***
- **Loop C – 2,657,197,686 BTU/hr *(band 2,656,716,681 – 2,657,679,004 BTU/hr)***

EVALUATOR'S NOTE:

- A completed table is attached at the end of this JPM showing all data.
- Listed band for Q_{bd} based on: ($m_{bd(min)}$) ($\Delta h_{2(min)}$) AND ($m_{bd(max)}$) ($\Delta h_{2(max)}$).
- Listed band for Q_{fw} based on: (m_{fw}) ($\Delta h_{1(min)}$) AND (m_{fw}) ($\Delta h_{1(max)}$).
- Listed band for Q_{loop} based on [$Q_{fw(max)}$ - $Q_{bd(min)}$], AND [$Q_{fw(min)}$ - $Q_{bd(max)}$]

COMMENTS:

STEP 14 Convert Pressurizer Heat Input from KW to BTU/hr by multiplying by 3413.0 BTU/hr/KW, and record results in appropriate boxes on Attachment 3, Page 2. *(Step 6.2.13)* **STANDARD:** a) Applicant multiplies PZR Heat Input (*850.7* KW) by 3413.0 BTU/hr/KW. b) Records 2,903,439.1 BTU/hr in appropriate block. **EVALUATOR'S NOTE:** A completed table is attached at the end of this JPM showing all data. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 15 **CRITICAL STEP** Calculate total heat from Reactor by using $Q_{Total} = Q_{loop\ A} + Q_{loop\ B} + Q_{loop\ C}$ (BTU/hr) - PRZR HTR Input (BTU/hr) - RCP Heat Input (BTU/hr) + Letdown, Seal Injection, and Charging Heat Loss (BTU/hr) + Insulation Loss (BTU/hr). Record results in appropriate box on Attachment 3, Page 2 *(Step 6.2.14)* **STANDARD:** Applicant calculates Q_{Total}. • **$Q_{loop\ A} + Q_{loop\ B} + Q_{loop\ C}$ = 7,968,540,080 BTU/hr** ***(band 7,967,096,581 – 7,969,983,633 BTU/hr)*** • **-RCP Heat Input + Letdown, Seal Injection, and Charging Heat Loss + Insulation Loss = – 18.78E6 BTU/hr** • **-PZR Heat Input = 2,903,439.1 BTU/hr** • **Q_T = 7,946,856,641 BTU/hr** ***(band 7,945,413,142 – 7,948,300,194 BTU/hr)*** **EVALUATOR'S NOTE:** A completed table is attached at the end of this JPM showing all data. Listed band for $Q_{loopTotal}$ based on $Q_{loop\ A+B+C(min)}$ AND $Q_{loop\ A+B+C(max)}$. Listed band for Q_T based on subtracting constants from $Q_{looptotal}$ band. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 16 Divide Q_T by 3.413 x 10^6 to find Reactor output in MW_{th}. Record results in appropriate box on Attachment 3, Page 2. *(Step 6.2.15)* **STANDARD:** Applicant calculates Reactor output in MW_{th}. • **MW_{th} = 7,946,856,641 BTU/hr ÷ 3413000** **= 2,328.40804** ***(band 2,327.985 – 2,328.83099)*** **EVALUATOR'S NOTE:** A completed table is attached at the end of this JPM showing all data. Listed band determined by dividing previous band limits by 3.413 E6. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 17 **CRITICAL STEP** Find the percent power level by using % Power = (MW_{th}/2587) x 100. Record results in appropriate box on Attachment 3, Page 2. *(Step 6.2.16)* **STANDARD:** Applicant calculates % Reactor Power. • **% Power = (2,328.0804 ÷ 2587) MWth x 100** **= 90.00 %** ***(band 90.10% - 89.90%)*** **EVALUATOR'S NOTE:** A completed table is attached at the end of this JPM showing all data. Band is based on rounding errors. The Applicant may sign and date the Attachment at this time and report the JPM completed. It is at the Evaluator's discretion to continue the procedure. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 18 IF the Manual Calorimetric Spreadsheet was used, THEN sign and date the computer generated printouts (performer and independent reviewer) and attach the printouts to this procedure. *(Step 6.2.17)* **STANDARD:** Applicant recalls that the Manual Calorimetric Spreadsheet was not used and enters N/A for the step. **EVALUATOR'S NOTE:** **If asked**: The Manual Calorimetric Spreadsheet was not used. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 19 IF Attachment 3 was used, THEN sign and date Attachment 3 (performer and independent reviewer). *(Step 6.2.18)* **STANDARD:** a) Applicant signs and dates Attachment 3. b) Requests an Independent Verifier to check work. **EVALUATOR'S NOTE:** The Applicant may report the JPM complete at this time. It is at the Evaluator's discretion to continue the procedure **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 20 **CAUTION** To prevent exceeding maximum rated Reactor thermal power, Reactor power must not be increased based on the result of this calorimetric. NOTE: Due to differences in the uncertainty calculations for Primary Plant Performance and the manual calorimetric, indicated power between the two may vary by 0.4%. IF Reactor Power as calculated is greater than 98.4%, THEN perform the following: *(Step 6.2.19)* a. Immediately reduce Reactor Power to less than 98.4% power IAW Attachment 4. b. Terminate this procedure and reperform calorimetric. **STANDARD:** Applicant notes that Reactor Power is 90%. Enters N/A in both blocks. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 21	
Report to Shift Manager (Evaluator) completion of Task. **COMMENTS:** ** **JPM COMPLETE** **	_______ **SAT** _______ **UNSAT**

STOP TIME: ___________________________

Comments: ____

____

____

____

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____

____

	LOOP A	LOOP B	LOOP C
Corrected Steam Pressure (psia)	U9171 *829.98*	U9172 *828.62*	U9173 *827.66*
Enthalpy Steam h_s (BTU/lbm)	***1198.54***	***1198.57***	***1198.60***
Feedwater Temp (°F)	T0418A *431.16*	T0438A *431.16*	T0458A *431.16*
Enthalpy FW h_f (BTU/lbm)	***409.61***	***409.61***	***409.61***
$\Delta h_1 = (h_s - h_f)$ BTU/lbm	***788.93***	***788.96***	***788.99***
Blowdown Flow (gpm)	(SG A) *57.540*	(SG B) *62.593*	(SG C) *58.400*
x Conversion gpm to lbm/hr	x 496.6563	x 496.6563	x 496.6563
Blowdown Flow M_{bd} (lbm/hr)	***= 28,577.6035***	***= 31,087.20779***	***= 29,004.72792***
Enthalpy h_{bd} (BTU/lbm)	***515.00***	***514.83***	***514.66***
$\Delta h_2 = (h_s - h_{bd})$ BTU/lbm	683.54	683.74	683.94
M_{bd} x Δh_2 (BTU/hr)	***= 19,533,935.1***	***= 21,255,567.45***	***= 19,837,493.61***
Feedwater Flow M_{fw} (lbm/hr)	SG A Feed Flow *3391.24E3*	SG B Feed Flow *3392.67E3*	SG C Feed Flow *3392.99E3*
M_{fw} x Δh_1 (BTU/hr)	***2,675,450,973***	***2,676,680,923***	***2,677,035,180***
Q_{loop} = (M_{fw} x Δh_1) – (M_{bd} x Δh_2) BTU/hr	$Q_{loop\ A}$ = ***2,655,917,038***	$Q_{loop\ B}$ = ***2,655,425,356***	$Q_{loop\ C}$ = ***2,657,197,686***

Pressurizer Heater Input (KW)	*850.7* (Q0400A)
x Conversion KW to BTU/hr	x 3413
Pressurizer Heater Input	= ***2,903,439.1*** *(2.9E6)*

$Q_{loop\ A}$ + $Q_{loop\ B}$ + Q_{loop} C (BTU/hr)	= ***7,968,540,080***
- RCP Input + Letdown, Charging, and Seal Injection Losses + Insulation Losses	- 18.78 x 106 BTU/hr
- Pressurizer Heater Input (BTU/hr)	- *2903439.1*
QT (BTU/hr)	= ***7,946,856,641***
MW_{th} = QT / 3413000	***= 2,328.40804 MW***th
% POWER = (MW/th / 2587) x 100	***= 90.00417627% POWER***

- Instructor-calculated values are in ***BOLD Italics***.

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- Unit 1 is at a stable power and has been stable for 2 hours. No periodic tests or calibration evolutions are in progress.
- Feed Water Ultrasonic Flow Measurement (UFM) is non-functional.
- The PCS Calorimetric program is otherwise functional.
- The following unit conditions exist:
  - The Manual Calorimetric Spreadsheet will NOT be used.
  - Feed Water Regulating Valve bypass valves are closed.

Initiating Cues

- Using the attached PP Output Summary sheet, perform Section 6.2 of 1-OPT-RX-003, Reactor Power Calorimetric using Feed Flow and PCS Computer Points (Manual).
- Your calculations should be performed as follows:
  - Round off your calculations to four (4) significant digits.
  - Do NOT use scientific notation.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- Unit 1 is at a stable power and has been stable for 2 hours. No periodic tests or calibration evolutions are in progress.
- Feed Water Ultrasonic Flow Measurement (UFM) is non-functional.
- The PCS Calorimetric program is otherwise functional.
- The following unit conditions exist:
  - The Manual Calorimetric Spreadsheet will NOT be used.
  - Feed Water Regulating Valve bypass valves are closed.

Initiating Cues

- Using the attached PP Output Summary sheet, perform Section 6.2 of 1-OPT-RX-003, Reactor Power Calorimetric using Feed Flow and PCS Computer Points (Manual).
- Your calculations should be performed as follows:
  - Round off your calculations to four (4) significant digits.
  - Do NOT use scientific notation.

Attachment 1

W1

Select Control Page Zoom Poke Recall 1/4 Help

DOMINION - SURRY 59010

89.83 P PCT 784.60 MWE UNIT 1 - PP OUTPUT SUMMARY

PP OUTPUT QUALITY DOWNGRADE:	NORMAL	
CURRENT SELECTED CALCALC:	FEED FLOW	

00:00

UFM AOT

CALCALC TOTAL THERMAL PWR % (U9104):	89.83 P	PCT
CALCALC 10 MIN AVG POWER % (U9105):	89.84 P	PCT
RUNNING SHIFT AVG POWER % (U9103):	B	PCT

CURRENT DATA:

CALCALC INST(1MIN) REACTOR PWR:	2323.02	MWTH
CALCALC INST(1MIN) REACT PWR %:	89.79	PCT
UNIT GROSS EFFICIENCY:	33.76	PCT

CURRENT SHIFT DATA:

SHIFT AVG PWR - UFM FW FLOW :	34.22	PCT
SHIFT AVG PWR - NORM FW FLOW :	34.78	PCT
SHIFT AVG PWR - NORM STM FLOW :	34.63	PCT
SHIFT AVG PWR - FW FLOW :	34.28	PCT
SHIFT AVG PWR - STM FLOW :	34.03	PCT
STM/FW SHIFT POWER DIFF :	0.25	PCT

PP200-DATA ENTRY

PP201-FLOW COMP

PP202-THERM COMP

PP206-RCS FLOW

	A	B	C	
FW UFM TEMPERATURE:	431.30	431.30	431.30	DEGF
FW NORM TEMPERATURE:	431.23	431.23	431.23	DEGF
FW RTD TEMPERATURE:	431.16 (T0418A)	431.16 (T0438A)	431.16 (T0458A)	DEGF
BLOWDOWN FLOW AUTO:	57.540 (F2551A)	62.593 (F2552A)	58.400 (F2553A)	GPM
BLOWDOWN FLOW MANUAL:	57.540	62.593	58.401	GPM
AUTO / MANUAL:	AUTO	AUTO	AUTO	
SG CORR STM PRESSURE:	829.98 (U9171)	828.62 (U9172)	827.66 (U9173)	PSIA

PRESSURIZER HTR POWER:	850.7 (Q0400A)	KW

1-OPT-RX-002

	A	B	C	
SG 1 MIN AVG STM FLOW:	3412.00	3363.56	3379.20	KLBH
SG 1 MIN AVG NORM STM FLOW:	3413.3	3459.9	3462.2	KLBH

1-OPT-RX-003

	A	B	C	
SG 1 MIN AVG UFM FW FLOW:	3377.7	3379.9		KLBH
SG 1 MIN AVG NORM FW FLOW:	3393.4	3439.8	3488.7	KLBH
SG FILT AVG FW FLOW:	3391.24 (U9174)	3392.67 (U9175)	3392.99 (U9176)	KLBH

NUMBER OF SHIFTS CONFIGURED IS: 2

CURRENT SHIFT IS: 1

PREVIOUS DAY DATA:

TOTAL THERMAL PWR % LAST DAY:	99.85	PCT
AVG GROSS HEAT RATE LAST DAY:	B	BTUKWH
AVG NET HEAT RATE LAST DAY:	B	BTUKWH

PREVIOUS SHIFT DATA:

SHIFT AVG POWER:	B	PCT
SHIFT AVG HEAT RATE GROSS:	B	BTUKWH
SHIFT AVG HEAT RATE NET:	B	BTUKWH

Operator Command Received.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR10301
Administrative Job Performance Measure 2.1.5

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Determine shift Core Crew composition.

K/A: G.2.1.5 – Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc. (2.5/3.9)

Applicability	**Validation Time**	**Actual Time**
SRO(I)(U)	30 Minutes	___________

Initial Conditions

- Task is PERFORMED in the CLASSROOM.

Standards

- Circles “MET” on the worksheet for the minimum D Shift complement.
- Lists the required actions in OP-AA-100: Attachment 2, 5.4.1 “a” and “b” on the worksheet.

Initiating Cue:

- You are to determine if the total D Shift complement requires a Condition Report.
- Based on current staffing, list all required actions to perform at the beginning of the shift.
- Record your answers on the attached form and submit them to me when complete.

Terminating Cues

- Completed worksheet given to the Evaluator.

Procedures

- OP-AA-100, Conduct Of Operations

Tools and Equipment

- Laptop for obtaining procedures

Safety Considerations

- None

PERFORMANCE CHECKLIST

Notes to the Evaluator.

- Task critical elements are bolded and noted by the words "Critical Step" at the end of the step.
- The Applicant is given a worksheet for this JPM.
- A laptop will be Available for the Applicant.
- **START TIME: __________**

STEP 1: Review of requirements in OP-AA-100, Conduct Of Operations. **STANDARD:** (a) Locates Shift Staffing requirements in Attachment 2, Section 5. (b) Notes at 5.2.1.b. that Core Crew requirement pertain to members that can stand watch in the Control Room: a. Shift Manager b. Unit Supervisor c. Shift Technical Advisor d. Reactor Operators (c) Determines that the Desk (WCC) SRO cannot be used to satisfy minimum core complement requirements. **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 2: **CRITICAL STEP** Evaluates current shift staffing against minimum core complement requirements. **STANDARD:** (a) Determines the following shift personnel meet the core crew requirements: a. Shift Manager b. Shift Technical Advisor (even if non-licensed) c. U1 SRO d. U1 OATC e. U2 Asst RO (b) Notes in OP-AA-100 Att. 2 Step 5.2.1.d that 5 Core Crew members are required to meet minimum core compliment at Surry. (c) Notes in OP-AA-100 Att. 2 Step 5.3.b that a CR is required when 5.2.1.d requirements are not met (in this case, they are MET). **(d) Circles NO on worksheet for "Condition Report Required?"** **EVALUATOR NOTES:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 3: **CRITICAL STEP** Determines all required actions based on team members not being part of the Core Crew. (OP-AA-100 Attachment 2) **STANDARD:** (a) Determines the actions of 5.4.1 apply due to individuals on shift not being part of the Core Crew. **(b) Lists the required actions in OP-AA-100, Attachment 2, 5.4.1 "a" and "b" on the worksheet.** **EVALUATOR NOTES:** • If the Candidate lists the specific procedure and step/substep numbers, it satisfies the **CRITICAL STEP**. (OP-AA-100, Attachment 2, 5.4.1.a. and b.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 4:	
Turns in attached worksheet. **STANDARD:** **EVALUATOR'S NOTE:** • Acknowledge the completion of the task. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STOP TIME: __________

EXAMINER REFERENCE MATERIAL:

Definititions:

A. Core Crew- Requires EVERY member of the associated crew members in order to be met (SM, both SROs, STA, and all ROs).

B. Minimum Core Complement- Requires at least 5 of the associated crew members of the team to be Core Crew members in order to be met.

From OP-AA-100, Attachment 2. CORE CREW requirement and MINIMUM CORE COMPLEMENT requirement:

5.2 Core Crew

5.2.1 Normal Operations

a. **ENSURE** minimum shift manning requirements are met as shown in Table 5.2-1, 5.2-2, 5.2-3, or 5.2-4.

b. Recognizing that changing even one crewmember can upset crew dynamics, **CONSIDER** core crew **NOT** met if one or more crew members standing watch in the control room are **NOT** normally assigned to that crew (Shift Manager, Unit Supervisor, Shift Technical Advisor, and Reactor Operators). This includes team members standing required proficiency watches and operators serving as a control room team member to cover for normal crew member absences (vacation, sick, etc.)

c. **IF** Shift Managers, Senior Reactor Operators, Reactor Operators, and Shift Technical Advisors who are re-assigned to a new crew have **NOT** met requirements of ATTACHMENT 2 section 5.1 and are standing watch in these positions, **THEN CONSIDER** core crew requirements **NOT** met.

d. **PLAN** shift schedules to maintain a minimum core complement of control room personnel normally assigned to that crew in accordance with the following requirements:

- North Anna and Surry: 5 control room team members normally assigned to that crew.
- Millstone: 3 control room team members normally assigned to that crew.
- V.C. Summer: 3 control room members normally assigned to that crew.

EXAMINER KEY:

1. Condition Report required? YES / NO (circle one)

2. List all required actions for current staffing:

   (From OP-AA-100, Attachment 2, 5.4.1.a. and b.)

DOMINION ENERGY

OP-AA-100
REVISION 43
PAGE 42 OF 87

ATTACHMENT 2
(Page 21 of 39)
Shift Operations

5.4 Mitigating Actions when **NOT** Meeting Core Crew Requirements

5.4.1 **IF** one or more crew members standing watch in the control room are **NOT** normally assigned to that crew in accordance with ATTACHMENT 2 step 5.2.1.b. or 5.2.1.c., **THEN DO** the following prior to or immediately after taking the watch:

a. Non-core crew members shall **REVIEW** the on-watch crew's crew notebook with a focus on crew and individual weaknesses, proficiency concerns, and leadership and team effectiveness gaps.

b. The shift manager and unit supervisor shall **REVIEW AND DISCUSS** individual performance focus areas and proficiency gaps for non-core crew members.

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions:

- Both units are at 100% power.
- You are a Tagging office RO, who has been called in to work as the Unit 1 Assistant RO.
- An RO normally assigned to this shift called out sick.
- Today's shift complement is as follows:
  - SM – core crew
  - STA (non-SRO licensed) – core crew
  - Desk (WCC) SRO – NOT core Crew
  - U1 SRO - core crew
  - U1 OATC – core crew
  - U1 Asst RO – (You)
  - U2 SRO – NOT core crew
  - U2 OATC –NOT core crew
  - U2 Asst RO – core crew

Initiating Cue:

- You are to perform the following:
  1) Determine if the total D Shift complement requires a Condition Report.
  2) Based on your determination, list all required actions to perform at the beginning of the shift.
- Record your answers on the attached form and submit them to me when complete.

Operator Directions Handout

(TO BE GIVEN TO APPLICANT)

Initial Conditions:

- Both units are at 100% power.
- You are a Tagging office RO, who has been called in to work as the Unit 1 Assistant RO.
- An RO normally assigned to this shift called out sick.
- Today's shift complement is as follows:
  - SM – core crew
  - STA (non-SRO licensed) – core crew
  - Desk (WCC) SRO – NOT core Crew
  - U1 SRO - core crew
  - U1 OATC – core crew
  - U1 Asst RO – (You)
  - U2 SRO – NOT core crew
  - U2 OATC –NOT core crew
  - U2 Asst RO – core crew

Initiating Cue:

- You are to perform the following:
  1) Determine if the total D Shift complement requires a Condition Report.
  2) Based on your determination, list all required actions to perform at the beginning of the shift.
- Record your answers on the attached form and submit them to me when complete.

Applicant name: ______________________________

1. Condition Report required? YES / NO (circle one)

2. List all required actions based on current staffing:

____
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U.S. Nuclear Regulatory Commission
Surry Power Station

SR10301
Administrative Job Performance Measure 2.2.13

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Determine Tagging Boundaries

K/A: G.2.2.13 – Knowledge of Tagging and Clearance Procedures. (4.1/4.3)

Applicability	Validation Time	Actual Time
SRO(I)(U)	30 Minutes	___________

Initial Conditions

- Task is PERFORMED in the CLASSROOM.

Standards

- Submits table with Component IDs and required positions in accordance with Boundary "A" in Step 4, **OR**
- Submits table with Component IDs and required positions in accordance with Boundary "B" in Step 4,

Initiating Cues

- Using the provided Station Drawings, you are to determine a tagging boundary adequate to support removal of 1-RT-27.
- On the attached table, list all components and their required positions.

Terminating Cues

- Attached table is completed and submitted.

Procedures

- OP-AA-200, Equipment Clearance
- 11448-FM-124A Sheet 2
- 11448-FE-1K

Tools and Equipment **Safety Considerations**

- Laptop for obtaining procedures
- 11448-FM-124A Sheet 2
- 11448-FE-1K

- None

PERFORMANCE CHECKLIST

Notes to the Evaluator.

- Task critical elements are bolded and noted by the words "Critical Step" at the end of the step.
- A laptop will be Available for the Applicant.
- **START TIME: ___________**

STEP 1: Reviews the initial conditions of the JPM and refers to the drawings and OP-AA-200, Equipment Clearance. **STANDARD:** (a) Utilizes DocTop to obtain OP-AA-200, **EVALUATOR'S NOTE:** • **If asked**, provide candidate with system to drawing number summary sheet. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 2: **CRITICAL STEP**	
Reviews electrical drawing 11448-FE-1K and identifies the electrical boundary (480V supply breaker) **STANDARD:** **(a) Notes that 1-EP-BKR-1A2-1-4B will need to be opened** **This is a critical step.** **EVALUATOR NOTES:** • Candidate may also no tag the control switch in OFF. • Component ID and required position are <u>both</u> critical. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 3: **CRITICAL STEP**	
Reviews mechanical drawing 11448-FM-124A SH2 and identifies the mechanical boundaries (suction, discharge, vent, and drain) **NOTE TO EVALUATOR:** **There are two possible safe working boundaries for this component. They are listed below as Boundary "A" and Boundary "B". All components for one choice are required for a safe working boundary.** **STANDARD:** Boundary "A" - 1-RT-25 – Suction Isol – CLOSED - 1-RT-36 – Pump ALT suction – CLOSED - 1-RT-88 – Chem injection Isol – CLOSED - 1-RT-59 – Discharge isol – CLOSED - 1-RT-32 – Discharge isol – CLOSED - 1-RT-27 – Pump Suction – OPEN (Not CS) Boundary "B" - 1-RT-25 – Suction Isol – CLOSED - 1-RT-37(38) – Suction Isol – CLOSED - 1-RT-88 – Chem injection Isol – CLOSED - 1-RT-59 – Discharge isol – CLOSED - 1-RT-27 – Pump Suction – OPEN (Not CS) Vents/Drains – Numerous Vents/drains exists – at least one of the following drains and at least one of the following vents shall be open. Boundary "A" - 1-RT-92 – Suction drain – OPEN - 1-RT-28 – Suction drain – OPEN - 1-RT-31 – Discharge drain – OPEN - 1-RT-70 – Suction Vent – OPEN - 1-RT-29 – Disch Vent – OPEN with PI removed Boundary "B" - 1-RT-92 – Suction drain – OPEN - 1-RT-28 – Suction drain - OPEN - 1-RT-31 – Discharge drain - OPEN - 1-RT-70 – Suction Vent – OPEN - 1-RT-29 – Disch Vent – OPEN with PI Removed - 1-RT-33 – Loop Drain – OPEN - 1-RT-67 – Suction Vent – OPEN – if 1-RT-38 used instead of 1-RT-37. **This is a critical step.** **EVALUATOR NOTES:** • Component ID and required position are both critical. • If asked – 1-RT-S-1B will not be removed from the system. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 4 (Boundary "A"): **CRITICAL STEP** Completes the attached table and reports that the task is complete. **STANDARD:** **Table is completed as follows:** **Boundary "A"**	_______ **SAT** _______ **UNSAT**

	Component ID Number / Name	Position
1	1-RT-P-1B Control Switch	OFF
2	**1-EP-BKR-1A2-1-4B ('B' RT Pump Supply Breaker)**	**OFF**
3	**1-RT-25 – Pump Suction Isolation**	**CLOSED**
4	**1-RT-36 – Pump ALT Suction**	**CLOSED**
5	**1-RT-88 – Chem Injection Isol**	**CLOSED**
6	**1-RT-59 – Pump Discharge Isol**	**CLOSED**
7	**1-RT-32 – Pump Discharge Isol**	**CLOSED**
8	1-RT-27 – Pump Suction	OPEN
	At least one of the following Drains	
9	**1-RT-92 – Suction Drain**	**OPEN**
9	**1-RT-28 – Suction Drain**	**OPEN**
9	**1-RT-31 – Discharge Drain**	**OPEN**
	At least one of the following Vents	
10	**1-RT-70 – Suction Vent**	**OPEN**
10	**1-RT-29 – Discharge Vent**	**OPEN w/ PI Removed**

EVALUATOR'S NOTE:

- **Minimum of 1 vent and 1 drain required. Additional vents/drains may be utilized.**
- **Meeting all requirements of Boundary "A" or Boundary "B" Satisfies the Critical Step.**

COMMENTS:

STEP 4 (Boundary "B"): **CRITICAL STEP, continued** Completes the attached table and reports that the task is complete. **STANDARD:** **Table is completed as follows:** **Boundary "B"**	_______ **SAT** _______ **UNSAT**

	Component ID Number / Name	Position
1	1-RT-P-1B Control Switch	OFF
2	**1-EP-BKR-1A2-1-4B ('B' RT Pump Supply Breaker)**	**OFF**
3	**1-RT-25 – Pump Suction Isolation**	**CLOSED**
4	**1-RT-37/38 – Pump Suction Isol**	**CLOSED**
5	**1-RT-88 – Chem Injection Isol**	**CLOSED**
6	**1-RT-59 – Pump Discharge Isol**	**CLOSED**
7	1-RT-27 – Pump Suction	OPEN
	At least one of the following Drains	
8	**1-RT-92 – Suction Drain**	**OPEN**
8	**1-RT-28 – Suction Drain**	**OPEN**
8	**1-RT-31 – Discharge Drain**	**OPEN**
8	**1-RT-33 – Loop Drain**	**OPEN**
	At least one of the following Vents	
9	**1-RT-70 – Suction Vent**	**OPEN**
9	**1-RT-29 – Discharge Vent**	**OPEN w/ PI Removed**
9	**1-RT-67 – Suction Vent** **EVALUATOR's NOTE – ONLY IF 1-RT-38 used vs. 1-RT-37**	**OPEN**

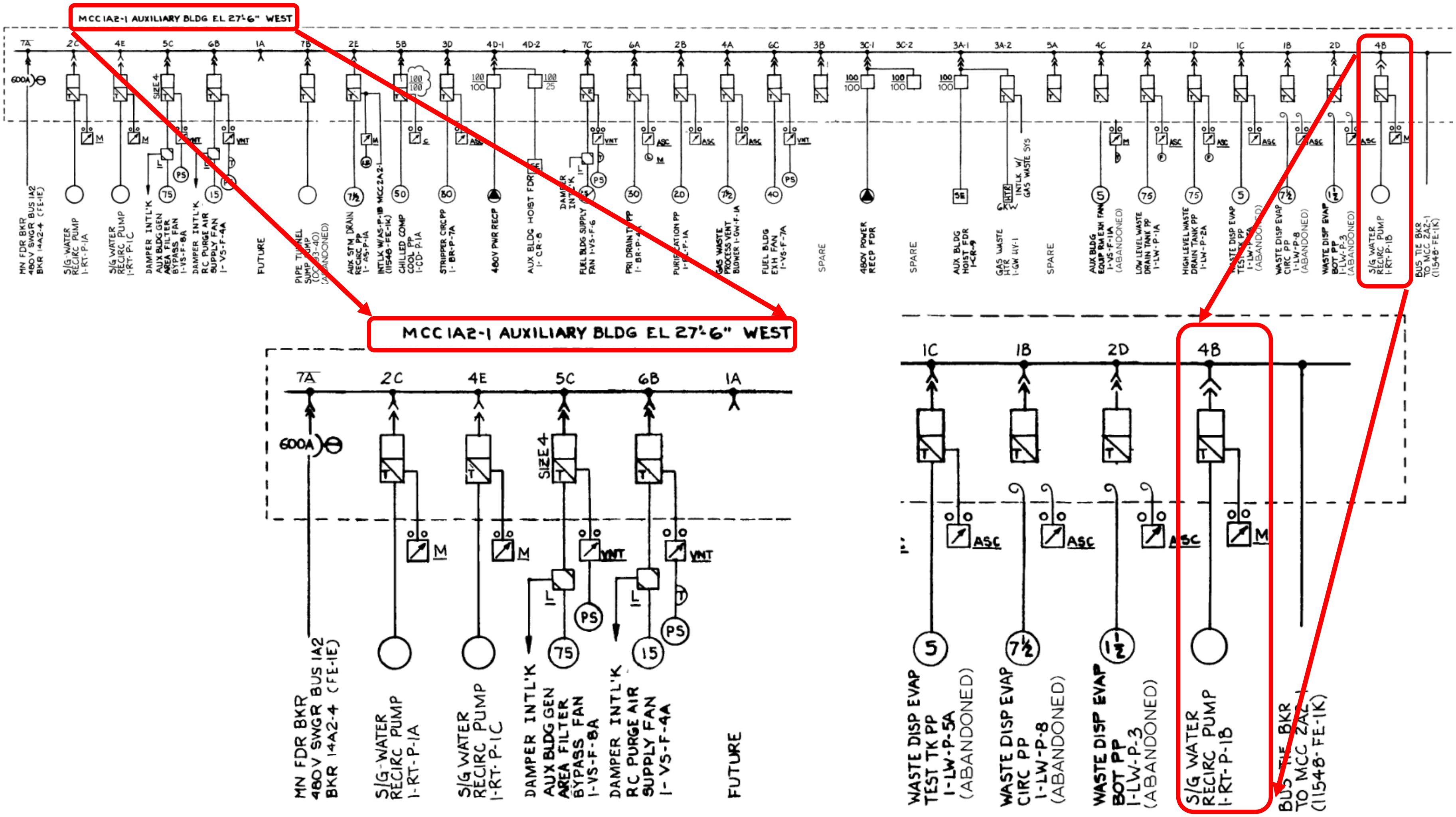
EVALUATOR'S NOTE:

- **Minimum of 1 vent and 1 drain required. Additional vents/drains may be utilized.**
- **Meeting all requirements of Boundary "A" or Boundary "B" Satisfies the Critical Step.**

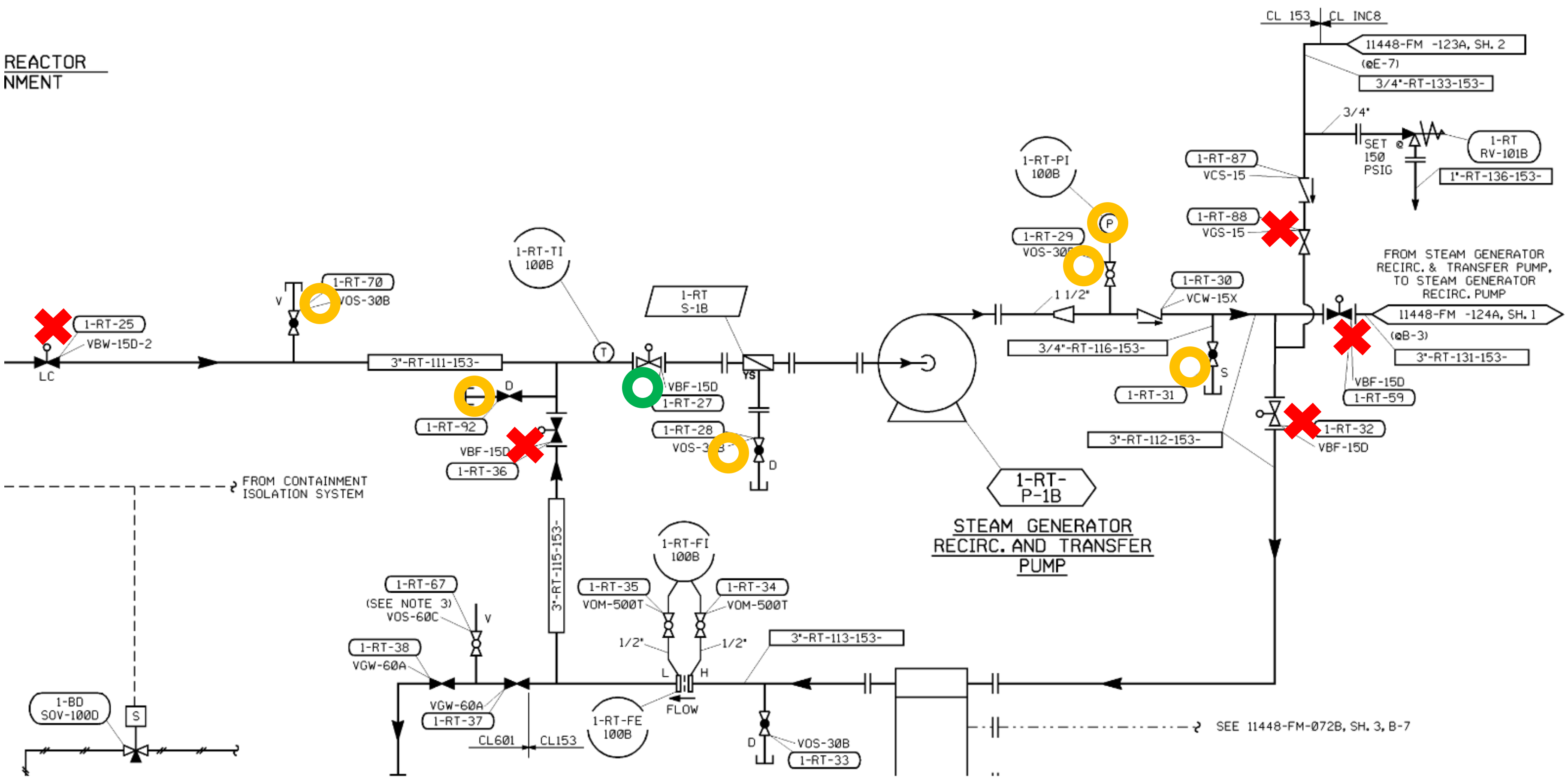
COMMENTS:

STOP TIME:

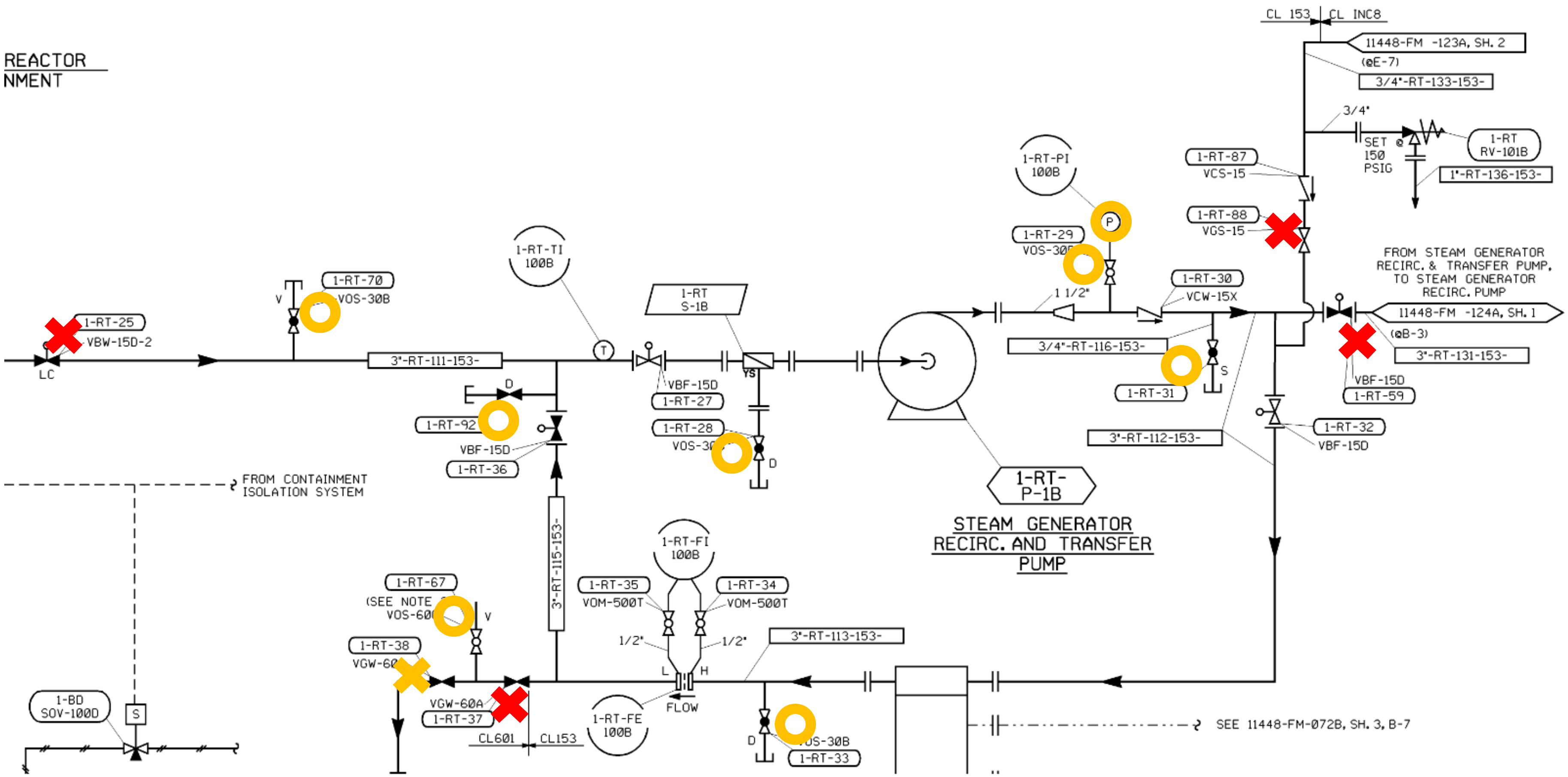
From 11448-FE-1K, Breaker for 1-RT-P-1B:



Boundary "A" Valves:



Boundary "B" Valves:



Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- Unit One is at Refueling Shutdown. The Unit 1 “B” S/G Recirc Transfer system is secured, in preparation for tagout.
- A temporary suction blank needs to be installed on the “B” RT pump (1-RT-P-1B). The “B” RT pump normal suction valve, 1-RT-27, must be removed to install the suction blank.
- The eSOMS Clearance Module is not operational.

Initiating Cues

- Using the provided Station Drawings, you are to determine a tagging boundary adequate to support removal of 1-RT-27.
- On the attached table, list all components and their required positions. The number of blanks on this table does not indicate the number of steps in the tagout or the number of components to be tagged.
- For this JPM, tagging sequence is not required.
- For this JPM, component noun names are not required.
- When you have completed the attached table, inform an examiner.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- Unit One is at Refueling Shutdown. The Unit 1 “B” S/G Recirc Transfer system is secured, in preparation for tagout.
- A temporary suction blank needs to be installed on the “B” RT pump (1-RT-P-1B). The “B” RT pump normal suction valve, 1-RT-27, must be removed to install the suction blank.
- The eSOMS Clearance Module is not operational.

Initiating Cues

- Using the provided Station Drawings, you are to determine a tagging boundary adequate to support removal of 1-RT-27.
- On the attached table, list all components and their required positions. The number of blanks on this table does not indicate the number of steps in the tagout or the number of components to be tagged.
- For this JPM, tagging sequence is not required.
- For this JPM, component noun names are not required.
- When you have completed the attached table, inform an examiner.

(TO BE GIVEN TO APPLICANT)

Applicant Name: ____

	Component ID Number / Name	Position
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		

U.S. Nuclear Regulatory Commission
Surry Power Station

SR09301
Administrative Job Performance Measure 2.3.7

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Determine the applicability of a RWP for a specific job and determine which personnel may be assigned the task based on personal qualifications and dose limitations.

K/A: G2.3.7 Ability to comply with radiation work permit requirements during normal or abnormal conditions. (3.5/3.6)

Applicability	**Estimated Time**	**Actual Time**
RO	15 Minutes	

Conditions

- Task is to be PERFORMED in the classroom.
- 1-BR-E-10A (Gas Stripper Steam Heater) has developed external leakage and requires isolation and tagging to minimize contamination.

Standards

- Calculate dose received to perform a task when given survey maps and equipment location at 320 mrem.
- Determine Operator # 1 cannot perform the task because he is not qualified on the watchstation.
- Determine Operator # 2 cannot perform the task because he would exceed admin dose limits of 2.0 REM.
- Determine Operator # 3 can perform the task.
- Determine that work cannot be performed with current RWP because the dose received would be greater than the RWP Dose limit.

Initiating Cues

- Shift Manager direction

Terminating Cues

RWP compliance and personnel selection complete.

Procedures

- VPAP-2101 – Radiation Protection Program

Question 1: Determine the dose received.

Assume the following Initial Conditions:

- 1-BR-E-10A (Gas Stripper Steam Heater) is to be tagged out and drained due to a suspected tube leak.
- This task will take one Operator 64 minutes to complete, working the entire time in the vicinity of the heat exchanger.
- All valves that will be manipulated or tagged are located in the immediate vicinity of the heat exchanger.

Included are copies of the Radiological Survey Map and an ALARA Component Locator Map for the area.

You are to determine:

1- Dose received by one operator to complete this task.

$$\frac{\text{300mr (dose rate in area)}}{\text{hour}} \text{ X 64 min (time for task completion) X } \frac{\text{1 hour}}{\text{60 minutes}}$$

ANSWER- 320 mrem – this is a critical task

Question 2: **Determine which operators can perform the task**

	Qualification Level	**Total dose received year to date**
Operator #1	Step 4	1247 mrem
Operator #2	Stepped Out	1694 mrem
Operator #3	Step 6	1278 mrem

(1) Assess each individual to determine which individuals could be assigned to perform the task based on qualification level and ensuring Station annual dose limits will not be exceeded. *Assume no dose upgrades will be authorized.*

Standard:

Bolded & underlined text items are CRITICAL STEPS.

Operator #1: **CANNOT** be assigned the task. **The Operator is not qualified on that Watchstation**. The Operator must have completed step 5 in order to perform tasks in the Auxiliary Building.

Operator #2: **CANNOT** be assigned the task. **The Operator would exceed admin limits (2.0 Rem/Yr)**. If task were performed, the additional 320 mr would put the operator over the 2.0 rem admin limit.

Operator #3: **CAN** be assigned the task. The Operator is qualified on the Watchstation and their quarterly dose is below the administrative limit.

Question 3: Determine if this task can be performed under RWP 09-0-1003-2 (attached) with one entry only, and provide justification for your answer.

- This task **CANNOT** be performed under RWP 09-0-1003-2 – **This determination (*CANNOT*) is a critical task**
- Expected dose to be received, 320 mr, is above the RWP Dose limit of 100 mr – **This reason (*in excess of RWP dose limit*) is a critical task**

STOP TIME:

NOTES:

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions:

- 1-BR-E-10A (Gas Stripper Steam Heater) is to be tagged out and drained due to a suspected tube leak.
- This task will take one Operator 64 minutes to complete, working the entire time in the vicinity of the heat exchanger.
- All valves that will be manipulated or tagged are located in the immediate vicinity of the heat exchanger.
- The following operators listed below with their Qualification level and Total Year to Date Dose is listed below:

	Qualification Level	Total dose received year to date
Operator #1	Step 4	1247 mrem
Operator #2	Stepped Out	1694 mrem
Operator #3	Step 6	1278 mrem

Initiating Cue:

- Attached to this JPM are copies of the Radiological Survey Map and an ALARA Component Locator Map for the area.
- You are to answer the following questions on the attached sheet:

1) What is the total dose received by one operator to complete this task?
2) Which operator(s) could be assigned to perform this task based on qualification level and total dose? Include in your answer a reason why any operator cannot perform the task. *(Assume no dose upgrades will be authorized)*
3) Can this task be performed under the attached RWP with one entry, and with no changes to the RWP? Provide justification for your answer if the task cannot be performed with this RWP.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions:

- 1-BR-E-10A (Gas Stripper Steam Heater) is to be tagged out and drained due to a suspected tube leak.
- This task will take one Operator 64 minutes to complete, working the entire time in the vicinity of the heat exchanger.
- All valves that will be manipulated or tagged are located in the immediate vicinity of the heat exchangers.
- The following operators listed below with their Qualification level and Total Year to Date Dose is listed below:

	Qualification Level	Total dose received year to date
Operator #1	Step 4	1247 mrem
Operator #2	Stepped Out	1694 mrem
Operator #3	Step 6	1278 mrem

Initiating Cue:

- Attached to this JPM are copies of the Radiological Survey Map and an ALARA Component Locator Map for the area.
- You are to answer the following questions on the attached Answer sheet:

1) What is the total dose received by one operator to complete this task?
2) Which operator(s) could be assigned to perform this task based on qualification level and total dose? Include in your answer a reason why any operator cannot perform the task. *(Assume no dose upgrades will be authorized)*
3) Can this task be performed under the attached RWP with one entry, and with no changes to the RWP? Provide justification for your answer if the task cannot be performed with this RWP.

JPM ANSWER SHEET

NAME________________

1) The total dose received by one operator is _________ mrem.

2) Which of the following Operators can perform this task?

Operator #1 – Qualification Level = Step 4; Total Dose = 1247 mrem

CAN / CANNOT perform the task (circle one).

Justification-

____

____

Operator #2 – Qualification Level = Stepped Out; Total Dose = 1694 mrem

CAN / CANNOT perform the task (circle one).

Justification-

____

____

Operator #3 – Qualification Level = Step 6; Total Dose = 1278 mrem

CAN / CANNOT perform the task (circle one).

Justification-

____

____

3) Can this task be performed under this RWP as written? If the task cannot be performed provide reason in space below:

This task <u>CAN / CANNOT</u> be performed under RWP 09-0-1003-2.
Circle One

Justification:

____

____

____

TRAINING USE ONLY – NOT VALID FOR WORK IN RADIATION AREA

VALID FROM 01-JAN-2009 00:00 TO 31-DEC-2009 23:59 RWP 09-1003-2 REV. NO 0

DOSE RATE ALARM:	1000	mrem/Hr	BUDGETED DOSE: 750	mrem
DOSE LIMIT ALARM:	100	mrem	ALARA EVALUATION NO:	09-002

JOB LOCATIONS:
OCP; NO CTMTS – Owner Controlled Property excluding Unit 1 and Unit 2 Reactor Containments

---

JOB DESCRIPTION: Task 2: Station Operations Support in LHRAs.

THE MAXIMUM POSTED AREA THAT CAN BE ENTERED:
Locked High Radiation Areas

RADIOLOGICAL CONDITIONS: *Indicates estimated value for RWP Preparation. See survey forms for details.

GENERAL AREA RADIATION LEVELS (mrem/hr):
See current RCA surveys.

CONTACT/HOT SPOT RADIATION LEVELS (mrem/hr):
See current RCA surveys.

CONTAMINATION LEVELS (dpm/100cm2):
See current RCA surveys.

AIRBORNE RADIOACTIVITY (DAC):
<0.1

REQUIRED JOB COVERAGE:
Continuous
Routine

COVERAGE COMMENTS:
Continuous Health Physics Coverage is required for ALL entries into a Locked High Radiation Area not utilizing RMS.

DOSIMETRY REQUIREMENTS:
DAD/SRD TLD

RESPIRATORY REQUIREMENTS:

FFAP	As required based on airborne concentrations and work activities.
Other	As required based on airborne concentrations and work activities.
PAPH	As required based on airborne concentrations and work activities.

A RWP PRE-JOB BRIEFING IS REQUIRED:
BRIEFED BY AN HP TECHNICIAN AND SIGN ATTENDANCE SHEET.

TRAINING USE ONLY – NOT VALID FOR WORK IN RADIATION AREA

WORKER INSTRUCTIONS:

1. Upon receiving and DAD alarms, ensure equipment is left in a safe condition, leave the area and report to the Health Physics office.

2. Notify HP-Ops prior to system venting.

3. Notify HP-Ops prior to entry into overhead areas.

4. Ensure any liquids (i.e. oil, water) encountered during the job is contained and removed per HP-Ops instructions.

5. Read and discuss the following during the pre-job briefing:

   5.1 CR24062, Surry, "Improper valve lineup made during performance of 1-OP-CS-004."

HEALTH PHYSICS INSTRUCTIONS:

1. Workers must stop work and leave the area if WHOLE BODY dose rates are detected in excess of 5,000 mrem/hr.

2. Staytimes will be based on dose rates in the work area.

3. Neutron Dose determination is required for all entries into areas posted "Neutron Exposure Area". Estimate worker's neutron dose using C-HP-1031.023, Neutron and Noble Gas Dose Estimate Record.

4. Radiation survey is required prior to accessing overhead areas.

5. Radiation and contamination surveys are required for contaminated system entries.

6. Evaluate initial system entry smears for hot particles.

ATTACHMENT B
(Page 1 of 1)

Map Number	Location/Description	Reactor Power
384	PDT, Gas Stripper and Liquid Waste Tank Room - Gate 11	Unit(s) **Unit 1** 100% **Unit 2** 100%

Purpose:	Type: **Radiation**	**Contamination**	**Air Sample**
☐ Routine ☒ Special ☐ RWP	☒ Gamma ☐ Beta ☐ Neutron	☐ GA ☐ LA ☐ DRP	☐ GA ☐ WS ☐ BZ

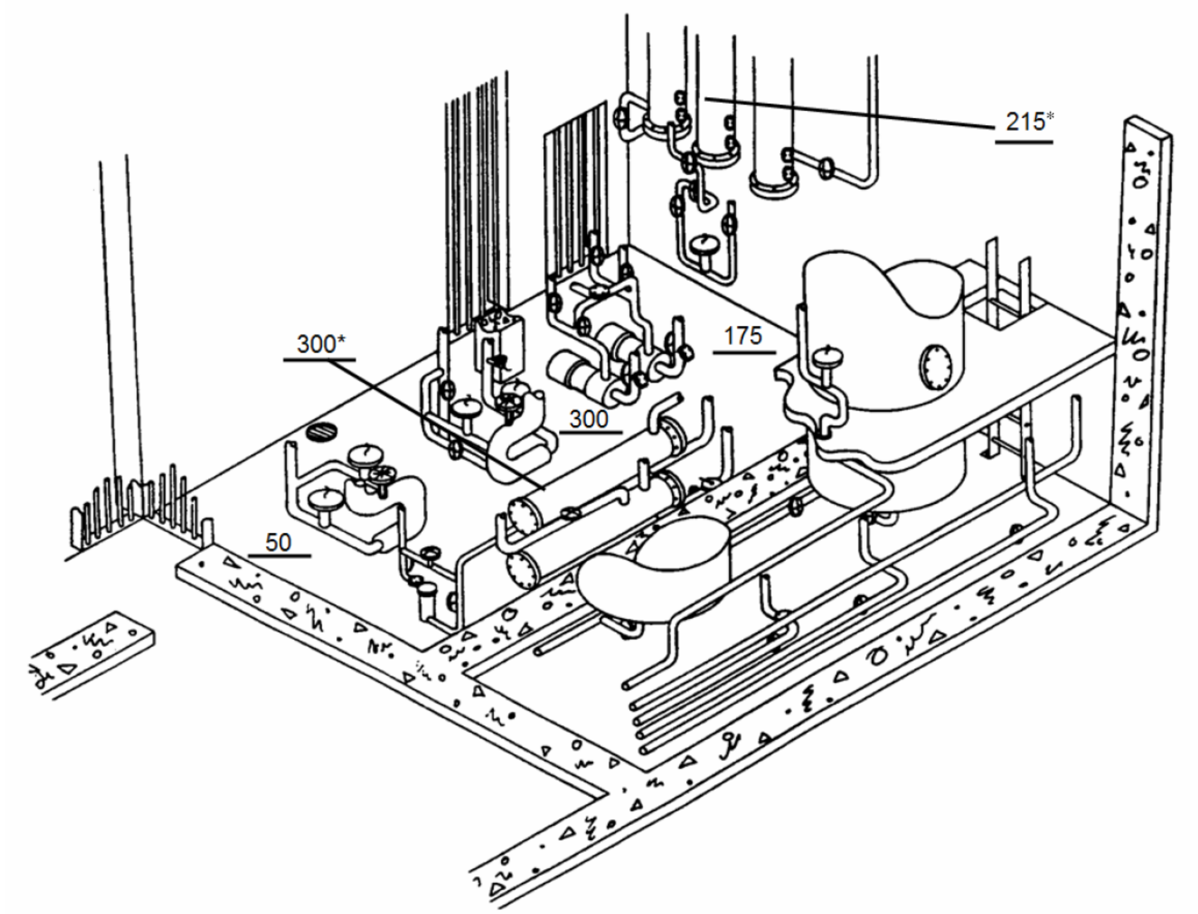
Instrument Model	Serial #
E-130A	152K

☐ All GA Smears < 1000 dpm/100cm^2
☐ All GA Smears < 20 dpm/100cm^2 Alpha
☐ All LA Smears < 1000 dpm/LAS

☐ Air Sample Results ____%DAC
☐ No DRP Detected
☐

Comments:
Support of 1-BR-E-10A maintenance, to include Ops tagout work.. All dose rates in mRem/hr.

Surveyed By (Print/Signature)	Date	Time	Reviewed By (Print/Signature)	Date
RP Tech1	Today	0000	RP Tech2	Today

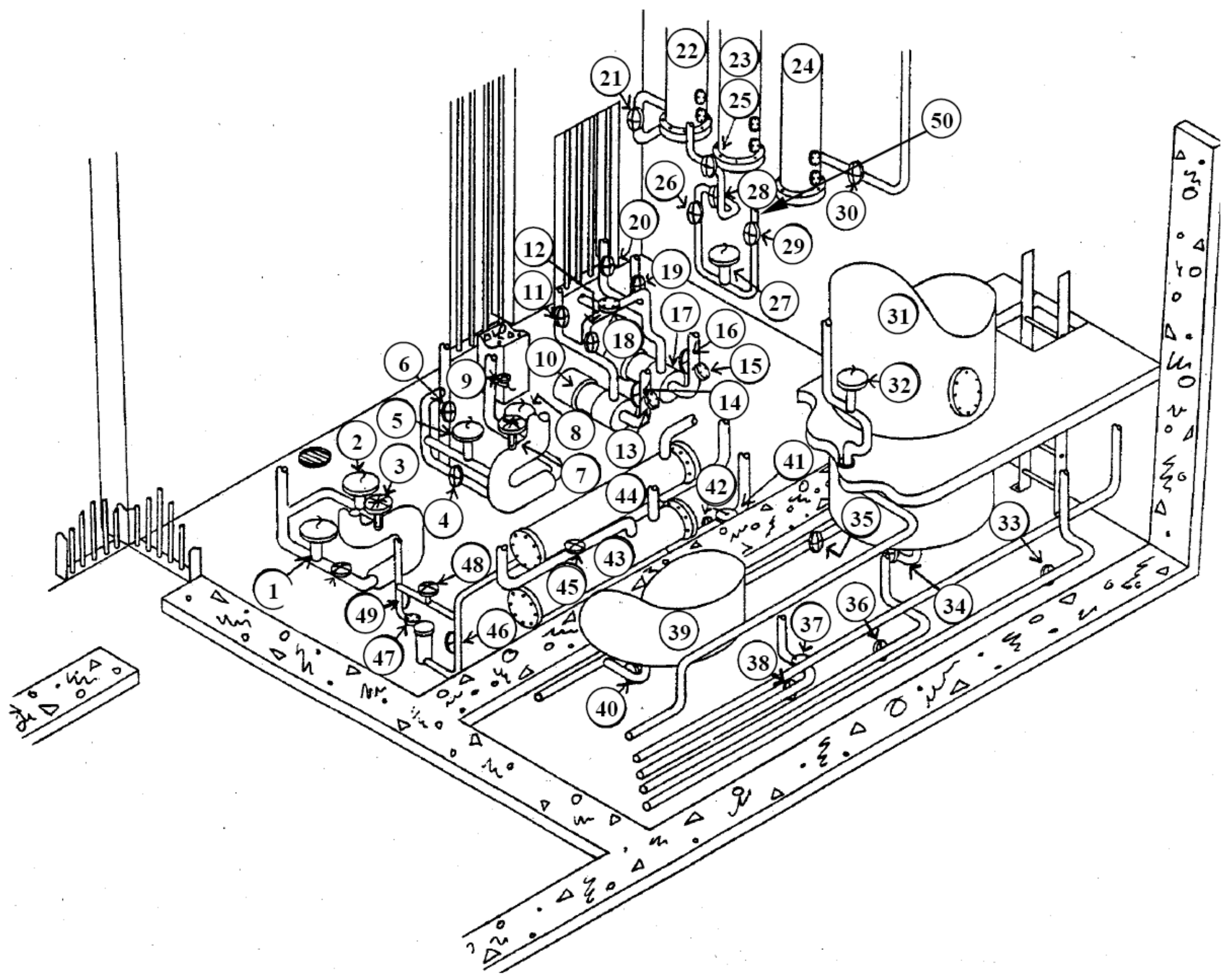


RA = Radiation Area	CA = Contaminated Area	LDWA = Low Dose Waiting Area
HRA = High Radiation Area	RCA = Radiological Control Area	HPA = Hot Particle Area
LHRA = Locked High Radiation Area	ARA = Airborne Radioactivity Area	NEA = Neutron Exposure Area
VHRA = Very High Radiation Area	RMA = Radioactive Material(s) Area	DRP = Discrete Radioactive Particle

① =Smear Location △ = A/S Location # = G/A Dose Rate #* = Contact Dose Rate —X—X—X— = Radiological Boundary

Dominion

RADIOLOGICAL PROTECTION
ALARA VALVE LOCATOR MAP
GATE 11 PDT AND GAS STRIPPER ROOM
Aux. Building 2' Elevation



1. 1-BR-TCV-103B
2. 1-AV-PCV-150B
3. 1-AS-77
4. 1-AS-174
5. 1-AV-PCV-150A
6. 1-AS-176
7. 1-AS-79
8. 1-BR-TVC-103A
9. 1-AS-80
10. 1-BR-P-7A
11. 1-BR-8
12. 1-BR-7
13. 1-BR-S-7A
14. 1-BR-3
15. 1-BR-S-7B
16. 1-BR-4
17. 1-BR-P-7B
18. 1-BR-10
19. 1-BR-26
20. 1-BR-25
21. 1-BR-39
22. 1-BR-E-6A
23. 1-BR-E-6B
24. 1-BR-E-12
25. 1-BR-15
26. 1-BR-11
27. 1-BR-PCV-131
28. 1-BR-12
29. 1-BR-13
30. 1-BR-47
31. 1-LW-TK-2B
32. 1-LW-HCV-109A
33. 1-LW-345
34. 1-LW-32
35. 1-LW-31
36. 1-LW-47
37. Not Labeled
38. Not Labeled
39. 1-LW-TK-2A
40. 1-LW-29
41. 1-BR-16
42. 1-BR-305
43. 1-BR-E-10B
44. 1-BR-E-10A
45. 1-AS-102
46. 1-AS-105
47. 1-AS-107
48. 1-AS-106
49. 1-AS-108
50. 1-BR-14

Valves Not Shown

1-CC-497	1-CC-507
1-CC-498	1-CC-508
1-CC-499	1-CC-509
1-CC-500	1-CC-510
1-CC-501	1-AS-104
1-CC-502	1-AS-176
1-CC-503	1-AS-177
1-CC-504	1-AS-180
1-CC-505	1-LW-46
1-CC-506	1-LW-40

1-LW-HCV-109B

FOR INFORMATION ONLY

U.S. Nuclear Regulatory Commission
Surry Power Station

SR10301
Administrative Job Performance Measure 2.2.12

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Review 1-PT-41.1, Component Cooling Water Pumps Performance Test

K/A: G.2.2.12 – Knowledge of surveillance procedures. (3.7/4.1)

Applicability	**Validation Time**	**Actual Time**
SRO(I)(U)	30 Minutes	___________

Initial Conditions

- Task is PERFORMED in the CLASSROOM.

Standards

- Identifies 1-CC-P-1A delta-P is in the INOP range per Attachment 1.
- Identifies 1-CC-P-1B vibration point 9 is in the INOP range per Attachment 2.
- Determines that with both 1-CC-P-1A and 1-CC-P-1B inoperable, a 24 hour Tech Spec 3.13 clock is in effect.

Initiating Cues

- Here is the completed 1-PT-41.1, Component Cooling Water Pumps Performance Test.
- You are to perform the Shift Supervision review of 1-PT-41.1.
- When you have completed this task please inform me so the Unit 2 team can commence performance of 2-PT-41.1.

Terminating Cues

- Review of 1-PT-41.1 is complete and Tech Specs reviewed.

Procedures

- 1-PT-41.1, Component Cooling Water Pumps Performance Test
- Tech Spec 3.13

Tools and Equipment **Safety Considerations**

- Laptop for obtaining procedures
- Completed copy of 1-PT-41.1

- None

PERFORMANCE CHECKLIST

Notes to the Evaluator.

- Task critical elements are bolded and noted by the words “Critical Step” at the end of the step.
- The Applicant is given a completed copy of 1-PT-41.1.
- A laptop will be Available for the Applicant.
- **START TIME: ___________**

STEP 1: Review of 1-PT-41.1 procedure body. **STANDARD:** (a) Starts review of the procedure, starting at Section 6.1. (b) Identifies Step 6.3.1 is not initialed. (c) Identifies that all notes at the beginning of Section 6.5 are not circle/slashed. (d) Identifies the operator who performed Attachment 6 did not sign the table at Step 7.3.1. **EVALUATOR’S NOTE:** • Evaluator may direct the Applicant to provide comments after completing the 1-PT-41.1 review. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 2: **CRITICAL STEP** Evaluate the test results by reviewing the Acceptance criteria for the components tested. (Step 7.1.1, substep a.) • 1-CC-P-1A – ΔP and Vibration Values (Attachment 1) are **not** in the INOP Range. **STANDARD:** (a) Reviews data in Attachment 1. **(b) Identifies ΔP is in the INOP range (not in the SAT range).** **EVALUATOR NOTES:** • Evaluator may direct the Applicant to provide comments after completing the 1-PT-41.1 review. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 3: **CRITICAL STEP** Evaluate the test results by reviewing the Acceptance criteria for the components tested. (Step 7.1.1, substep b.) • 1-CC-P-1B – ΔP and Vibration Values (Attachment 2) are **not** in the INOP Range. **STANDARD:** (a) Reviews data in Attachment 2. **(b) Identifies Inboard Vibration (pt. 9) is in the INOP range (not in the SAT range).** **EVALUATOR NOTES:** • Evaluator may direct the Applicant to provide comments after completing the 1-PT-41.1 review. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 4: Evaluate the test results by reviewing the Acceptance criteria for the components tested. (Step 7.1.1, substep c.) • 1-CC-557, 1-CC-P-1A Discharge Check Valve, functioned correctly (Step 6.5.14 – 1-CC-557 fully closed). **STANDARD:** (a) Reviews Step 6.5.14 and determines 1-CC-557 fully closed. **EVALUATOR NOTES:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5: Evaluate the test results by reviewing the Acceptance criteria for the components tested. (Step 7.1.1, substep d.) • 1-CC-563, 1-CC-P-1A Discharge Check Valve, functioned correctly (Step 6.4.14 – 1-CC-557 fully closed). **STANDARD:** (a) Reviews Step 6.4.14 and determines 1-CC-563 fully closed. **EVALUATOR NOTES:** **COMMENTS:**	

STEP 6: Document the test results. (Step 7.1.2) **STANDARD:** (a) Determines the test is unsatisfactory. (b) Determines 1-CC-P-1A is INOPERABLE. (c) Determines 1-CC-P-1B is INOPERABLE. **EVALUATOR NOTES:** • Evaluator may direct the Applicant to provide comments after completing the 1-PT-41.1 review. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: Report results of 1-PT-41.1 to Shift Manager STANDARD: (a) Informs Shift Manager that 1-PT-41.1 is UNSAT for 1-CC-P-1A and 1-CC-P-1B. EVALUATOR NOTES: • CUE: **If notified**, inform the Applicant to review regulatory requirements for applicability. COMMENTS:	_______ **SAT** _______ **UNSAT**

STEP 7: **CRITICAL STEP**	
Review of Tech Specs for applicability. STANDARD: **(a) Determines a 24 hour T.S.3.13.B clock is in effect, with less than 3 operable CC pumps.** EVALUATOR NOTES: • With both units at power, 3 of 4 CC pumps are required to be operable. COMMENTS:	

STEP 8:	
Reports task is complete. **STANDARD:** **EVALUATOR'S NOTE:** • Acknowledge the completion of the task. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STOP TIME: __________

Summary of 1-PT-41.1 conflicts:

CRITICAL STEPS:

- **Attachment 1, identifies Delta P for 1-CC-P-1A is in the INOP range (below SAT and ALERT ranges).**
- **Attachment 2, identifies Vibration pt. 9 for 1-CC-P-1B is in the INOP range.**
- **(Not a part of 1-PT-41.1, but after Evaluator Cue) Determines that with both 1-CC-P-1A and 1-CC-P-1B inoperable, a 24 hour TS 3.13 clock is in effect.**

Non-critical steps:

- Identifies Step 6.3.1 is not initialed.
- Identifies the Notes at beginning of Section 6.5 Not circle/slashed.
- Identifies the operator who performed Attachment 6 did not sign the table at Step 7.3.1.

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions:

- Both Units are at 100% power.
- The Unit 1 team has just finished performing 1-PT-41.1, Component Cooling Water Pumps Performance Test.
- The Unit 2 team is scheduled to perform 2-PT-41.1, Component Cooling Water Pumps Performance Test, after the 1-PT-41.1 Supervisor review is complete.

Initiating Cue:

- Here is the completed 1-PT-41.1, Component Cooling Water Pumps Performance Test.
- You are to perform the Shift Supervision review of 1-PT-41.1, and determine if Tech Spec requirements are met.
- Document your answers on the attached sheet.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions:

- Both Units are at 100% power.
- The Unit 1 team has just finished performing 1-PT-41.1, Component Cooling Water Pumps Performance Test.
- The Unit 2 team is scheduled to perform 2-PT-41.1, Component Cooling Water Pumps Performance Test, after the 1-PT-41.1 Supervisor review is complete.

Initiating Cue:

- Here is the completed 1-PT-41.1, Component Cooling Water Pumps Performance Test.
- You are to perform the Shift Supervision review of 1-PT-41.1, and determine if Tech Spec requirements are met.
- Document your answers on the attached sheet.

Applicant name: ______________________________

1. 1-PT-41.1 test result: SAT / UNSAT (circle one)

2. Discrepancies noted, if any:

____

____

____

____

____

____

____

____

____

____

____

____

3. Tech Spec requirements MET / NOT MET (circle one)

   If NOT MET, what are the Tech Spec required actions?

____

____

____

____

____

U.S. Nuclear Regulatory Commission
Surry Power Station

SR2021301
Administrative Job Performance Measure G2.1.40

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Authorize Fuel Movement

K/A: G2.1.40 Knowledge of refueling administrative procedures (2.8/3.9)

Applicability	**Estimated Time**	**Actual Time**
SRO(I)/SRO(U)	20 Minutes	

Conditions

- Task is to be PERFORMED in the simulator.

Standards

- Determines 1-VG-RI-131A is inoperable, which will prevent fuel movement.
- Determines 1-VS-AC-1, and 1-VS-AC-2 are inoperable which will prevent fuel movement.

Procedures

- 1-OSP-ZZ-004, Unit 1 Safety Systems Status List For Cold Shutdown/Refueling Conditions.
- Technical Specifications

Tools and Equipment

- None

Safety Considerations

- None

Simulator Set-up

- Recall a IC 390 (Protected) or (IC35 25% Cold Cal) and ensure that RHR pump discharge and RCS temperatures are below 140 ^{o}F.
- Align HHSI and fill pressurizer to 56.5% cold cal if necessary.
- Fail Rad Monitor 1-VG-RI-131B HI by inserting Malf RM0702.
- Verify Alarms 0-RMA-D6, VENT STACK #2 PART ALERT/HI is lit.
- Simulate failure of MCR AHUs 1-VS-AC-1, and 1-VS-AC-2 by overriding red AND green lights OFF.
- Tagout 1-RH-P-1B and **place a red magnet above control switch.**
- VERIFY 1-RC-LR-100, RCS STANDPIPE RECORDER is turned ON.

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded.
- **Determination of items to be in non-compliance that actually are in compliance constitutes a critical step failure.**
- **START TIME: _________________**

STEP 1: Refueling Containment Integrity set. Remarks: IAW 1-OP-FH-001 **STANDARD:** _____ Recalls (or refers to) turnover statement that refuel integrity is SET. _____ Initials in "D" block for *Refueling Containment Integrity set* **EVALUATOR NOTES:** • **If asked:** The shift manager has verified that refueling integrity is set as directed by 1-OP-FH-001. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

CRITICAL STEP

STEP 2:

_______ **SAT**

_______ **UNSAT**

Radiation Monitors Operable:

- Manipulator Crane 1 operable
- Containment Gaseous 1 operable
- Containment Particulate 1 operable
- SFP Bridge 1 operable
- Vent-Vent Gaseous 1 operable
- **Vent-Vent Particulate 0 operable**

Remarks:
Alarms 0-RMA-D6 is LIT.

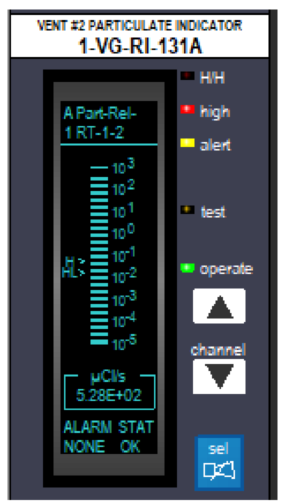
STANDARD:

_____ Examines each radiation monitor and verifies normal readings.

_____ **Determines radiation monitor 1-VG-RI-131A inoperability prevents fuel movement. CRITICAL STEP.**

EVALUATOR NOTES:

- **If asked:** Radiation monitors are as they appear.
- Shown is 1-VG-RI-131A.
- **If asked:** Have candidate continue and identify any other problems.



COMMENTS:

STEP 3: Source Range Detectors (audible indication in CTMT must be verified operable) • 2 operable Remarks: None **STANDARD:** _____ Observes normal indication on NI-31 _____ Observes normal indication on NI-32. **EVALUATOR NOTES:** • **If asked:** there is discernible audible count rate in containment. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: Cavity level > 23 feet. Remarks: OU-SU-201, should be maintained as high as possible. No fuel movement permitted if < 23 feet in Cavity **STANDARD:** _____ Recalls (or refers to) turnover statement that cavity level is 26.5'. _____ Determines that adequate cavity level exists to support fuel movement. **EVALUATOR NOTES:** • **If asked:** cavity level has been verified at 26.5'. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5: RHR pump and Heat Exchanger: Cavity Level > 23 feet 1 operable Cavity Level < 23 feet 2 operable **STANDARD:** _____ Recalls (or refers to) turnover statement that cavity level is 26.5'. _____ Observes 1 RHR pump in operation and one tagged out. _____ Determines that with present cavity level and operable RHR pump, fuel movement can commence. **EVALUATOR NOTES:** • **If asked:** cavity level has been verified at 26.5'. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 6: Direct communication between the Control Room and Manipulator Crane Remarks: When changing core geometry **STANDARD:** _____ Recalls (or refers to) turnover statement that communications have been established. _____ Determines that communication capability allows for fuel movement. **EVALUATOR NOTES:** • **If asked:** operator is in the MCR equipped with a headset in communication with the refueling team. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 7: RCS Boron concentration- ≥ 2350 PPM (Admin limit) Remarks: RCS must be sampled at least once every 24 hours if the head is unbolted (Not required if defueled and cavity is drained below flange level. (Ref 2.3.15) **STANDARD:** _____ Recalls (or refers to) turnover statement that RHR pump discharge and cavity boron is currently 2404 ppm (sampled 30 minutes ago). _____ Determines that current boron concentration allows for fuel movement. **EVALUATOR NOTES:** • **If asked:** RHR pump discharge and cavity boron is currently 2404 ppm (sampled 30 minutes ago). **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 8: RHR Temperature: ≤140 °F Remarks: None **STANDARD:** _____ Observes RHR pump discharge temperature and determines that current RCS temperature allows for fuel movement. **EVALUATOR NOTES:** • **If asked:** All RCS loops are isolated and drained. • **If asked:** All CETCs have been disconnected. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 9: Reactor shutdown greater than 100 hours Remarks: For movement of irradiated fuel **STANDARD:** _____ Recalls (or refers to) turnover statement that unit has been shutdown 122 hours. _____ Determines that sufficient time from shutdown exists to allow fuel movement. **EVALUATOR NOTES:** • **If asked:** The reactor was shutdown 122 hours ago. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 10: Control Room and Relay Room Emergency Ventilation- 2 Trains Remarks: None **STANDARD:** _____ Examines current configuration of MCR/ESGR ventilation and determines that all fans are available. _____ Determines that current MCR/ESGR Emergency Ventilation configuration allows for fuel movement by observing the configuration of 1-VS-F-41/42 and 2-VS-F-41/42. **EVALUATOR NOTES:** • **If asked:** Conditions are as they appear. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 11: Control Room Chillers- 3 minimum Remarks: Operable IAW power supply requirements of TS 3.23 **STANDARD:** _____ Examines current configuration of MCR chillers and determines that all chillers are available. _____ Determines that current MCR Chiller configuration allows for fuel movement by observing the configuration of 1-VS-E-4A, B, C, D, E. **EVALUATOR NOTES:** • **If asked:** Conditions are as they appear. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

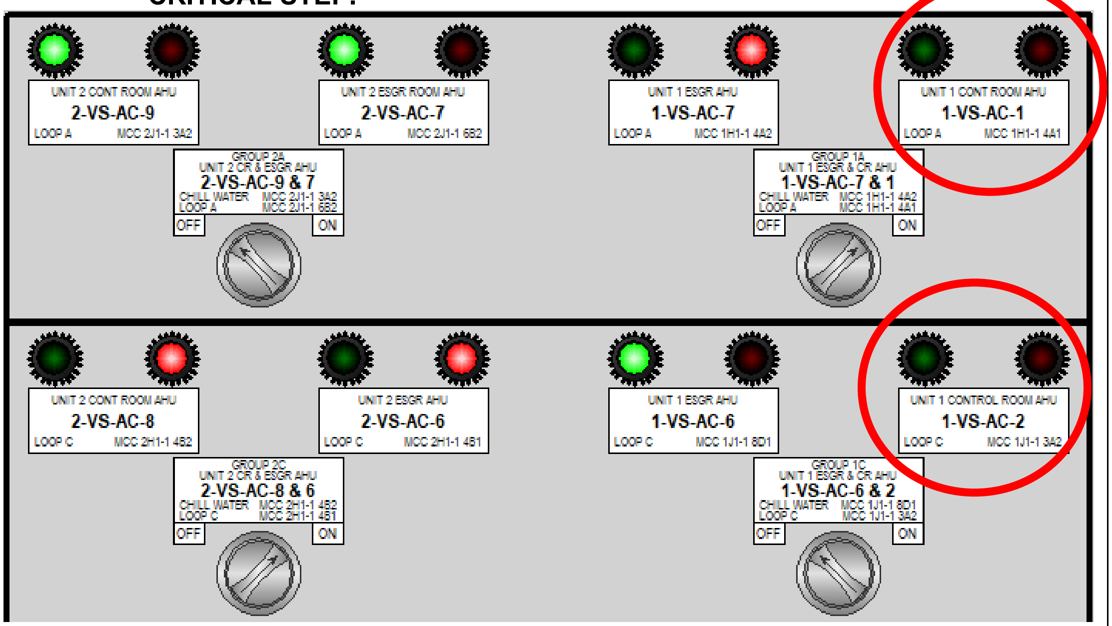
CRITICAL STEP

STEP 12: MCR/ESGR AHU- 8 minimum Remarks: Selected AHUs should be in operation	_______ **SAT** _______ **UNSAT**

STANDARD:

_____ **Examines current configuration of MCR/ESGR air handlers and determines that MCR Air Handling Units 1-VS-AC-1 AND 1-VS-AC-2 are NOT operating. CRITICAL STEP.**

_____ **Determines that per TECH SPECS we need at least one Unit 1 MCR AHU in operation for fuel movement, therefore Fuel movement is NOT allowed. CRITICAL STEP.**



EVALUATOR NOTES:

- **If an operator is dispatched locally to 1-VS-AC-1, and 1-VS-AC-2:** The AHUs supply breakers are both tripped with no indication as to the reason they are tripped. No other abnormalities noted.

COMMENTS:

STEP 13: 120 Volt Vital Buses- 2 minimum Remarks: None **STANDARD:** ______ Observes that all vital busses are energized and NO UPS/Battery charger alarms are LIT. ______ Recalls (or refers to) turnover statement that all vital bus UPS are in a normal **EVALUATOR NOTES:** • **If asked:** All vital bus UPS are in a normal configuration. • **If asked:** Both station batteries are operable and split out. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 14: SFP Cooling- 1 train available Remarks: None **STANDARD:** ______ Observes that one spent fuel cooling pump is in service. ______ Recalls (or refers to) turnover statement that both trains of SFP cooling are available with one in service. **EVALUATOR NOTES:** • **If asked:** both trains of SFP cooling are available with one in service. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 16: SFP makeup borated water source- 1 source available Remarks: None **STANDARD:** ______ Recalls (or refers to) turnover statement that all make-up flowpaths to the SFP are available. **EVALUATOR NOTES:** • **If asked:** All make-up flowpaths to the SFP are available. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 17: Reports to Shift Manager that task is complete **STANDARD:** _____ Reports that fuel movement **CANNOT** commence until the following problems are resolved: • **1-VG-RI-131A must be returned to operable status.** • **1-VS-AC-1, AND 1-VS-AC-2 must be returned to operable status.** **EVALUATOR NOTES:** • **None** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STOP TIME____:

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Attachment 8
REFUELING OPERATIONS REQUIREMENTS

EQUIPMENT	MIN REQ	D	N	TECH SPECS	REMARKS
Refueling Containment Integrity set	As Required			3.10.A.1	IAW 1-OP-FH-001
Radiation Monitors: • Manipulator Crane • Containment Gaseous • Containment Particulate • SFP Bridge • Vent-Vent Gaseous • Vent-Vent Particulate	 1 operable 1 operable 1 operable 1 operable 1 operable 1 operable			3.10.A.3 3.10.B.1	If the Containment Air Recirculation fans are not running then refer to Tech Spec 3.10 for actions.
Source Range Detectors (audible indication in CTMT must be checked operable)	2 operable			3.10.A.2	
Cavity level > 23 feet	23 feet			3.10.A.6	OU-SU-201, should be maintained as high as possible. No fuel movement permitted if < 23 feet in Cavity.
RHR pump and Heat Exchanger: • Cavity Level > 23 feet • Cavity Level < 23 feet	 1 operable 2 operable			 3.10.A.4 3.10.A.5	
Direct communication between the Control Room and Manipulator Crane	Yes			3.10.A.8	When changing core geometry
RCS Boron concentration	≥ 2350 PPM (Admin limit)			CY-AP-PRI-100	RCS must be sampled at least once every 24 hours if the head is unbolted (Not required if defueled and cavity is drained below flange level. (Ref 2.3.15)
RHR Temperature	≤ 140°F			1.0.C.1	
Reactor shutdown greater than 100 hours	100 hours			3.10.A.9	For movement of irradiated fuel

Attachment 8
REFUELING OPERATIONS REQUIREMENTS

EQUIPMENT	MIN REQ	D	N	TECH SPECS	REMARKS
Control Room and Relay Room Emergency Ventilation	2 Trains			3.10.A.11 3.10.B.4	
Control Room Chillers	3			3.10.A.13	Operable IAW power supply requirements of TS 3.23
MCR/ESGR AHU	8			3.10.A.14	
120 Volt Vital Buses	2				As a minimum two 120 VAC Vital Buses shall be energized from the inverters connected to the respective DC Buses.
SFP Cooling	1 train available				(*) OU-AA-200, Attachment 5 OU-SU-201 SFP Cooling Pump powered from bus with available EDG preferred.
SFP makeup water source	2 sources available				(*) OU-AA-200, Attachment 5

(*) If equipment requirements are not met, then the STA/SRO involved in the review of outage schedules will coordinate development of contingency plans IAW OU-AA-200.

10. A spent fuel cask or heavy loads exceeding 110 percent of the weight of a fuel assembly (not including fuel handling tool) shall not be moved over spent fuel, and only one spent fuel assembly will be handled at one time over the reactor or the spent fuel pit.

    This restriction does not apply to the movement of the transfer canal door.

11. Two Main Control Room/Emergency Switchgear Room (MCR/ESGR) Emergency Ventilation System (EVS) trains shall be OPERABLE.

    a. With one required train inoperable for reasons other than an inoperable MCR/ESGR envelope boundary, restore the inoperable train to OPERABLE status within 7 days. If the inoperable train is not returned to OPERABLE status within 7 days, comply with Specification 3.10.C.

    b. If two required trains are inoperable or one or more required trains are inoperable due to an inoperable MCR/ESGR envelope boundary, comply with Specification 3.10.C.

12. Manual actuation of the MCR/ESGR Envelope Isolation Actuation Instrumentation shall be OPERABLE as specified in TS 3.7.F.

13. Three chillers shall be OPERABLE in accordance with the power supply requirements of Specification 3.23.C. With one of the required OPERABLE chillers inoperable or not powered as required by Specification 3.23.C.1, return the inoperable chiller to OPERABLE status within 7 days or comply with Specification 3.10.C. With two of the required OPERABLE chillers inoperable or not powered as required by Specification 3.23.C.1, comply with Specification 3.10.C.

14. Eight air handling units (AHUs) shall be OPERABLE in accordance with the operability requirements of Specification 3.23.C. With two AHUs inoperable on the shutdown unit, ensure that one AHU is OPERABLE in each unit's main control room and emergency switchgear room, and restore an inoperable AHU to OPERABLE status within 7 days, or comply with Specification 3.10.C. With more than two AHUs inoperable, comply with Specification 3.10.C.

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions:

- Unit 1 is at Refueling Shutdown with the head and upper internals removed. A request from the refueling SRO has been made to authorize fuel movement (core offload) in accordance with 1-OSP-ZZ-004 attachment 8.

- Current conditions are as follows (items not observable from the control room):
    - Refueling containment integrity is set and verified by the shift manager.
    - Cavity level is 26.5'.
    - RHR pump discharge and cavity boron is currently 2404 ppm (sampled 30 minutes ago).
    - The reactor was shutdown 122 hours ago.
    - Both station batteries are operable and split out.
    - Both trains of SFP cooling are available with one in service.
    - All make-up flowpaths to the SFP are available.
    - 0-RMA-D6, VENT STACK #2 PART ALERT/HI has just alarmed.
    - 'A' RHR pump in service to the 'A' HX. 'B' RHR pump and HX are tagged out for maintenance.

- Headset communications between the MCR and the manipulator crane have been verified.

- The containment refueling SRO has called the control room for permission to commence core offload.

Initiating Cues

- You are to verify Refuel conditions are satisfied by reviewing 1-OSP-ZZ-004, attachment 8, <u>in its entirety</u> and if conditions allow then authorize fuel movement. If conditions do not allow Refueling operations to begin then you are to list ALL issues present that must be resolved to allow fuel movement to commence.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions:

- Unit 1 is at Refueling Shutdown with the head and upper internals removed. A request from the refueling SRO has been made to authorize fuel movement (core offload) in accordance with 1-OSP-ZZ-004 attachment 8.

- Current conditions are as follows (items not observable from the control room):
  - Refueling containment integrity is set and verified by the shift manager.
  - Cavity level is 26.5'.
  - RHR pump discharge and cavity boron is currently 2404 ppm (sampled 30 minutes ago).
  - The reactor was shutdown 122 hours ago.
  - Both station batteries are operable and split out.
  - Both trains of SFP cooling are available with one in service.
  - All make-up flowpaths to the SFP are available.
  - 0-RMA-D6, VENT STACK #2 PART ALERT/HI has just alarmed.
  - 'A' RHR pump in service to the 'A' HX. 'B' RHR pump and HX are tagged out for maintenance.

- Headset communications between the MCR and the manipulator crane have been verified.

- The containment refueling SRO has called the control room for permission to commence core offload.

Initiating Cues

- You are to verify Refuel conditions are satisfied by reviewing 1-OSP-ZZ-004, attachment 8, <u>in its entirety</u> and if conditions allow then authorize fuel movement. If conditions do not allow Refueling operations to begin then you are to list ALL issues present that must be resolved to allow fuel movement to commence.

(Page 1 of 2)

Attachment 8

REFUELING OPERATIONS REQUIREMENTS

EQUIPMENT	MIN REQ	D	N	TECH SPECS	REMARKS
Refueling Containment Integrity set	As Required			3.10.A.1	IAW 1-OP-FH-001
Radiation Monitors: • Manipulator Crane • Containment Gaseous • Containment Particulate • SFP Bridge • Vent-Vent Gaseous • Vent-Vent Particulate	 1 operable 1 operable 1 operable 1 operable 1 operable 1 operable			3.10.A.3 3.10.B.1	If the Containment Air Recirculation fans are not running then refer to Tech Spec 3.10 for actions.
Source Range Detectors (audible indication in CTMT must be checked operable)	2 operable			3.10.A.2	
Cavity level > 23 feet	23 feet			3.10.A.6	OU-SU-201, should be maintained as high as possible. No fuel movement permitted if < 23 feet in Cavity.
RHR pump and Heat Exchanger: • Cavity Level > 23 feet • Cavity Level < 23 feet	 1 operable 2 operable			 3.10.A.4 3.10.A.5	
Direct communication between the Control Room and Manipulator Crane	Yes			3.10.A.8	When changing core geometry
RCS Boron concentration	≥ 2350 PPM (Admin limit)			CY-AP-PRI-100	RCS must be sampled at least once every 24 hours if the head is unbolted (Not required if defueled and cavity is drained below flange level. (Ref 2.3.15)
RHR Temperature	≤ 140°F			1.0.C.1	
Reactor shutdown greater than 100 hours	100 hours			3.10.A.9	For movement of irradiated fuel

Attachment 8
REFUELING OPERATIONS REQUIREMENTS

EQUIPMENT	MIN REQ	D	N	TECH SPECS	REMARKS
Control Room and Relay Room Emergency Ventilation	2 Trains			3.10.A.11 3.10.B.4	
Control Room Chillers	3			3.10.A.13	Operable IAW power supply requirements of TS 3.23
MCR/ESGR AHU	8			3.10.A.14	
120 Volt Vital Buses	2				As a minimum two 120 VAC Vital Buses shall be energized from the inverters connected to the respective DC Buses.
SFP Cooling	1 train available				(*) OU-AA-200, Attachment 5 OU-SU-201 SFP Cooling Pump powered from bus with available EDG preferred.
SFP makeup water source	2 sources available				(*) OU-AA-200, Attachment 5

(*) If equipment requirements are not met, then the STA/SRO involved in the review of outage schedules will coordinate development of contingency plans IAW OU-AA-200.

U.S. Nuclear Regulatory Commission
Surry Power Station

SR10301
Administrative Job Performance Measure 2.1.20

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Determine Partial Pressure following a Loss of Containment Cooling

K/A: G2.1.20 – Ability to interpret and execute procedure steps. (4.6/4.6)

Applicability	**Validation Time**	**Actual Time**
SRO(I)(U)	15 Minutes	___________

Initial Conditions

- Task is PERFORMED in the CLASSROOM.

Standards

- Obtains T_{cont2} from PCS and determines T_{cont2} is 128°F, and records this on Attachment 3.
- Utilizing the 8/25/21 PT-36 determines that T_{cont1} is 118.38, and records this on Attachment 3.
- Determines that the pre-event Containment Partial Pressure is 10.25 psia, and records this on Attachment 3.
- Determines Containment Partial Pressure, P_{air2} is 10.42 psia (allowable tolerance -.01/+.01).
- Determines partial pressure is NOTwithin acceptable limits of Tech Specs Figure 3.8-1.

Initiating Cues

- Given simulated plant conditions, perform Attachment 2 of Annunciator Response Procedure (ARP) 1B-A6, Containment Pressure -0.1 PSI Channel 1, to calculate Containment Partial Pressure and Technical Specification Compliance.

Terminating Cues

- Steps 1-7 of Attachment 2 of ARP 1B-A6 are complete.

Procedures

- Attachment 2 of procedure 1B-A6, CTMT PRESS –0.1 PSI CH 1
- Tech Spec 3.8

Tools and Equipment

- Calculator
- Tech Specs
- DRP-003
- Ruler

Safety Considerations

- None

PERFORMANCE CHECKLIST

Notes to the Evaluator.

- Task critical elements are bolded and noted by the words "Critical Step" at the end of the step.
- **START TIME: ___________**

STEP 1: Notes prior to Step 1 of Attachment 2: • This calculation must be performed within one hour after Partial Pressure indication is declared inoperable and hourly thereafter. • Determining partial pressure using local containment samples is required within 6 hours of declaring Partial Pressure indication inoperable and 6 hours thereafter. • Bleeding air into containment or running Containment Vacuum pumps will require Engineering or STA calculations. • Partial pressure calculated using ideal gas laws is expected to rise as Containment Weighted Average rises. • Partial pressure determined using local samples is more accurate and should be used if there is a difference in results between partial pressure determined using local samples and ideal gas law calculations. • Determining Partial Pressure (P_{Air2}) using the Ideal Gas Law is obtained from the formula $P_{air2} = (T_{cont2} / T_{cont1})\ P_{air\ 1}$. ○ P_{air1} is the highest Containment Partial Pressure reading from the last valid 1-PT-36 reading. ○ T_{cont1} is the Containment Weighted Average Temperature reading from the last valid 1-PT-36 reading. ○ T_{cont2} is the current Containment Weighted Average Temperature. • Determinig partial pressure (P air) is obtained from the formula Ptot - Psat = Pair • Ptot is CTMT pressure from one of the following: ○ The highest of 1-CV-PI-101A or 1-CV-PI-101B ○ The highest of Unit 1 PCS points P1LM002A, P1LM003A, P1LM001A, or P1LM004A • Determining Psat relies on measurement of dew point or relative humidity, since the actual saturation temperature is a function of both dry-bulb temperature and relative humidity. **STANDARD:** (a) Acknowledges the notes. **EVALUATOR'S NOTE:** • **If asked**, it is desired to perform this calculation now. • **If asked,** no containment air samples have been taken. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 2:

Step 1 of Attachment 2:

1. Record the Date and Time in the Calculation of CTMT Air Partial Pressure Using Ideal Gas Law Data Table in Attachment 3.

STANDARD:

a) Records Date of 08/25/21 and Time of 2200 in Attachment 3.

EVALUATOR NOTES:

Attachment 3 will be filled out as follows:

Date/Time	T_{cont2}	T_{cont1}	P_{air1}	P_{air2}	Initials
8/25/21:2200					

COMMENTS:

_______ **SAT**

_______ **UNSAT**

STEP 3: **CRITICAL STEP**

Step 2 of Attachment 2:

2. Obtain T_{cont2} (current Containment Weighted Average Temperature) using PCS point U0091 and record in Attachment 3.

STANDARD:

a) **Obtains T_{cont2} from PCS Attachment and determines T_{cont2} is 128°F, and records this on Attachment 3. CRITICAL STEP**

EVALUATOR NOTES:

- T_{cont2} can be determined using PCS by calling up CONT SPRAY DWG, CONT TEMP DWG, or by calling up individual point U0091.
- **Cue:** If mouse is hovered over or right click on 'CTMT Weighted Average Temp on PCS, computer point U0091 will appear.

Attachment 3 will be filled out as follows:

Date/Time	T_{cont2}	T_{cont1}	P_{air1}	P_{air2}	Initials
8/25/21:2200	**128°F**				

COMMENTS:

STEP 4: **CRITICAL STEP**

_______ SAT

_______ UNSAT

Step 3 of Attachment 2:

3. Obtain Tcont1 (pre-event Containment Weighted Average Temperature) using the last valid 1-PT-36 log reading and record in Attachment 3.

STANDARD:

a) Utilizing the PT-36 determines that Tcont1 is 118.38, and records this on Attachment 3. CRITICAL STEP

EVALUATOR NOTES:

- This information can be found on page 25 of 1-PT-36.

Attachment will be filled out as follows:

Date/Time	T_{cont2}	T_{cont1}	P_{air1}	P_{air2}	Initials
8/25/21:2200	128°F	**118.38 °F**			

COMMENTS:

STEP 5: **CRITICAL STEP**

Step 4 of Attachment 2:

4. Obtain P_{air1} (pre-event Containment Partial Pressure) using the highest Containment Partial Pressure reading from the last valid 1-PT-36 log reading and record in Attachment 3.

STANDARD:

a) Determines that the pre-event Containment Partial Pressure is 10.25 psia, and records this on Attachment 3. CRITICAL STEP.

EVALUATOR NOTES:

Attachment 3 will be filled out as follows:

Date/Time	T_{cont2}	T_{cont1}	P_{air1}	P_{air2}	Initials
8/25/21:2200	128°F	118.38 °F	**10.25**		

COMMENTS:

STEP 6: Step 5 of Attachment 2 5. Determine P_{air2} (current Containment Partial Pressure) IAW the following: a) Calculate $P_{air2} = [(T_{cont2} + 459.6^oF) / (T_{cont1} + 459.6^oF)] \times P_{air1}$ **STANDARD:** **a) Determines Pair2 is 10.42 psia (allowable tolerance -.01/+.01).** $P_{air2} = [(128\,^oF + 459.6^oF) / (118.38\,^oF + 459.6^oF)] \times 10.25$ psia **EVALUATOR NOTES:** Attachment 3 will be filled out as follows (using PCS data):	_______ **SAT** _______ **UNSAT**

Date/Time	T_{cont2}	T_{cont1}	P_{air1}	P_{air2}	Initials
8/25/21:2200	128°F	118.38 °F	10.25 psia	**10.42 psia**	

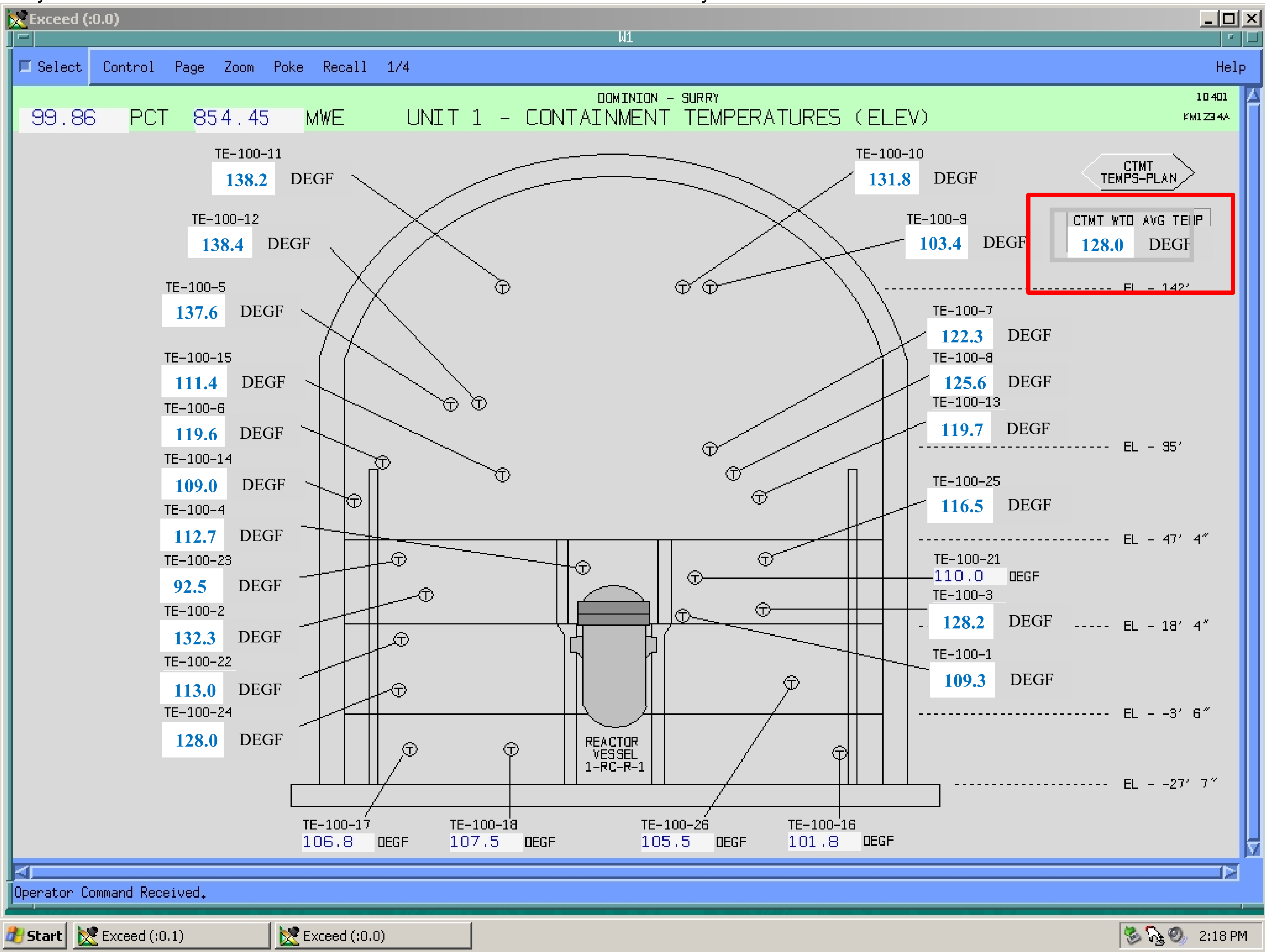
COMMENTS:

STEP 7: Step 6 of Attachment 2 6. IF air has been bled into Containment OR Containment Vacuum Pumps have been in service since the last partial pressure reading, THEN contact Engineering or the STA to calculate change in containment air per ETS SU 2020-0057, Containment Air Partial Pressure Calculation. STANDARD: Determines air has not been bled into containment. EVALUATOR NOTES: CUE: **If asked,** inform applicant that air has NOT been bled into containment. COMMENTS:	_______ **SAT** _______ **UNSAT**

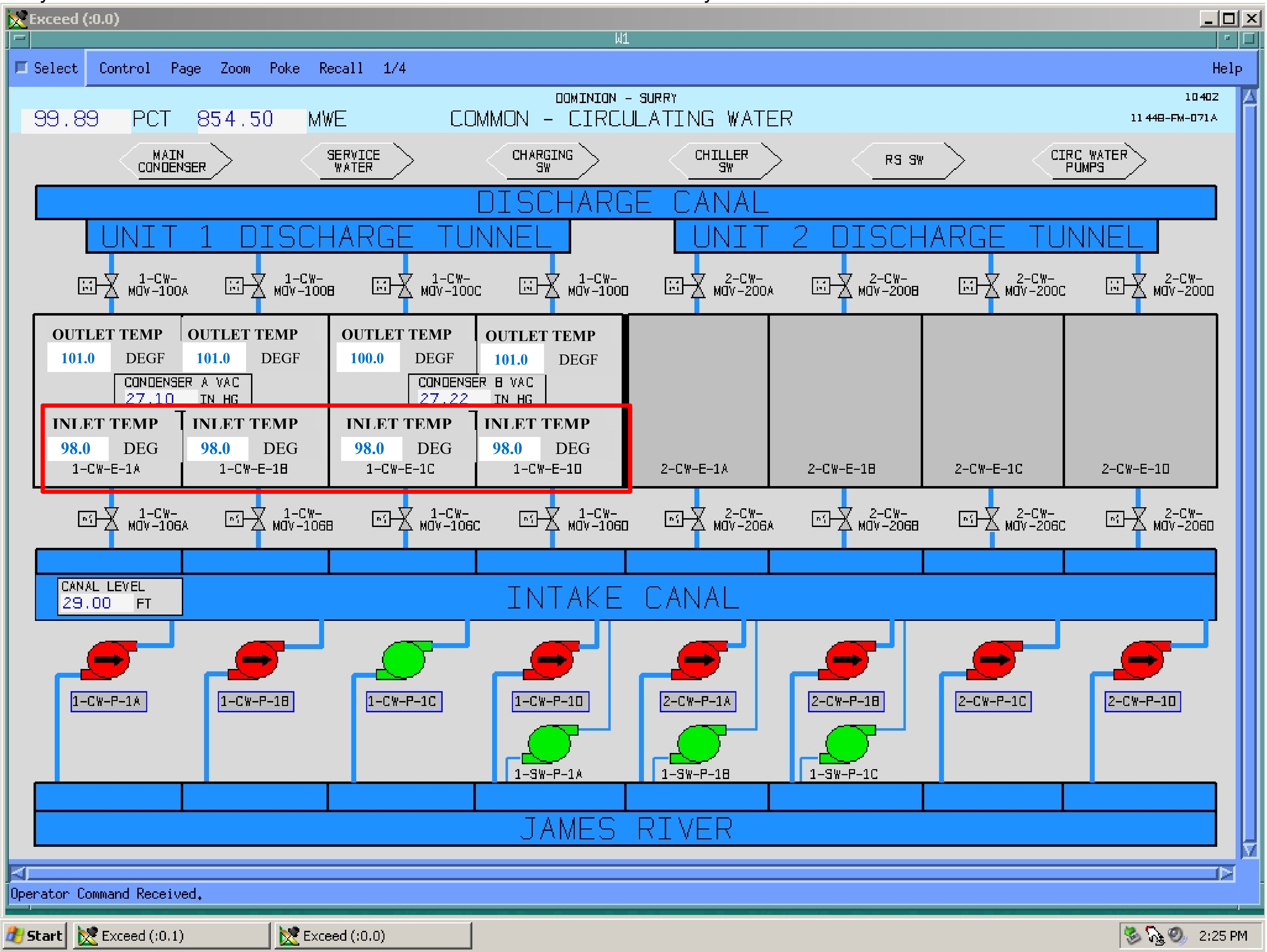
STEP 7: **CRITICAL STEP**	
Step 7 of Attachment 2 7. Verify CTMT Air Partial Pressure is within Tech Spec 3.8-1 limits. STANDARD: **a) Obtains a copy of Tech Specs and refers to Figure 3.8-1 and determines that partial pressure <u>is NOT within acceptable Tech Spec limits</u>. CRITICAL STEP** **b) Required Action is to restore Containment pressure within the curve within one hour.** EVALUATOR NOTES: • Given information: CW inlet temp will be 98˚F. • If report is given that partial pressure is outside of Table 3.8-1 limits, ask the applicant to determine and report applicable LCO limits and actions required. COMMENTS:	

STEP 8: Reports task is complete. **STANDARD:** **EVALUATOR'S NOTE:** • Acknowledge the completion of the task. **COMMENTS:** **END OF JPM**	_______ **SAT** _______ **UNSAT**

STOP TIME_____:

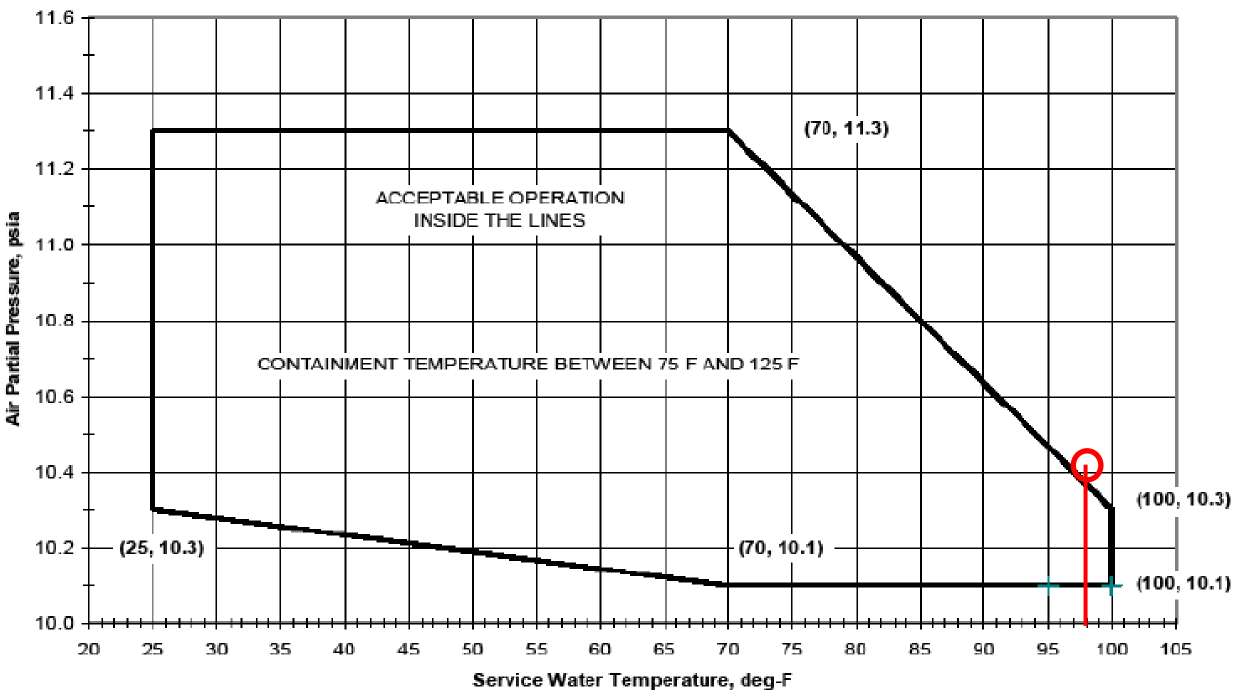


Exceed (:0.0)
W1
Select
Control
Page
Zoom
Poke
Recall
1/4
Help
DOMINION - SURRY
99.86 PCT 854.45 MWE
UNIT 1 - CONTAINMENT TEMPERATURES (ELEV)
CTMT TEMPS-PLAN
CTMT WTD AVG TEMP
128.0 DEGF
TE-100-11 138.2 DEGF
TE-100-10 131.8 DEGF
TE-100-12 138.4 DEGF
TE-100-9 103.4 DEGF
EL - 142'
TE-100-5 137.6 DEGF
TE-100-7 122.3 DEGF
TE-100-15 111.4 DEGF
TE-100-8 125.6 DEGF
TE-100-6 119.6 DEGF
TE-100-13 119.7 DEGF
EL - 95'
TE-100-14 109.0 DEGF
TE-100-25 116.5 DEGF
TE-100-4 112.7 DEGF
EL - 47' 4"
TE-100-23 92.5 DEGF
TE-100-21 110.0 DEGF
TE-100-2 132.3 DEGF
TE-100-3 128.2 DEGF
EL - 18' 4"
TE-100-22 113.0 DEGF
TE-100-1 109.3 DEGF
EL - -3' 6"
TE-100-24 128.0 DEGF
REACTOR VESSEL 1-RC-R-1
EL - -27' 7"
TE-100-17 106.8 DEGF
TE-100-18 107.5 DEGF
TE-100-26 105.5 DEGF
TE-100-16 101.8 DEGF
Operator Command Received.
Start
Exceed (:0.1)
Exceed (:0.0)
2:18 PM


Exceed (:0.0)
W1
Select Control Page Zoom Poke Recall 1/4 Help
DOMINION - SURRY
99.89 PCT 854.50 MWE COMMON - CIRCULATING WATER
10402
11448-FM-071A
MAIN CONDENSER
SERVICE WATER
CHARGING SW
CHILLER SW
RS SW
CIRC WATER PUMPS
DISCHARGE CANAL
UNIT 1 DISCHARGE TUNNEL
UNIT 2 DISCHARGE TUNNEL
1-CW-MOV-100A
1-CW-MOV-100B
1-CW-MOV-100C
1-CW-MOV-100D
2-CW-MOV-200A
2-CW-MOV-200B
2-CW-MOV-200C
2-CW-MOV-200D
OUTLET TEMP 101.0 DEGF
OUTLET TEMP 101.0 DEGF
OUTLET TEMP 100.0 DEGF
OUTLET TEMP 101.0 DEGF
CONDENSER A VAC 27.10 IN HG
CONDENSER B VAC 27.22 IN HG
INLET TEMP 98.0 DEG 1-CW-E-1A
INLET TEMP 98.0 DEG 1-CW-E-1B
INLET TEMP 98.0 DEG 1-CW-E-1C
INLET TEMP 98.0 DEG 1-CW-E-1D
2-CW-E-1A
2-CW-E-1B
2-CW-E-1C
2-CW-E-1D
1-CW-MOV-106A
1-CW-MOV-106B
1-CW-MOV-106C
1-CW-MOV-106D
2-CW-MOV-206A
2-CW-MOV-206B
2-CW-MOV-206C
2-CW-MOV-206D
CANAL LEVEL 29.00 FT
INTAKE CANAL
1-CW-P-1A
1-CW-P-1B
1-CW-P-1C
1-CW-P-1D
2-CW-P-1A
2-CW-P-1B
2-CW-P-1C
2-CW-P-1D
1-SW-P-1A
1-SW-P-1B
1-SW-P-1C
JAMES RIVER
Operator Command Received.
Start
Exceed (:0.1)
Exceed (:0.0)
2:25 PM

Snapshot of TS FIG. 3.8-1

SURRY TECHNICAL SPECIFICATION CURVE FOR CONTAINMENT
ALLOWABLE AIR PARTIAL PRESSURE INDICATION VS. SERVICE WATER TEMPERATURE



Note: Operation on or outside the line requires entry into TS 3.8.D.1.a

Amendment Nos. 259 and 259

06-17-08

c. Isolate each affected penetration within 4 hours by use of at least one closed manual valve or blind flange, or

d. Otherwise, place the unit in HOT SHUTDOWN within the next 6 hours and COLD SHUTDOWN within the following 30 hours.

D. Internal Pressure

1. Containment air partial pressure shall be maintained within the acceptable operation range as identified in Figure 3.8-1 whenever the Reactor Coolant System temperature and pressure exceed 350°F and 450 psig, respectively.

   a. With the containment air partial pressure outside the acceptable operation range, restore the air partial pressure to within acceptable limits within 1 hour or be in at least HOT SHUTDOWN within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions:

- Both Units are at 100% power.
- Today is 08/25/2021, 2200 and this is the 4th day in a row with ambient temperatures above 100 °F.
- Containment Cooling was being supplied by Chilled Water with Chiller 1-CD-REF-1A in operation. 1-CD-REF-1B is inoperable due to breaker maintenance.
- Approximately 30 minutes ago the operating chilled water system chiller tripped. As a result, annunciators 1B-A6 (CTMT PART PRESS -0.1 PSI CH 1) and 1B-B6 (CTMT PART PRESS -0.1 PSI CH 2) were received.
- The Containment Partial pressure indicators were declared inoperable 15 minutes ago.
- The operating team has implemented ARP-1B-A6 up to the point of implementing Attachment 2.
- Maintenance has determined that the chiller will not be returned to service until tomorrow.
- Air has NOT been bled into Containment, AND Containment Vacuum pumps have not been run in last 24 hours.
- No Containment sample has been taken.

Initiating Cue:

- Here is a copy of Attachment 2 of Annunciator Response Procedure (ARP) 1B-A6, Containment Pressure -0.1 PSI Channel 1, Attachment 3, PCS Screen shots, AND the latest PT-36 Operator Log excerpts.
- I need you to perform Attachment 2 of Annunciator Response Procedure (ARP) 1B-A6, steps 1-7, to Determine Containment Partial Pressure and Technical Specification Compliance. Write your answers on the attached Answer sheet.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions:

- Both Units are at 100% power.
- Today is 08/25/2021, 2200 and this is the 4th day in a row with ambient temperatures above 100 ^{o}F.
- Containment Cooling was being supplied by Chilled Water with Chiller 1-CD-REF-1A in operation. 1-CD-REF-1B is inoperable due to breaker maintenance.
- Approximately 30 minutes ago the operating chilled water system chiller tripped. As a result, annunciators 1B-A6 (CTMT PART PRESS -0.1 PSI CH 1) and 1B-B6 (CTMT PART PRESS -0.1 PSI CH 2) were received.
- The Containment Partial pressure indicators were declared inoperable 15 minutes ago.
- The operating team has implemented ARP-1B-A6 up to the point of implementing Attachment 2.
- Maintenance has determined that the chiller will not be returned to service until tomorrow.
- Air has NOT been bled into Containment, AND Containment Vacuum pumps have not been run in last 24 hours.
- No Containment sample has been taken.

Initiating Cue:

- Here is a copy of Attachment 2 of Annunciator Response Procedure (ARP) 1B-A6, Containment Pressure -0.1 PSI Channel 1, Attachment 3, PCS Screen shots, AND the latest PT-36 Operator Log excerpts.
- I need you to perform Attachment 2 of Annunciator Response Procedure (ARP) 1B-A6, steps 1-7, to Determine Containment Partial Pressure and Technical Specification Compliance. Write your answers on the attached Answer sheet.

NAME:_________________________

Partial Pressure (P_{air2}) = _____________psia

Tech Spec LCO (clock) in effect? Yes / no (Circle one)

Tech Spec Required Actions (if any):

____

____

____

____

____

____

NOTE:
- This calculation must be performed within one hour after Partial Pressure indication declared inoperable and hourly thereafter.
- Determining partial pressure using local containment samples is required within 6 hours of declaring Partial Pressure indication inoperable and every 6 hours thereafter.
- Bleeding air into containment or running Containment Vacuum Pumps will require Engineering or STA support for calculations to account for the addition or subtraction of air per ETE SU 2020-0057, Containment Air Partial Pressure Calculation.
- Partial pressure calculated using the ideal gas law is expected to rise as Containment Weighted Average Temperature rises.
- Partial pressure determined using local samples is more accurate and should be used if there is a difference in results between partial pressure determined using local samples and ideal gas law calculations.
- Determining Partial Pressure (P_{air2}) using the Ideal Gas Law is obtained from the formula $P_{air2} = (T_{cont2} / T_{cont1}) P_{air1}$

  where:

  P_{air1} is the highest Containment Partial Pressure reading from the last valid 1-PT-36 log reading.

  T_{cont1} is the Containment Weighted Average Temperature reading from the last valid 1-PT-36 log reading.

  T_{cont2} is the current Containment Weighted Average Temperature.
- Determining Air partial pressure (P_{air}) using local samples is obtained from the formula $P_{tot} - P_{sat} = P_{air}$
- P_{tot} is CTMT pressure from one of the following:
  - The highest of 1-CV-PI-101A or 1-CV-PI-101B
  - The highest of Unit 1 PCS points P1LM002A, P1LM003A, P1LM001A, or P1LM004A
- Determining P_{sat} relies on measurement of dew point or relative humidity, since the actual saturation temperature is a function of both dry-bulb temperature and relative humidity.

1. ___ Record the current Date and Time in the Calculation of CTMT Air Partial Pressure Using Ideal Gas Law Data Table in Attachment 3.

2. ___ Obtain T_{cont2} (current Containment Weighted Average Temperature) using PCS point U0091 and record in Attachment 3.

3. ___ Obtain T_{cont1} (pre-event Containment Weighted Average Temperature) using the last valid 1-PT-36 log reading and record in Attachment 3.

4. ___ Obtain P_{air1} (pre-event Containment Partial Pressure) using the highest Containment Partial Pressure reading from the last valid 1-PT-36 log reading and record in Attachment 3.

5. ___ Determine P_{air2} (current Containment Partial Pressure) IAW the following:

   a) Calculate $P_{air2} = [(T_{cont2} + 459.6°F) / (T_{cont1} + 459.6°F)] \times P_{air1}$

6. ___ IF air has been bled into Containment OR Containment Vacuum Pumps have been in service since the last partial pressure reading, THEN contact Engineering or the STA to calculate change in containment air per ETE SU 2020-0057, Containment Air Partial Pressure Calculation.

7. ___ Check current CTMT Air Partial Pressure (P_{air2}) is within Tech Spec 3.8-1 limits.

NOTE: Containment Partial Pressure must be calculated using local samples every 6 hours and every 6 hours thereafter.

8. ___ IF a more accurate measurement of Containment Partial Pressure is required, THEN perform the remainder of this Attachment. Otherwise, enter N/A for Steps Step 9 through Step 17 AND GO TO Step 18.

9. ___ Record the Date, Time, and CTMT Air Partial Pressure in the P_{air} column from the last valid 1-PT-36 log reading in the first row of the CTMT Pressure Data Table in Attachment 4.

10. ___ Record the current Date and Time in the CTMT Pressure Data Table in the next available row in Attachment 4.

11. ___ Obtain P_{tot} from one of the following sources and record in the P_{tot} column in the CTMT Pressure Data Table in Attachment 4.

   ☐ • The highest of 1-CV-PI-101A or 1-CV-PI-101B

   ☐ • The highest of Unit 1 PCS points P1LM002A, P1LM003A, P1LM001A, or P1LM004A

NOTE: The Reed Model R6200 WBGT Heat Stress Meter is an approved device to measure relative humidity or dew point and meets the accuracy requirement in ETE SU 2020-0057.

12. ___ Obtain an Engineering approved instrument for measuring relative humidity or dew point.

13. ___ Request HP assistance.

14. ___ Obtain a sample of the CTMT atmosphere from CTMT entry.

15. ___ Determine the relative humidity or dew point of the CTMT atmosphere sample.

16. ___ Determine P_{sat} IAW the following:

☐ b) IF a measured value for CTMT air dew point (t_d) is obtained, THEN use Steam Tables to determine P_{sat} corresponding to t_d.

☐ c) IF measured values for CTMT relative humidity (RH) and temperature (dry-bulb) are obtained, THEN use Steam Tables to determine P_{sat} corresponding to the dry-bulb temperature.

- Calculate P_{sat} = RH x (P_{sat} corresponding to the dry-bulb temperature)

☐ d) Calculate P_{air} by subtracting P_{sat} from P_{tot}.

17. ___ Check current CTMT Air Partial Pressure (P_{air}) is within Tech Spec 3.8-1 limits.

18. ___ Perform Containment Partial Pressure calculations in accordance with the following:

- Perform ideal gas law calculation at least hourly
- Perform calculation based on local samples at least every 6 hours.

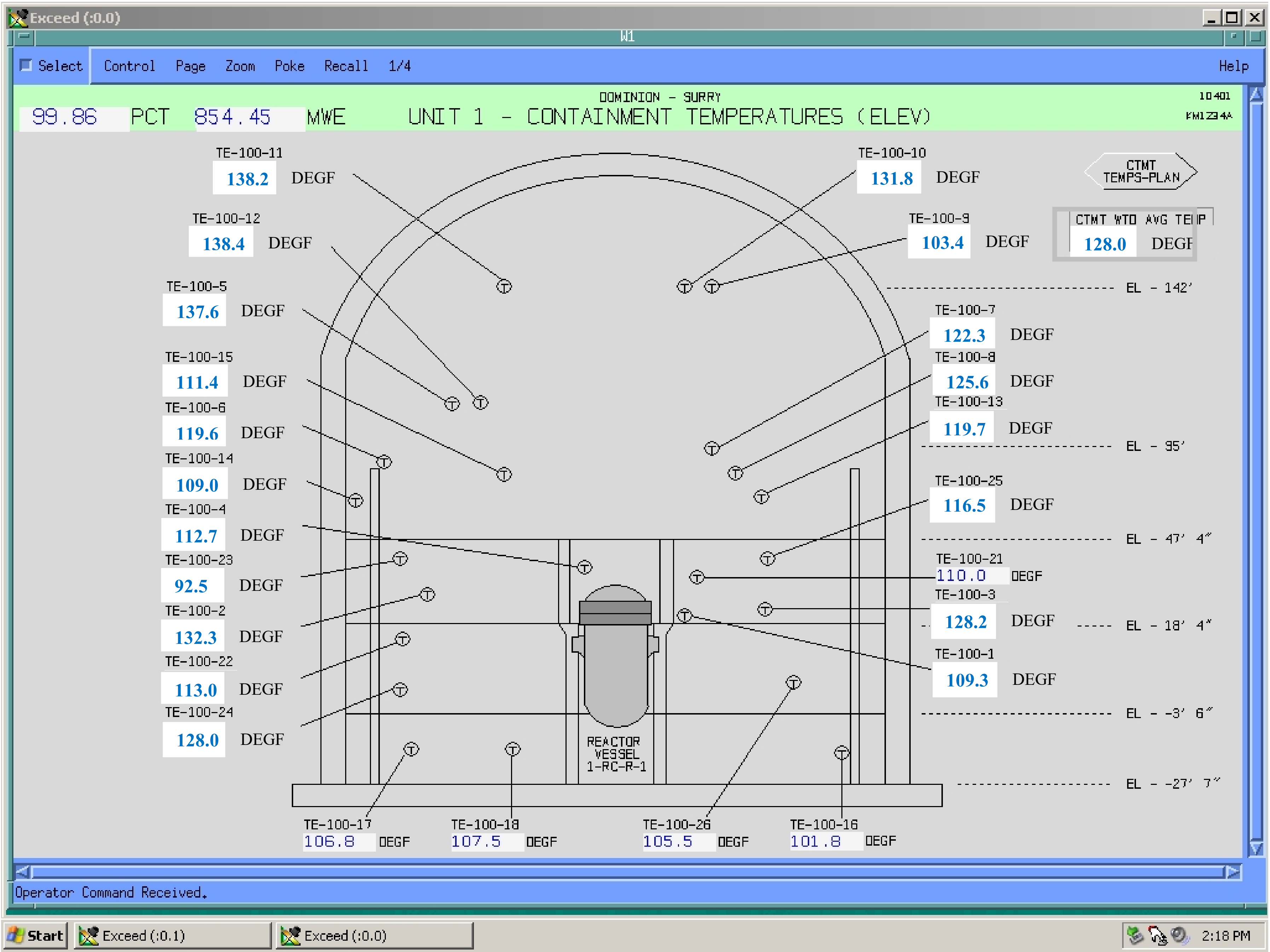
19. ___ WHEN containment partial pressure channels are operable, THEN secure from log readings in the associated attachment.

Date/Time	T_{cont2}	T_{cont1}	P_{air1}	P_{air2}	Initials

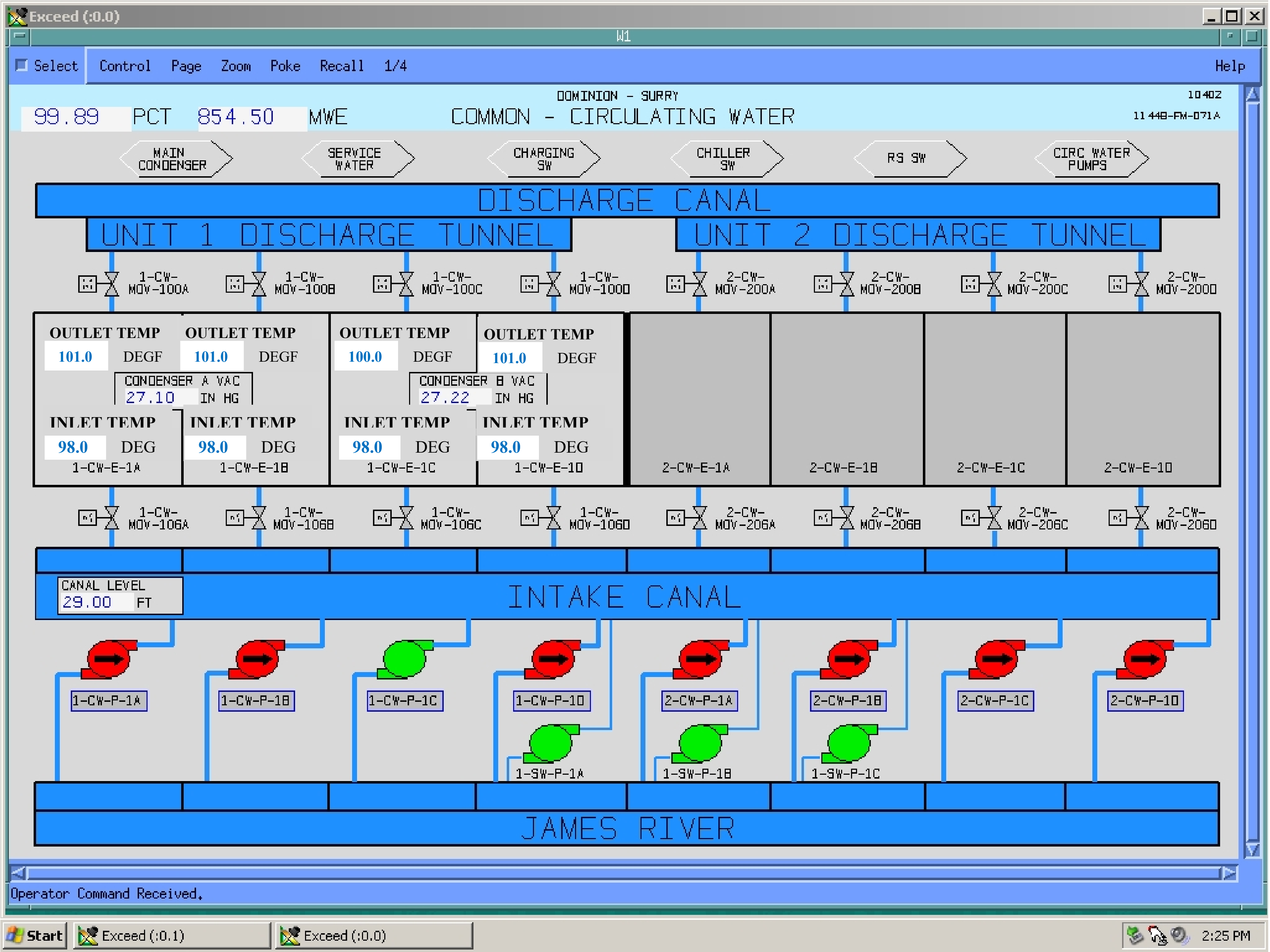
CONT PARTIAL PRESS CH1 *		
08/25/2021 21:00	10.25	Barttels, Joshua
08/25/2021 15:00	10.25	Dunlevy, James
08/25/2021 09:00	10.20	Goodman, Ian Blake
08/24/2021 03:00	10.20	Shcroth, John

CONT PARTIAL PRESS CH2 *		
08/25/2021 21:00	10.25	Barttels, Joshua
08/25/2021 15:00	10.20	Dunlevy, James
08/25/2021 09:00	10.19	Goodman, Ian Blake
08/24/2021 03:00	10.19	Shcroth, John

U0091 PCS WEIGHTED AVG CONT TEMP		
08/25/2021 21:00	118.38	Barttels, Joshua
08/25/2021 15:00	117.50	Dunlevy, James
08/25/2021 09:00	117.05	Goodman, Ian Blake
08/24/2021 03:00	116.20	Shcroth, John



Exceed (:0.0)
W1
Select
Control
Page
Zoom
Poke
Recall
1/4
Help
DOMINION - SURRY
99.86 PCT 854.45 MWE
UNIT 1 - CONTAINMENT TEMPERATURES (ELEV)
CTMT TEMPS-PLAN
CTMT WTD AVG TEMP 128.0 DEGF
TE-100-11 138.2 DEGF
TE-100-10 131.8 DEGF
TE-100-12 138.4 DEGF
TE-100-9 103.4 DEGF
TE-100-5 137.6 DEGF
EL - 142'
TE-100-7 122.3 DEGF
TE-100-15 111.4 DEGF
TE-100-8 125.6 DEGF
TE-100-6 119.6 DEGF
TE-100-13 119.7 DEGF
EL - 95'
TE-100-14 109.0 DEGF
TE-100-25 116.5 DEGF
TE-100-4 112.7 DEGF
EL - 47' 4"
TE-100-23 92.5 DEGF
TE-100-21 110.0 DEGF
TE-100-2 132.3 DEGF
TE-100-3 128.2 DEGF
EL - 18' 4"
TE-100-22 113.0 DEGF
TE-100-1 109.3 DEGF
TE-100-24 128.0 DEGF
EL - -3' 6"
REACTOR VESSEL 1-RC-R-1
EL - -27' 7"
TE-100-17 106.8 DEGF
TE-100-18 107.5 DEGF
TE-100-26 105.5 DEGF
TE-100-16 101.8 DEGF
Operator Command Received.
Start
Exceed (:0.1)
Exceed (:0.0)
2:18 PM


Exceed (:0.0)
W1
Select
Control
Page
Zoom
Poke
Recall
1/4
Help
DOMINION - SURRY
10402
99.89 PCT
854.50 MWE
COMMON - CIRCULATING WATER
11448-FM-071A
MAIN CONDENSER
SERVICE WATER
CHARGING SW
CHILLER SW
RS SW
CIRC WATER PUMPS
DISCHARGE CANAL
UNIT 1 DISCHARGE TUNNEL
UNIT 2 DISCHARGE TUNNEL
1-CW-MOV-100A
1-CW-MOV-100B
1-CW-MOV-100C
1-CW-MOV-100D
2-CW-MOV-200A
2-CW-MOV-200B
2-CW-MOV-200C
2-CW-MOV-200D
OUTLET TEMP
101.0 DEGF
OUTLET TEMP
101.0 DEGF
OUTLET TEMP
100.0 DEGF
OUTLET TEMP
101.0 DEGF
CONDENSER A VAC
27.10 IN HG
CONDENSER B VAC
27.22 IN HG
INLET TEMP
98.0 DEG
INLET TEMP
98.0 DEG
INLET TEMP
98.0 DEG
INLET TEMP
98.0 DEG
1-CW-E-1A
1-CW-E-1B
1-CW-E-1C
1-CW-E-1D
2-CW-E-1A
2-CW-E-1B
2-CW-E-1C
2-CW-E-1D
1-CW-MOV-106A
1-CW-MOV-106B
1-CW-MOV-106C
1-CW-MOV-106D
2-CW-MOV-206A
2-CW-MOV-206B
2-CW-MOV-206C
2-CW-MOV-206D
CANAL LEVEL
29.00 FT
INTAKE CANAL
1-CW-P-1A
1-CW-P-1B
1-CW-P-1C
1-CW-P-1D
2-CW-P-1A
2-CW-P-1B
2-CW-P-1C
2-CW-P-1D
1-SW-P-1A
1-SW-P-1B
1-SW-P-1C
JAMES RIVER
Operator Command Received.
Start
Exceed (:0.1)
Exceed (:0.0)
2:25 PM

U.S. Nuclear Regulatory Commission
Surry Power Station

SR19301
Administrative Job Performance Measure G2.4.44
TIME CRITICAL

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

CLASSIFY AN EVENT AND DETERMINE REQUIRED PAR ACTIONS

K/A: G2.4.41– Knowledge of the emergency action level thresholds and classifications. (2.9/4.6)
K/A: G2.4.44 – Knowledge of emergency plan protective action recommendations. (2.4/4.4)

Applicability	**Validation Time**	**Actual Time**
SRO ONLY	15 Minutes **(Time Critical)**	___________

Conditions

- Task is to be PERFORMED in the CLASSROOM.

Standards

- Classify EAL as RG1.2, General Emergency - Dose assessment using actual meteorology indicates doses > 1,000 mrem TEDE or 5,000 mrem adult thyroid CDE at or beyond the SITE BOUNDARY within 15 minutes.
- Determine PAR+ Evacuate 2 mile radious, and 2-5 miles downwind in sectors A, B, and C.
- Completes Attachment 3 correctly by including the following:
    - Check mark in Evacuate box. Fills in 2 mile radius and 2-5 miles downwing in sectors A, B, C.
    - Check mark in Recommend KI.
    - Signs for approval to transmit.

Initiating Cues

- EAL part: A Gaseous release is in progress. HP MIDAS data indicates TEDE dose of 1200 mrem and adult thyroid CDE dose of 4750 mrem at the site boundary.
- PAR part: A GE based on EAL RG 1.2 has just been declared.

Terminating Cues

- EPIP-1.06, Step 4 Completed.

Procedures

- EPIP-1.06, Protective Action Recommendations, Revision 11.

Tools and Equipment

- SEM EP Notebooks (3)

Safety Considerations

- None

Performance Checklist

Notes to the Evaluator.

- Task critical elements are **bolded**.
- This JPM includes two parts: Part 1 is the classification of EAL. Part 2 is Determine PAR. Part 2 is started after part 1 is completed.

MAKE SURE YOU PROVIDE THE CORRECT CUE SHEET (Part 1, LAST PAGE OF THIS JPM) FOR THE PORTION OF THE TASK TO BE PERFORMED.

- **TIME CRITICAL REQUIREMENT:**
  The EAL must be determined within 15 minutes after the applicant indicated he/she is ready.
  This PAR must be identified and relayed to Emergency Communicators within 15 minutes.
- **START TIME: ______________**

EAL STEP 1 **Evaluator's** note- candidate may choose to make EAL classification straight from EAL tables and NOT implement steps of EPIP-1.01. Steps are given here as guidance. Critical task time ends when classification determined regardless of determination method. Caution and Note prior to step 1. CAUTION: Declaration of the highest emergency class for which an Emergency Action Level is exceeded shall be made. NOTE: The PCS is potentially unreliable in the event of an earthquake. Therefore, PCS parameters should be evaluated for accuracy should an earthquake occur. Standards (a) Acknowledges CAUTION and NOTE Evaluator's Note Evaluator's Comments	_______ **SAT** _______ **UNSAT**

CRITICAL STEP **EAL STEP 1:**	
EVALUATE EMERGENCY ACTION LEVELS: a) Determine event category using the applicable Emergency Action Level Matrix: • Hot Conditions (RCS > 200 °F) b) Review EAL associated with event category (R) c) Verifies EAL Threshold is currently Exceeded. d) Verify EAL - CURRENTLY EXCEEDED e) Initiate a chronological log of events **Standards** **(a)** Refers to the HOT chart (b) Determines event category to Event R; Abnormal Rad Levels/Rad Effluent. (c) Verifies EAL threshold currently exceeded **(d) Determines EAL identifier to be RG1.2 General Emergency - Dose assessment using actual meteorology indicates doses > 1,000 mrem TEDE or 5,000 mrem adult thyroid CDE at or beyond the SITE BOUNDARY (Note 4). CRITICAL STEP** **(e)** Initiates (or verbalizes) a chronological log of events. **Evaluator's Note: If candidate makes EAL determination at this step, record stop time.** **Evaluator's Comments** **STOP TIME: ___________** **TIME CRITIAL- 15 minutes**	_______ **SAT** _______ **UNSAT**

CRITICAL STEP **EAL Step 2:** **RECORD EAL IDENTIFIER, TIME EMERGENCY DECLARED AND SM/SEM NAME.** **Standards** **(a) Determines that event is a General Emergency based on EAL RG1.2 Dose assessment using actual meteorology indicates doses > 1,000 mrem TEDE or 5,000 mrem adult thyroid CDE at or beyond the SITE BOUNDARY (Note 4). CRITICAL STEP** (b) Records EAL identifier, time and SEM name. **Evaluator's Note:** ▪ **If candidate makes EAL determination at this step, record stop time.** ▪ **If candidate makes an incorrect classification then end the JPM at this point.** **Evaluator's Comments** **STOP TIME: ___________** **TIME CRITIAL- 15 minutes**	_______ **SAT** _______ **UNSAT**

After completion of Part 1, Part 2 may commence in a <u>separate room</u>. The Evaluator should collect Part 1 of the JPM prior to reading the Cue statement for Part 2.

START TIME: _________________

PAR STEP 1 Obtains and Initiates EPIP-1.06. (*Step 1*) **STANDARD:** a) Obtains EPIP-1.06 from Station Emergency Manager binder. b) Acknowledges NOTE before Step 1 that Attachments 4 and 5 may be used for reference. c) Initiates procedure by filling out name, date, and time. **EVALUATOR'S NOTE:** • When asked: Provide SEM binder to applicant. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

PAR STEP 2 **CRITICAL STEP** USE ATTACHMENT 1, PROTECTIVE ACTION RECOMMENDATION FLOWCHART SPS, TO DETERMINE INITIAL PAR. (*Step 2*) **STANDARD:** a) Applicant uses Attachment 1 (flowchart) to determine the initial PAR. b) *Severe Accident* = NO c) *Hostile Action* = NO d) *Dose Assessment Available* = Yes **e) PAR = Evacuate: 2 mile radius and 2-5 miles downwind miles downwind. CRITICAL STEP** **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
PAR STEP 3 **CRITICAL STEP** IMPLEMENT ATTACHMENT 2, AFFECTED SECTOR(S) MAP. (*Step 3*) **STANDARD:** a) Acknowledges NOTE before Step 3 that Attachment 2 is used for EPIP-1.06 PARs only, not EPIP-4.07 PARs. b) Applicant implements Attachment 2 to determine affected sector(s). Applicant will round up 191.5 to 192. - Acknowledges NOTE regarding rounding of wind direction up or down. - Records time data acquired**.** - Records wind direction from 192°. - Records wind speed of 15 mph. - **Uses table to determine that the affected sectors are A, B, C and records on attachment. CRITICAL STEP** - Marks the affected sectors on map using pen, pencil, highlighter, etc. **EVALUATOR'S NOTE:** **COMMENTS**	_______ **SAT** _______ **UNSAT**

PAR STEP 4 COMPLETE ATACHMENT 3, REPORT OF PROTECTIVE ACTION RECOMMENDATION. (*Step 4 and Attachment 3*) **STANDARD:** **Applicant completes Attachment 3:** − Records #1 in PAR MESSAGE space. − Acknowledges NOTES to transmit PAR to Virginia EOC only using ARD, autodial, or direct dial. Only use Insta-Phone if all other methods of contacting VEOC are non-functional. − Places check mark in “Drill Message” box, or “Emergency Message for Protective Actions” box. − **Places check mark in “EVACUATE” box. Fills in (0-2) Mile radius 360° and 5 (2-5) miles downwind in the following sectors: A, B, C. CRITICAL STEP** − **Places check mark in “Recommend implementation of Potassium Iodide (KI) for general public. CRITICAL STEP** − Acknowledges NOTE in REMARKS block regarding Shelter-in-Place recommendations. − Record Notes (Optional). − **Signs for approval to transmit. CRITICAL STEP** Records current date and time. **EVALUATOR’S NOTE:** **This step must be complete within 15 minutes of start of task.** **Record STOP Time: ______** **COMMENTS**	_______ **SAT** _______ **UNSAT**

Stop Time:__________

____

____

____

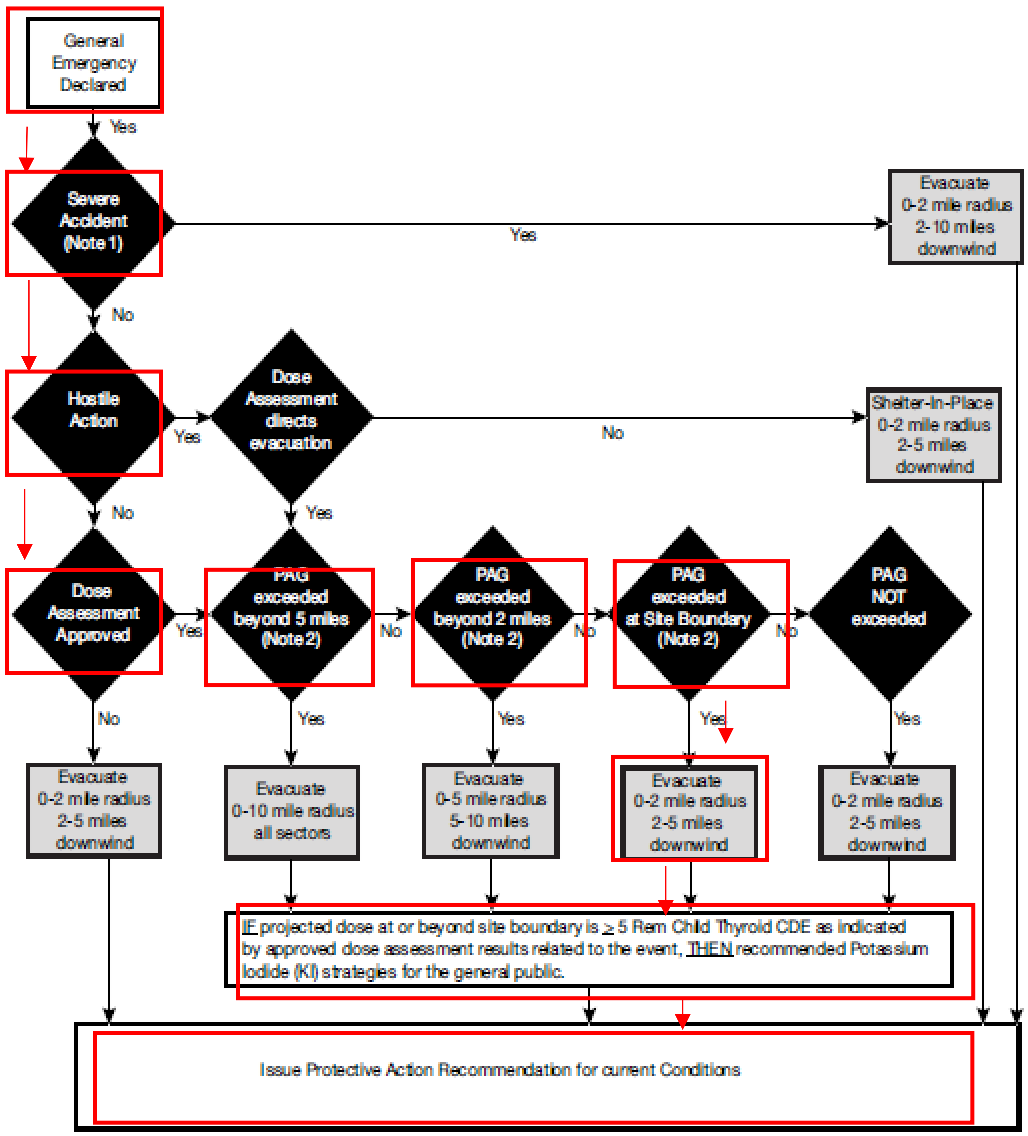
____

____

____

EXAMINER KEY

NUMBER EPIP-1.06	ATTACHMENT TITLE PROTECTIVE ACTION RECOMMENDATION FLOWCHART SPS	ATTACHMENT 1
REVISION 14		PAGE 1 of 1



Note 1:
Severe Accident Conditions
• CSFST Core Cooling RED
AND
• Any Containment Loss Fission Product Barrier threshold met

Note 2:
EPA Protective Action Guides (PAGs)
• ≥1 Rem TEDE
OR
• ≥ 5 Rem Adult Thyroid CDE

Graphics No: MT2068C

EXAMINER KEY

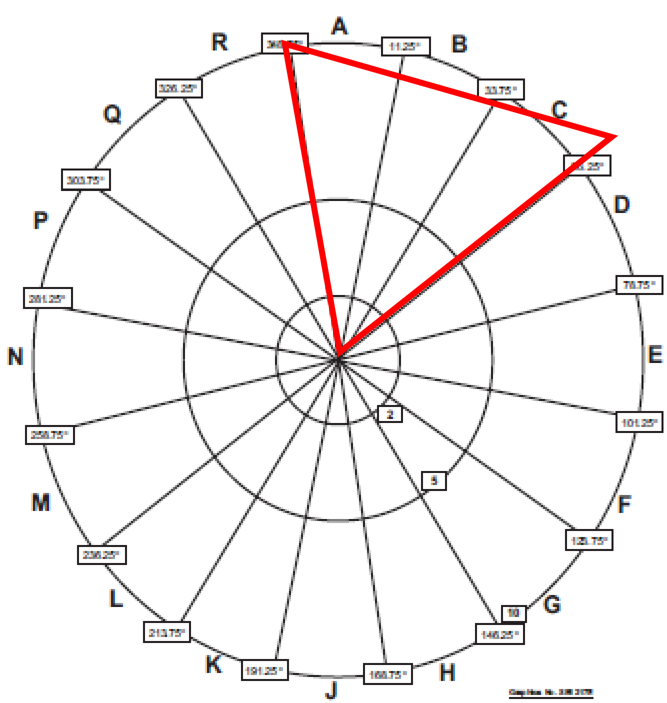
NUMBER EPIP-1.06	ATTACHMENT TITLE	ATTACHMENT 2
REVISION 14	AFFECTED SECTOR(S) MAP	PAGE 1 of 1

NOTE: Rounding shall be used when determining affected sectors using wind direction.
For example: Wind Direction (degrees from) 11.5 to 11.9 would be rounded up to 12.0.
Wind Direction (degrees from) 11.1 to 11.4 would be rounded down to 11.0.

Average Wind Direction Data:

At Time, Wind Direction From 191.5, Sectors A, B, C
(24-hr time) (degrees)

At ____________, Wind Direction From ____________, Sectors ______________
(24-hr time) (degrees)



AVERAGE WIND DIRECTION (Degrees) From	AFFECTED SECTORS
349 - 11	H, J, K
12 - 33	J, K, L
34 - 56	K, L, M
57 - 78	L, M, N
79 - 101	M, N, P
102 - 123	N, P, Q
124 - 146	P, Q, R
147 - 168	Q, R, A
169 - 191	R, A, B
192 - 213	A, B, C
214 - 236	B, C, D
237 - 258	C, D, E
259 - 281	D, E, F
282 - 303	E, F, G
304 - 326	F, G, H
327 - 348	G, H, J

EXAMINER KEY

NUMBER EPIP-1.06	ATTACHMENT TITLE REPORT OF PROTECTIVE ACTION RECOMMENDATION	ATTACHMENT 3
REVISION 14		PAGE 1 of 1

PAR MESSAGE # 1

NOTE: • Transmit to Virginia EOC only using one of the following:

- VEOC ARD
- VEOC Autodial pushbutton alternative: (804) 674-2400 or (804) 310-8868
- CERC Only - VEOC Pushbutton (direct dial - (804) 674-2400), VEOC Alternate Pushbutton (direct dial - (804) 674-2300), VEOC Cell Pushbutton (direct dial - (804) 310-8868)
- IF all means of communications with VEOC nonfunctional, THEN use **S&L ALL CALL** button

This is Surry Power Station with a(n) ☒ Drill Message ☐ Emergency Message for Protective Action Recommendation. **Use the Report of Protective Action Recommendation form to copy this message.**

(READ SLOWLY)

PROTECTIVE ACTION RECOMMENDATION:

☐ SHELTER-IN-PLACE: ____ Mile radius 360° and ____ Miles downwind in the following sectors:

____

☒ EVACUATE: 2 Mile radius 360° and 5 Miles downwind in the following sectors:
A, B, C.

☐ BEYOND 10 MILE EPZ:

☐ Evacuate Area: _____ Centerline in degrees; _____Distance in Miles; _____ Width in feet

☐ Shelter-in-place: _____ Centerline in degrees; _____Distance in Miles; _____ Width in feet

☒ POTASSIUM IODIDE:

Recommend implementation of Potassium Iodide (KI) strategies for the general public. The projected dose at the site boundary is ≥ 5 Rem Child Thyroid CDE.

The time is ______________ (24-hr time).

This is ______________________________ / Emergency Communicator.

Message received by: Virginia EOC contact (name) ______________________.

This is Surry Power Station out at ______________ (24-hr time) on ______________ (date).

REMARKS (OPTIONAL) / APPROVAL INFORMATION [DO NOT READ]

NOTE: Shelter-in-Place may be recommended as a result of evacuation impediments (e.g., Hostile Action events).

REMARKS: ______________________________

APPROVED BY: Applicant Signature / Today / Now

Station Emergency Manager or Technical Support Manager **Date** **Time**

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER AFTER COMPLETION OF PART 1)

Initial Conditions

- A General Emergency based on EAL RG1.2 has just been declared (*use current date/time*).
- CETC temperature is 580 °F.
- The State and Local Communicator has determined wind direction to be from 191.5° and wind speed to be 15 mph.
- On site and Off site Dose Assessment teams have been dispatched.
- The RAD reports the following dose at the Site boundary and 2 mile locations from the Dose monitoring teams:

	Site Boundary	**2 miles**
TEDE	1.05 REM	0.9 REM
Adult Thyroid CDE	3.4 REM	2.2 REM
Child Thyroid CDE	5.1 REM	3.3 REM

Initiating Cues

- **This JPM is TIME CRITICAL.**
- You are to determine the Protective Action Recommendations, by performing steps 1-4 of EPIP-1.06, Report of Protective Action Recommendations.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- A General Emergency based on EAL RG1.2 has just been declared (*use current date/time*).
- CETC temperature is 580 °F.
- The State and Local Communicator has determined wind direction to be from 191.5° and wind speed to be 15 mph.
- On site and Off site Dose Assessment teams have been dispatched.
- The RAD reports the following dose at the Site boundary and 2 mile locations from the Dose monitoring teams:

	Site Boundary	**2 miles**
TEDE	1.05 REM	0.9 REM
Adult Thyroid CDE	3.4 REM	2.2 REM
Child Thyroid CDE	5.1 REM	3.3 REM

Initiating Cues

- **This JPM is TIME CRITICAL.**
- You are to determine the Protective Action Recommendations, by performing steps 1-4 of EPIP-1.06, Report of Protective Action Recommendations.

PAR MESSAGE # ________

NOTE: • Transmit to Virginia EOC only using one of the following:
- VEOC ARD
- VEOC Autodial pushbutton alternative: (804) 674-2400 or (804) 310-8868
- CERC Only - VEOC Pushbutton (direct dial - (804) 674-2400), VEOC Alternate Pushbutton (direct dial - (804) 674-2300), VEOC Cell Pushbutton (direct dial - (804) 310-8868)
- IF all means of communications with VEOC nonfunctional, THEN use **S&L ALL CALL** button

This is Surry Power Station with a(n) ☐ Drill Message ☐ Emergency Message for Protective Action Recommendation. **Use the Report of Protective Action Recommendation form to copy this message.**

(READ SLOWLY)

PROTECTIVE ACTION RECOMMENDATION:

☐ SHELTER-IN-PLACE: ____ Mile radius 360° and ____ Miles downwind in the following sectors:

____.

☐ EVACUATE: ____ Mile radius 360° and ____ Miles downwind in the following sectors:

____.

☐ BEYOND 10 MILE EPZ:

☐ Evacuate Area: _____ Centerline in degrees; _____Distance in Miles; _____ Width in feet

☐ Shelter-in-place: ____ Centerline in degrees; _____Distance in Miles; _____ Width in feet

☐ POTASSIUM IODIDE:

Recommend implementation of Potassium Iodide (KI) strategies for the general public.
The projected dose at the site boundary is $\geq$ 5 Rem Child Thyroid CDE.

The time is _____________ (24-hr time).

This is ____ / Emergency Communicator.

Message received by: Virginia EOC contact (name) ______________________________.

This is Surry Power Station out at ________________ (24-hr time) on ___________________ (date).

REMARKS (OPTIONAL) / APPROVAL INFORMATION [DO NOT READ]

NOTE: Shelter-in-Place may be recommended as a result of evacuation impediments (e.g., Hostile Action events).

REMARKS: ____

____

APPROVED BY: ____________________________________ ____________ / ________

Station Emergency Manager or Technical Support Manager **Date** **Time**

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER PART 1)

Initial Conditions

- Both Units are operating at 100%.
- A gaseous release is in progress.
- Annunciator RMA-D7 (Vent Stack #2 Normal Range Gas Alert/High) is in alarm.
- Vent #2 Gas Indicator radiation monitor 1-GW-RI-131B is indicating 7.0×10^7 µCi/sec.
- HP MIDAS data, using live on-site meteorology, indicates TEDE dose of 1200 mRem and adult thyroid CDE dose of 4750 mRem at the site boundary.

Initiating Cues

- **This JPM is TIME CRITICAL.**
- You are to CLASSIFY the EAL in accordance with EPIP-1.01, EMERGENCY MANATER CONTROLLING PROCEDURE.
- Write your name and EAL in the space provided below, and inform me when you have finished.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- Both Units are operating at 100%.
- A gaseous release is in progress.
- Annunciator RMA-D7 (Vent Stack #2 Normal Range Gas Alert/High) is in alarm.
- Vent #2 Gas Indicator radiation monitor 1-GW-RI-131B is indicating 7.0×10^7 µCi/sec.
- HP MIDAS data, using live on-site meteorology, indicates TEDE dose of 1200 mRem and adult thyroid CDE dose of 4750 mRem at the site boundary.

Initiating Cues

- **This JPM is TIME CRITICAL.**
- You are to CLASSIFY the EAL in accordance with EPIP-1.01, EMERGENCY MANATER CONTROLLING PROCEDURE.
- Write your name and EAL in the space provided below, and inform me when you have finished.

NAME ________________________________

EAL_________

U.S. Nuclear Regulatory Commission
Surry Power Station

SR2014301
Administrative Job Performance Measure 2.3.13

Applicant________________________________ Start Time___________________

Examiner_______________________________

Date ___________________________________ Stop Time___________________

Title

Perform Containment Entry Checklist

K/A: G2.3.13 - Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (3.4/3.8)

Applicability	**Estimated Time**	**Actual Time**
SRO(I)/SRO(U)	20 Minutes	

Initial Conditions

- Task is PERFORMED in the CLASSROOM.

Standards

- Determines Incore detectors are not tagged out as required.
- Determines next Containment entry will exceed Tech Spec 3.8.B.1.b. limits

Initiating Cues

Given simulated plant conditions, perform Attachment 1 of VPAP-0106, Subatmospheric Containment Entry, to evaluate preparation for Containment Entry and Technical Specification Compliance.

Terminating Cues

- VPAP-0106, attachment 1 assessment complete.

Procedures

- VPAP-0106, Subatmospheric Containment Entry.
- Tech Spec 3.8

Tools and Equipment

- VPAP-0106
- Tech Specs

Safety Considerations

- None

Terminating Cues

- Applicant has completed the attachment, discussed results and problems with examiner, and determined the next Containment entry cannot be performed as stated.

Tools and Equipment

- VPAP-0106, Attachment 1
- Technical Specifications
- RWP 1012

Safety Considerations

- None

Notes

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and noted by the words “Critical Step” at the end of the step.
- The Applicant is given an initiated copy of VPAP-0106 Attachment 1.
- A laptop will be Available for the Applicant.
- Task critical elements are bolded and denoted by an asterisk (*).
- **START TIME: ________________**

STEP 1: Review of Part 1 of VPAP-0106 Attachment 1. **STANDARD:** (a) Starts review of Attachment 1, starting at Part 1. (b) Identifies no discrepancies in Part 1. **EVALUATOR’S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 2: **CRITICAL STEP** Review of Part 2 of VPAP-0106 Attachment 1. **STANDARD:** (a) Determines total Outer Door open time will be 62 minutes after the next entry. **(b) Based on the Note in the same section, determines the estimated Outer Door times for the next entry will exceed the cumulative limit of one hour per year.** **EVALUATOR'S NOTE:** • **<u>If notified</u>** that the cumulative Outer Door open time will exceed the one hour limit, inform the Applicant that the times for the next entry are being re-evaluated, and direct them to continue the review of Attachment 1 Parts 1 through 4. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 3: **CRITICAL STEP** Review of Parts 3 and 4 of VPAP-0106 Attachment 1. **STANDARD:** (a) Completes review of Part 3 of Attachment 1 with no discrepancies. (b) Ensures no other actions are underway or scheduled which may change containment conditions during the entry. **(c) Identifies Tag-Out of incore detectors is NOT hung in accordance with OP-AA-200, Equipment Clearance**, based on Initial conditions and the "N/A" entered for this item in Part 4. **EVALUATOR NOTES:** • **If asked:** there are no other activities underway or scheduled that may impact containment conditions. • **If asked:** inform the Applicant the tag has been removed from the Unit 2 incore detector system to support Unit 2 flux mapping. • **When notified** that the incore detectors are not properly tagged out, inform the Applicant that another SRO will pursue removal of the Temp Lift. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 17: Reports to Shift Manager that review is complete **STANDARD:** (a) Reports the Unit 2 Containment entry cannot be made at this time. (b) Submits the list of discrepancies. **EVALUATOR NOTES:** • An answer key is provided in this JPM with the list of discrepancies. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STOP TIME____:

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Dominion Energy

Containment Entry Checklist

VPAP-0106 – Attachment 1 Page 1 of 4

Part 1 - Completed by Responsible Supervisor

☐ Unit 1 ☑ Unit 2	Date [TODAY]	Estimated Time of Entry 1500	Radiation Work Permit (RWP) Number 21-0-1012-1

List personnel designated for Containment Entry Team

Note: Containment Entry Team minimum composition is two and maximum composition is fifteen people.

Name (Please Print)	Signature	DLR Number	Containment Entry Training Satisfactorily Completed
Marvin Hebb	[signature]	8421	☑ Yes ☐ No
Matthew R Davis	[signature]	16103	☑ Yes ☐ No
Martin Connelly	[signature]	12592	☑ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No

Containment Entry Team Leader (Name - Please Print)
Marvin Hebb

Permission granted by Site Vice President, Plant Manager (Nuclear), or Director Nuclear Station Safety and Licensing (Name - Please Print) DOUG LAWRENCE

If any Containment Entry Team Member is not Trained, List Reason Why and Designate Escort ☑ N/A

Reason for Entry and Work to be Performed
Repair inner door seal on Unit 2 Containment personnel hatch

Responsible Supervisor (Signature)	Date
[signature]	[TODAY]

Key: DLR- Dosimeter of Legal Record; SCBA-Self Contained Breathing Apparatus; psia-pounds per square inch absolute; LOCA-Loss of Coolant Accident

Form No. 722650(Sep 2020)

Dominion Energy

Containment Entry Checklist

Part 2 - Completed by Shift Manager

List personnel designated for Containment Emergency Team

Note: Containment Emergency Team members must satisfy training requirements in Step 6.2.2. Two members are required.

Name (Please Print)	Signature	DLR Number
Richard Downs	[signature]	12103
R.J. Simmons	[signature]	12644
David Day	Dave Day	2502

Permission granted by Site VP, Plant Manager (Nuclear), or Director NSS&L - Ensure ALL Crafts Have Obtained Permission (Name - Please Print) DOUG LAWRENCE

Containment Pressure: 10.2 psia

SCBA Required? ☑ YES ☐ NO

Is personnel air lock operable? ☐ YES ☑ NO

If inner door is inoperable due to leakage, record time outer door is opened and place entry in Action Statement Log. (Surry) Mark "N/A" if not applicable.

	Entry	Exit
Outer Door Open:	minutes	minutes
Outer Door Closed:	minutes	minutes
Total Time:	minutes	minutes

Note: If entry through outer door, do not open for greater than fifteen minutes with total accumulated time remaining less than one hour per year. (Surry)

Shift Manager (Signature) | Date

Part 3 - Completed By Containment Entry Team Leader

Stay-time: Radiological Protection Evaluation 1.4E7 Minutes

Containment Entry Team Leader (Signature) [signature] | Date [TODAY]

Key: **DLR- Dosimeter of Legal Record; SCBA-Self Contained Breathing Apparatus; psia-pounds per square inch absolute; LOCA-Loss of Coolant Accident**

Dominion Energy

Containment Entry Checklist

VPAP-0106 – Attachment 1 Page 3 of 4

Part 4 - Containment Pre-Entry Checklist	
Shift Manager (Initials) A	Ensure no other activities are underway or scheduled which may change containment conditions during entry.
Shift Manager or Unit Supervisor (Initials)	Brief Containment Entry Team and Containment Emergency Team on work to be performed, contingency actions, condition of Personnel Air-Lock, Equipment Hatch escape lock, containment elevator, and stay-time.
Shift Manager (Initials) N/A	Tag-Out of incore detectors in accordance with OP-AA-200, Equipment Clearance.
Containment Entry Team Leader (Initials) M	Review requirement to check respiratory equipment satisfactory (check for thirty-five percent oxygen, straps and rigging, bottle pressure, mask fit, unit operates, bypass operates).
Containment Entry Team Leader (Initials)	Stress during pre-entry briefing: ☐ Hand signal for exiting containment ☐ Self determination ☐ Buddy system ☐ Fluid replacement ☐ Work scheduling/pacing ☐ Rest requirements ☐ Use of ice vests (optional) ☐ 60 minute limit ☐ Signs of heat exhaustion: Cool, pale, clammy skin, profuse sweating, weakness, dizziness, or nausea ☐ Signs of heat stroke: Hot, dry and flushed skin, no sweating, confusion, convulsions or unconsciousness, elevated body temperature ☐ How to notify the control room if personnel must exit containment via the emergency escape lock.
Containment Entry Team Leader (Initials) M	Checked out containment over-ride key and watch, if required.
Containment Entry Team Leader (Initials) N/A M	For work in, over, or adjacent to Containment Recirculation Sump or Strainer, a **HIGH RISK PLAN** is **REQUIRED** as per MA-AA-102, Foreign Material Exclusion.
Containment Entry Team Leader (Initials) M	Review concerns noted on Containment Entry Debrief Status/Board.
Containment Entry Team Leader (Initials) M	Containment lights on, notify Shift Manager of entry and requirement to enter Containment Hatch in the Action Statement Log.
Containment Entry Team Leader (Initials) M	Ensure equipment to remain in containment has been discussed and identified. All items left in containment must have Station Engineering written approval. At North Anna, FSRC approval is also required.
Containment Entry Team Leader (Initials) M	Ensure instructions have been given for prior-to-use inspection of portable ladders located in containment. Instructions should be in accordance with station inspection procedures.
RP Supervisor (Initials) N/A	Ensure RP Supervisor, or designee, is signed on as Tag Out Holder for Incore Detector tag out.
RP Supervisor (Initials)	Brief Containment Entry Team and Containment Emergency Team on radiological conditions, use of radio communications, minimum pressure for the type of SCBA being used, and expected use/duration time for the type of SCBA being used.
RP Supervisor (Initials)	Discuss contingency plan and assigned personnel for removing disabling devices from the equipment hatch escape lock in the event this pathway must be used to exit containment in an emergency. (Cable ties at NAPS and strong backs at SPS)
RP Supervisor (Initials) N/A	For entry inside containment "bioshield" areas or reactor cavity with reactor critical, a **HIGH RADIOLOGICAL RISK PLAN** is **REQUIRED** as per RP-AA-275, Radiological Risk Assessment Process.

Dominion Energy

Containment Entry Checklist

Part 5 - Containment Exit Checklist	
Shift Manager (Initials)	Ensure the Containment Status Control Board is updated.
Shift Manager (Initials)	Tag-Out removed from incore detectors in accordance with OP-AA-200, Equipment Clearance (N/A if not required to be removed).
Containment Entry Team Leader or Unit Supervisor (Initials)	Fill in required information: **Note:** Stay-time commences when inner door is opened. Entry Time Exit Time Actual Stay-Time
Containment Entry Team Leader (Initials)	Inspect affected areas within containment for loose debris which could cause restriction of containment recirculation pump suction during LOCA conditions. Remove as necessary.
Containment Entry Team Leader (Initials)	Notify Shift Manager of containment exit.
Containment Entry Team Leader (Initials)	Return containment elevator over-ride key (N/A if not required).
Containment Entry Team Leader (Initials)	Containment lights turned off (mark N/A if other Containment Entry Team entries are in progress or planned).
Containment Entry Team Leader (Initials)	Only equipment identified during pre-job briefing has been left in containment. All other equipment taken into containment has been removed. If not, then notify Shift Supervisor and do the following at respective station: **North Anna** • Inform responsible supervisor additional equipment has been left in containment. • Submit Condition Report (CR) • Responsible supervisor obtain written approval from Station Engineering and FSRC approval for equipment to remain in containment or remove equipment from containment **Surry** • Submit Condition Report (CR) • Inform responsible supervisor no other entry is planned and have him/her obtain written approval from Station Engineering for equipment to remain in containment **OR** **Inform responsible supervisor additional entries will be made to complete task.**
RP Supervisor (Initials)	Conduct debriefing.
RP Supervisor (Initials)	Ensure equipment hatch disabling devices have been reinstalled if removed.

Part 6 - Completed By RP Supervisor or Unit Supervisor	
Completed By (Signature)	Date

Key: **DLR- Dosimeter of Legal Record; SCBA-Self Contained Breathing Apparatus; psia-pounds per square inch absolute; LOCA-Loss of Coolant Accident**

EXAMINER ANSWER KEY

Unit 2 Containment Entry IS / IS NOT permitted (circle ONE)

Unresolved conflicts:

1. **Cumulative Outer door total accumulated open time will exceed 1 hour/year.**
2. **Incore detectors are not tagged out as required.**

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions:

- Unit 2 is at 100% power.
- The Unit 2 containment personnel hatch is inoperable due to excessive inner door seal leakage.
- Multiple U2 Containment entries have been made this week, to support investigation and repair of the Inner Door seal.
- Unit 2 flux mapping has just commenced to satisfy a Tech Spec requirement.
- Current Unit 2 Containment personnel hatch status is as follows:
    - The last Unit 2 Containment entry was performed last shift.
    - The Outer Door has been open this week for a cumulative time of 50 minutes.
- The projected Outer door open times are as follows for the next Containment entry:
    - During Personnel Hatch entry, the Outer door will be open for 5 minutes.
    - During Personnel Hatch exit, the Outer door will be open for 7 minutes.
- The SRO who had the roles of Responsible Supervisor/Shift Manager for the next Unit 2 Containment entry had to leave the station.

Initiating Cues

- A new VPAP-0106 Attachment 1, Containment Entry Checklist, has been initiated.
- You have been directed to assume the roles of Responsible Supervisor/Shift Manager for the next Unit 2 Containment entry.
- You are to review all portions of Parts 1 through 4 of VPAP-0106 Attachment 1. Immediately after your review of Attachment 1, the team will conduct the Pre-Job Brief and subsequent Unit 2 Containment entry.
- Document the following on the provided handout:
    - Whether or not Unit 2 Containment Entry is permitted.
    - If any, list unresolved conflicts identified in Attachment 1.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions:

- Unit 2 is at 100% power.
- The Unit 2 containment personnel hatch is inoperable due to excessive inner door seal leakage.
- Multiple U2 Containment entries have been made this week, to support investigation and repair of the Inner Door seal.
- Unit 2 flux mapping has just commenced to satisfy a Tech Spec requirement.
- Current Unit 2 Containment personnel hatch status is as follows:
    - The last Unit 2 Containment entry was performed last shift.
    - The Outer Door has been open this week for a cumulative time of 50 minutes.
- The projected Outer door open times are as follows for the next Containment entry:
    - During Personnel Hatch entry, the Outer door will be open for 5 minutes.
    - During Personnel Hatch exit, the Outer door will be open for 7 minutes.
- The SRO who had the roles of Responsible Supervisor/Shift Manager for the next Unit 2 Containment entry had to leave the station.

Initiating Cues

- A new VPAP-0106 Attachment 1, Containment Entry Checklist, has been initiated.
- You have been directed to assume the roles of Responsible Supervisor/Shift Manager for the next Unit 2 Containment entry.
- You are to review all portions of Parts 1 through 4 of VPAP-0106 Attachment 1. Immediately after your review of Attachment 1, the team will conduct the Pre-Job Brief and subsequent Unit 2 Containment entry.
- Document the following on the provided handout:
    - Whether or not Unit 2 Containment Entry is permitted.
    - If any, list unresolved conflicts identified in Attachment 1.

Applicant name: ____________________________

Unit 2 Containment Entry IS / IS NOT permitted (circle ONE)

Unresolved conflicts, if any, identified in VPAP-0106 Attachment 1:

____

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Dominion Energy

Containment Entry Checklist

VPAP-0106 – Attachment 1 Page 1 of 4

Part 1 - Completed by Responsible Supervisor

☐ Unit 1 ☑ Unit 2	Date [TODAY]	Estimated Time of Entry 1500	Radiation Work Permit (RWP) Number 21-0-1012-1

List personnel designated for Containment Entry Team

Note: Containment Entry Team minimum composition is two and maximum composition is fifteen people.

Name (Please Print)	Signature	DLR Number	Containment Entry Training Satisfactorily Completed
Marvin Hebb	[signature]	8421	☑ Yes ☐ No
Matthew R Davis	[signature]	16103	☑ Yes ☐ No
Martin Connelly	[signature]	12592	☑ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No

Containment Entry Team Leader (Name - Please Print)
Marvin Hebb

Permission granted by Site Vice President, Plant Manager (Nuclear), or Director Nuclear Station Safety and Licensing
(Name - Please Print) DOUG LAWRENCE

If any Containment Entry Team Member is not Trained, List Reason Why and Designate Escort ☑ N/A

Reason for Entry and Work to be Performed
Repair inner door seal on Unit 2 Containment personnel hatch

Responsible Supervisor (Signature)	Date
[signature]	[TODAY]

Dominion Energy

Containment Entry Checklist

Part 2 - Completed by Shift Manager

List personnel designated for Containment Emergency Team

Note: Containment Emergency Team members must satisfy training requirements in Step 6.2.2. Two members are required.

Name (Please Print)	Signature	DLR Number
Richard Downs	[signature]	12103
R.J. Simmons	[signature]	12644
David Day	Dave Day	2502

Permission granted by Site VP, Plant Manager (Nuclear), or Director NSS&L - Ensure ALL Crafts Have Obtained Permission (Name - Please Print) DOUG LAWRENCE

Containment Pressure: 10.7 psia

SCBA Required? ☑ YES ☐ NO

Is personnel air lock operable? ☐ YES ☑ NO

If inner door is inoperable due to leakage, record time outer door is opened and place entry in Action Statement Log. (Surry) Mark "N/A" if not applicable.

	Entry	Exit
Outer Door Open:	minutes	minutes
Outer Door Closed:	minutes	minutes
Total Time:	minutes	minutes

Note: If entry through outer door, do not open for greater than fifteen minutes with total accumulated time remaining less than one hour per year. (Surry)

Shift Manager (Signature)	Date

Part 3 - Completed By Containment Entry Team Leader

Stay-time: Radiological Protection Evaluation 1.4E7 Minutes

Containment Entry Team Leader (Signature)	Date
[signature]	[TODAY]

Key: DLR- Dosimeter of Legal Record; SCBA-Self Contained Breathing Apparatus; psia-pounds per square inch absolute; LOCA-Loss of Coolant Accident

Dominion Energy

Containment Entry Checklist

VPAP-0106 – Attachment 1 Page 3 of 4

Part 4 - Containment Pre-Entry Checklist	
Shift Manager (Initials) A	Ensure no other activities are underway or scheduled which may change containment conditions during entry.
Shift Manager or Unit Supervisor (Initials)	Brief Containment Entry Team and Containment Emergency Team on work to be performed, contingency actions, condition of Personnel Air-Lock, Equipment Hatch escape lock, containment elevator, and stay-time.
Shift Manager (Initials) N/A	Tag-Out of incore detectors in accordance with OP-AA-200, Equipment Clearance.
Containment Entry Team Leader (Initials) M	Review requirement to check respiratory equipment satisfactory (check for thirty-five percent oxygen, straps and rigging, bottle pressure, mask fit, unit operates, bypass operates).
Containment Entry Team Leader (Initials)	Stress during pre-entry briefing: ☐ Hand signal for exiting containment ☐ Self determination ☐ Buddy system ☐ Fluid replacement ☐ Work scheduling/pacing ☐ Rest requirements ☐ Use of ice vests (optional) ☐ 60 minute limit ☐ Signs of heat exhaustion: Cool, pale, clammy skin, profuse sweating, weakness, dizziness, or nausea ☐ Signs of heat stroke: Hot, dry and flushed skin, no sweating, confusion, convulsions or unconsciousness, elevated body temperature ☐ How to notify the control room if personnel must exit containment via the emergency escape lock.
Containment Entry Team Leader (Initials) M	Checked out containment over-ride key and watch, if required.
Containment Entry Team Leader (Initials) N/A	For work in, over, or adjacent to Containment Recirculation Sump or Strainer, a **HIGH RISK PLAN** is **REQUIRED** as per MA-AA-102, Foreign Material Exclusion.
Containment Entry Team Leader (Initials) M	Review concerns noted on Containment Entry Debrief Status/Board.
Containment Entry Team Leader (Initials) M	Containment lights on, notify Shift Manager of entry and requirement to enter Containment Hatch in the Action Statement Log.
Containment Entry Team Leader (Initials) M	Ensure equipment to remain in containment has been discussed and identified. All items left in containment must have Station Engineering written approval. At North Anna, FSRC approval is also required.
Containment Entry Team Leader (Initials) M	Ensure instructions have been given for prior-to-use inspection of portable ladders located in containment. Instructions should be in accordance with station inspection procedures.
RP Supervisor (Initials) N/A	Ensure RP Supervisor, or designee, is signed on as Tag Out Holder for Incore Detector tag out.
RP Supervisor (Initials)	Brief Containment Entry Team and Containment Emergency Team on radiological conditions, use of radio communications, minimum pressure for the type of SCBA being used, and expected use/duration time for the type of SCBA being used.
RP Supervisor (Initials)	Discuss contingency plan and assigned personnel for removing disabling devices from the equipment hatch escape lock in the event this pathway must be used to exit containment in an emergency. (Cable ties at NAPS and strong backs at SPS)
RP Supervisor (Initials) N/A	For entry inside containment "bioshield" areas or reactor cavity with reactor critical, a **HIGH RADIOLOGICAL RISK PLAN** is **REQUIRED** as per RP-AA-275, Radiological Risk Assessment Process.

Key: DLR- Dosimeter of Legal Record; SCBA-Self Contained Breathing Apparatus; psia-pounds per square inch absolute; LOCA-Loss of Coolant Accident

Dominion Energy

Containment Entry Checklist

Part 5 - Containment Exit Checklist	
Shift Manager (Initials)	Ensure the Containment Status Control Board is updated.
Shift Manager (Initials)	Tag-Out removed from incore detectors in accordance with OP-AA-200, Equipment Clearance (N/A if not required to be removed).
Containment Entry Team Leader or Unit Supervisor (Initials)	Fill in required information: **Note:** Stay-time commences when inner door is opened. Entry Time Exit Time Actual Stay-Time
Containment Entry Team Leader (Initials)	Inspect affected areas within containment for loose debris which could cause restriction of containment recirculation pump suction during LOCA conditions. Remove as necessary.
Containment Entry Team Leader (Initials)	Notify Shift Manager of containment exit.
Containment Entry Team Leader (Initials)	Return containment elevator over-ride key (N/A if not required).
Containment Entry Team Leader (Initials)	Containment lights turned off (mark N/A if other Containment Entry Team entries are in progress or planned).
Containment Entry Team Leader (Initials)	Only equipment identified during pre-job briefing has been left in containment. All other equipment taken into containment has been removed. If not, then notify Shift Supervisor and do the following at respective station: **North Anna** • Inform responsible supervisor additional equipment has been left in containment. • Submit Condition Report (CR) • Responsible supervisor obtain written approval from Station Engineering and FSRC approval for equipment to remain in containment or remove equipment from containment **Surry** • Submit Condition Report (CR) • Inform responsible supervisor no other entry is planned and have him/her obtain written approval from Station Engineering for equipment to remain in containment **OR** **Inform responsible supervisor additional entries will be made to complete task.**
RP Supervisor (Initials)	Conduct debriefing.
RP Supervisor (Initials)	Ensure equipment hatch disabling devices have been reinstalled if removed.

Part 6 - Completed By RP Supervisor or Unit Supervisor	
Completed By (Signature)	Date

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Administrative Job Performance Measure G2.1.7

Applicant________________________________	Start Time___________________
Examiner________________________________	Stop Time___________________
Date ___________________________________	SAT _________ UNSAT ________

Title

Perform a Quadrant Power Tilt Calculation.

K/A: G.2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. [4.4/4.7]

Applicability	**Validation Time**	**Actual Time**
RO	30 Minutes	____ Minutes

Conditions

- Task is to be PERFORMED in the classroom.

Standards

- Divides Maximum Upper channel current by the Average Upper Detector currents to determine the Upper Excore Quadrant Power Tilt Ratio (1.0754).
- Divides Maximum Lower channel current by the Average Lower Detector currents to determine the Lower Excore Quadrant Power Tilt Ratio (1.0950).
- Calculates Tilt % for Upper channels between 7.5% – 7.6%.
- Calculates Tilt % for Lower channels between 9.45% – 9.55%.
- Reports a Tech Spec LCO (Clock) is in effect per Tech Spec 3.12.B.

Initiating Cues

- A dropped rod has occurred on Unit 1.
- A Quadrant Power Tilt Calculation needs to be performed as directed by 0-AP-1.00. Rod Control System Malfunction.

Terminating Cues

- Applicant has completed the QPTR calculation.

Procedures

- 0- AP-1.00, Rod Control System Malfunction

Tools and Equipment

- Calculator
- NI/RM Info book
- Laptop

Safety Considerations

- None

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are **bolded** and denoted as a **CRITICAL STEP**.
- **START TIME_______:**

STEP 1: Step 1 NOTE: Calculations for QPTR should be carried out to four places to the right of the decimal place to provide for accuracy and consistency of results. **STANDARD:** a) Acknowledges NOTE. **EVALUATOR'S NOTE:** **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 2: RECORD THE FOLLOWING DATA *(Step 2)* Reactor Power___________% Date____________ Time____________ **STANDARD:** a) Enters 100% for Reactor power. b) Enters today's date. c) Enters current time. **EVALUATOR'S NOTE:** **If Asked**: Current Reactor Power is 100%. **If Asked**: Use todays date. **If Asked**: Use current time. **COMMENTS:**	**_______ SAT** **_______ UNSAT**

STEP 3: RECORD THE FOLLOWING EXCORE DETECTOR DATA. *(Step 2)* • Actual Excore Detector Readings. • Expected Excore Detector Readings. **STANDARD:** a) Places PR NI currents and Normalized Currents (from NI/RM Info book) in appropriate location on Calculation of Excore Quadrant Power Tilt Ratios. **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: NORMALIZE THE UPPER DETECTOR READINGS. *(Step 3)* **STANDARD:** a) Divides Upper Detector currents by Normalized currents for each detector. **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) . **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5: SUM OF NORMALIZED VALUES FOR THE UPPER DETECTORS. *(Step 3)* **STANDARD:** a) Adds Upper Detector Normalized values for all Upper detectors. **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 6: NORMALIZE THE LOWER DETECTOR READINGS. *(Step 3)* **STANDARD:** a) Divides Lower Detector currents by Normalized currents for each detector. **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) . **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 7: SUM OF NORMALIZED VALUES FOR THE LOWER DETECTORS. *(Step 3)* **STANDARD:** a) Adds Lower Detector Normalized values for all Lower detectors. **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 8: RECORD THE NUMBER OF DETECTORS IN USE. *(Step 4)* **STANDARD:** a) Records “4” **EVALUATOR’S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 9: CALCULATE AVERAGE UPPER AND LOWER DETECTOR CURRENT VALUES. *(Step 5)* **STANDARD:** a) Transcribes Upper and Lower detector Sum of Normalized Values from Step 3 of Attachment 6. b) Divides each sum by the number of Detectors in use. **EVALUATOR’S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 10: RECORD THE MAXIMUM NORMALIZED UPPER AND LOWER DETECTOR CURRENTS. *(Step 6)* **STANDARD:** a) Records the Maximum Normalized Upper Detector Current from Step 3 (N42 value of 1.0135). b) Records the Maximum Normalized Lower Detector Current from Step 3 (N42 value of 1.0176). **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 11: CALCULATE MAXIMUM UPPER AND LOWER EXCORE QUADRANT POWER TILT RATIOS. *(Step 7)* **STANDARD:** a) Divides Maximum Upper channel current by the Average Upper Detector currents to determine the Upper Excore Quadrant Power Tilt Ratio (1.0754). b) Divides Maximum Lower channel current by the Average Lower Detector currents to determine the Lower Excore Quadrant Power Tilt Ratio (1.0950). **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 12: **CRITICAL STEP** CALCULATE TILT%. *(Step 8)* **STANDARD:** a) **Calculates Tilt % for Upper channels between 7.5% – 7.6% (7.54%). CRITICAL STEP** b) **Calculates Tilt % for Lower channels between 9.45% – 9.55% (9.50%). CRITICAL STEP** **EVALUATOR'S NOTE:** (See attached Calculation of Excore Quadrant Power Tilt Ratios for calculations.) **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 13: **CRITICAL STEP** DETERMINES IF A TECH SPEC LCO IS IN EFFECT. **STANDARD:** a) Determines QPT exceeds the 2% limit in Tech Specs. **b) Reports a Tech Spec LCO (Clock) is in effect per Tech Spec 3.12.B. CRITICAL STEP** **EVALUATOR'S NOTE:** • If the Candidate only reports that a Tech Spec clock is in effect, then direct them to include the applicable section of Tech Specs with their answer. • **If Asked**: Inform the Candidate another operator will be responsible for Step 10. **COMMENTS:**	
STEP 14: NOTIFY UNIT SUPERVISOR. *(Step 9)* **STANDARD:** c) Turns in Attachment 1. **EVALUATOR'S NOTE:** **If Asked**: Inform the Candidate another operator will be responsible for Step 10. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STOP TIME:

EXAMINER KEY

NOTE: Calculations for QPTR should be carried out to four places to the right of the decimal place to provide for accuracy and consistency of results.

1. ___ Record the following data:

Reactor Power_____100%_________% Date_[TODAY]___ Time___[NOW]_____

2. ___ Record the following Excore Detector Data:

Actual Excore Detector Readings				Expected Excore Detector Readings at 100% Power			
Upper		Lower		Upper		Lower	
N41U	94.0	N41L	89.5	$N41U_{100}$	118.1	$N41L_{100}$	119.5
N42U	120.1	N42L	121.4	$N42U_{100}$	118.5	$N42L_{100}$	119.3
N43U	115.3	N43L	114.0	$N43U_{100}$	119.1	$N43L_{100}$	119.5
N44U	118.7	N44L	119.1	$N44U_{100}$	119.1	$N44L_{100}$	119.5

3. ___ Normalize the Actual Excore Detector Readings to the expected Excore Detector readings at 100% power, and sum the normalized values for both the upper and lower detectors.

Upper Detector Fraction	Upper Detector Fraction Values	Normalized Value (I_U)	Lower Detector Fraction	Lower Detector Fraction Values	Normalized Value (I_L)
$\frac{N41U}{N41U_{100}}$	$\frac{94.0}{118.8}$ =	0.7912	$\frac{N41L}{N41L_{100}}$	$\frac{89.5}{119.5}$ =	0.7490
$\frac{N42U}{N42U_{100}}$	$\frac{120.1}{118.5}$ =	1.0135	$\frac{N42L}{N42L_{100}}$	$\frac{121.4}{119.3}$ =	1.0176
$\frac{N43U}{N43U_{100}}$	$\frac{115.3}{119.1}$ =	0.9681	$\frac{N43L}{N43L_{100}}$	$\frac{114.0}{119.5}$ =	0.9540
$\frac{N44U}{N44U_{100}}$	$\frac{118.7}{119.1}$ =	0.9966	$\frac{N44L}{N44L_{100}}$	$\frac{119.1}{119.5}$ =	0.9967
Sum of Normalized Values = $\sum I_U$=		3.7694	Sum of Normalized Values = $\sum I_L$=		3.7173

4. ___ Record N = the No. of Detectors in use = 4

5. ___ Calculate the average upper and lower detector current values.

Average $I_U = \frac{\Sigma I_U}{N} = \frac{3.7694}{4} =$ 0.9424

Average $I_L = \frac{\Sigma I_L}{N} = \frac{3.7173}{4} =$ 0.9293

6. ___ From Step 3, record the following values.

Maximum Normalized Upper Detector Current = I_{Umax} = 1.0135

Maximum Normalized Lower Detector Current = I_{Lmax} = 1.0176

7. ___ Calculate the maximum upper and lower Excore Quadrant Power Tilt Ratios.

☐ a. Upper Excore Quadrant Power Tilt Ratio = $\frac{I_{Umax}}{Average I_U}$ = 1.0754

☐ b. Lower Excore Quadrant Power Tilt Ratio = $\frac{I_{Lmax}}{Average I_L}$ = 1.0950

8. ___ Calculate tilt%:

☐ a. Subtract 1 from Step 7.a and multiply by 100 for Upper Tilt %: 7.54% (7.50-7.60%)

☐ b. Subtract 1 from Step 7.b and multiply by 100 for Lower Tilt %: 9.50 % (9.45-9.55%)

9. ___ Notify Unit Supervisor.

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions:

- Unit 1 was operating at 100% power.
  - Control Rod K-4, Control Bank B, dropped and is currently indicating 0 steps.
  - The team is performing 0-AP-1.00, Rod Control Malfunction.
- You are provided a copy of the NI/RM Info book providing Normalized Values.

Initiating Cues

- Perform the Quadrant Power Tilt (QPT) Calculation in accordance with Steps 1 through 9 of 0-AP-1.00, Attachment 6, Calculation of Excore Quadrant Power Tilt Ratios.
- The current date/time is to be used in Attachment 6 Step 1.
- When you have performed Steps 1 through 9, answer the following questions:
  - What is the calculated Upper Tilt %?
  - What is the calculated Lower Tilt %?
  - Based on these results, is a Tech Spec LCO in effect? (Yes/No, including the Tech Spec Section referenced)
- Report your results to the examiner.

Actual current detector currents taken from the Power Range NIs:

N-41 Upper Detector Current	94.0
N-41 Lower Detector Current	89.5
N-42 Upper Detector Current	120.1
N-42 Lower Detector Current	121.4
N-43 Upper Detector Current	115.3
N-43 Lower Detector Current	114.0
N-44 Upper Detector Current	118.7
N-44 Lower Detector Current	119.1

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions:

- Unit 1 was operating at 100% power.
  - Control Rod K-4, Control Bank B, dropped and is currently indicating 0 steps.
  - The team is performing 0-AP-1.00, Rod Control Malfunction.
- You are provided a copy of the NI/RM Info book providing Normalized Values.

Initiating Cues

- Perform the Quadrant Power Tilt (QPT) Calculation in accordance with Steps 1 through 9 of 0-AP-1.00, Attachment 6, Calculation of Excore Quadrant Power Tilt Ratios.
- The current date/time is to be used in Attachment 6 Step 1.
- When you have performed Steps 1 through 9, answer the following questions:
  - What is the calculated Upper Tilt %?
  - What is the calculated Lower Tilt %?
  - Based on these results, is a Tech Spec LCO in effect? (Yes/No, including the Tech Spec Section referenced)
- Report your results to the examiner.

Actual current detector currents taken from the Power Range NIs:

N-41 Upper Detector Current	94.0
N-41 Lower Detector Current	89.5
N-42 Upper Detector Current	120.1
N-42 Lower Detector Current	121.4
N-43 Upper Detector Current	115.3
N-43 Lower Detector Current	114.0
N-44 Upper Detector Current	118.7
N-44 Lower Detector Current	119.1

NOTE: Calculations for QPTR should be carried out to four places to the right of the decimal place to provide for accuracy and consistency of results.

1. ___ Record the following data:

Reactor Power______________% Date_______________ Time_______________

2. ___ Record the following Excore Detector Data:

Actual Excore Detector Readings				Expected Excore Detector Readings at 100% Power			
Upper		Lower		Upper		Lower	
N41U		N41L		$N41U_{100}$		$N41L_{100}$	
N42U		N42L		$N42U_{100}$		$N42L_{100}$	
N43U		N43L		$N43U_{100}$		$N43L_{100}$	
N44U		N44L		$N44U_{100}$		$N44L_{100}$	

3. ___ Normalize the Actual Excore Detector Readings to the expected Excore Detector readings at 100% power, and sum the normalized values for both the upper and lower detectors.

Upper Detector Fraction	Upper Detector Fraction Values	Normalized Value (I_U)	Lower Detector Fraction	Lower Detector Fraction Values	Normalized Value (I_L)
$\frac{N41U}{N41U_{100}}$	---------------=		$\frac{N41L}{N41L_{100}}$	-------------- =	
$\frac{N42U}{N42U_{100}}$	---------------=		$\frac{N42L}{N42L_{100}}$	-------------- =	
$\frac{N43U}{N43U_{100}}$	-------------- =		$\frac{N43L}{N43L_{100}}$	---------------=	
$\frac{N44U}{N44U_{100}}$	-------------- =		$\frac{N44L}{N44L_{100}}$	---------------=	
Sum of Normalized Values = $\sum I_U$=			Sum of Normalized Values = $\sum I_L$=		

4. ___ Record N = the No. of Detectors in use = __________________

5. ___ Calculate the average upper and lower detector current values.

Average I_U = $\dfrac{\Sigma I_U}{N}$ = ---------------------- = ____________________

Average I_L = $\dfrac{\Sigma I_L}{N}$ = ---------------------- = ____________________

6. ___ From Step 3, record the following values.

Maximum Normalized Upper Detector Current = I_{Umax} = ___________________

Maximum Normalized Lower Detector Current = I_{Lmax} = ___________________

7. ___ Calculate the maximum upper and lower Excore Quadrant Power Tilt Ratios.

☐ a. Upper Excore Quadrant Power Tilt Ratio = $\dfrac{I_{Umax}}{\text{Average}I_U}$ = __________________

☐ b. Lower Excore Quadrant Power Tilt Ratio = $\dfrac{I_{Lmax}}{\text{Average}I_L}$ = __________________

8. ___ Calculate tilt%:

☐ a. Subtract 1 from Step 7.a and multiply by 100 for Upper Tilt %: ___________________

☐ b. Subtract 1 from Step 7.b and multiply by 100 for Lower Tilt %: ___________________

9. ___ Notify Unit Supervisor.

10. ___ IF additional Quadrant Power Tilt Ratio Calculations are required, THEN 0-NPT-RX-011, Quadrant Power Tilt Ratio Calculations and Corrective Actions, Attachment 2, should be used.

Completed by: ____ Date: __________

Reviewed by: ____ Date: __________

U.S. Nuclear Regulatory Commission
Surry Power Station

SR21301
Administrative Job Performance Measure

Applicant________________________________ Start Time___________________

Examiner________________________________ Stop Time___________________

Date ___________________________________ SAT _________ UNSAT ________

Title

Review 1-OPT-CH-001, CHARGING PUMP OPERABILITY AND PERFORMANCE TEST FOR 1-CH-P-1A

K/A: GEN2.2.37 Ability to determine operability and/or availability of safety related equipment. [3.6/4.6]

Applicability	Validation Time	Actual Time
RO/SRO(I)/SRO(U)	40 Minutes	_____ Minutes

Conditions

- Task is to be PERFORMED in the classroom.

Standards

- Identifies the open stroke test time for 1-CH-MOV-1286A exceeds the acceptable range.
- Identifies the Outboard Vibration Horizontal pt 22 exceeds the INOP range.
- Determines a Tech Spec LCO is NOT in effect, based on having an OPERABLE Charging Pump powered by each train of emergency bus power (two trains) per T.S.3.2 and T.S.3.3.

Initiating Cues

- 1-OPT-CH-001 has just been performed and is ready for review before statusing as complete.
- After the OPT was performed, 1-CH-P-1C was placed back in service and 1-CH-P-1A is now secured in AUTO.

Terminating Cues

- Candidate submits list of discrepancies and determination if a Tech Clock LCO is in effect.

Procedures

- 1-OPT-CH-001
- Tech Specs

Tools and Equipment **Safety Considerations**

• Laptop	• None

Notes

PERFORMANCE CHECKLIST

Notes to the Evaluator

- Task critical elements are bolded and denoted as a **CRITICAL STEP**.
- **START TIME_______:**

STEP 1: REVIEW SECTIONS 1 THROUGH 5 **STANDARD:** a) Reviews Section 1.0 (Purpose). b) Reviews Section 2.0 (References). c) Reviews Section 3.0 (Initial Conditions) and verifies all steps are initialed. d) Reviews Section 4.0 (Precautions and Limitations) and verifies all steps are initialed. e) Reviews Section 5.0 (Special Tools and Equipment). **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 2: REVIEWS WORK PREPARATION. *(Section 6.1)* **STANDARD:** a) Verifies proper place keeping on all steps, notes, and cautions. b) Verifies associated information has been entered in Attachment 1. c) Verifies by the table in step 6.1.4 that Subsections 6.6 and 6.7 were the correct ones to be performed. **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 3: VERIFIES SECTIONS 6.2 THROUGH 6.5 NOT PERFORMED. **STANDARD:** a) Verifies all steps of subsections 6.2, 6.3, 6.4, and 6.5 are entered “N/A”. **EVALUATOR’S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 4: **CRITICAL STEP** DISCHARGE CHECK VALVE TEST, MOV TIMING, LUBE OIL TCV TIMING AND STARTING 1-CH-P-1A. *(Section 6.6)* **STANDARD:** a) Verifies proper place keeping on all steps, notes, and cautions. b) Identifies the operator with the initial “β” did not sign in the Section 7.3 table. c) Verifies all associated data recorded in Attachments 1 and 4. d) Per step 6.6.1.f.3, **identifies the open stroke test time (recorded in Attachment 4) for 1-CH-MOV-1286A exceeds the acceptable range. (CRITICAL STEP)** **EVALUATOR’S NOTE:** • **Note:** The Candidate may identify the unacceptable stroke time during performance of step 7.1.1. • **If the Candidate reports the stroke time for 1-CH-MOV-1286A,** direct the Candidate to complete the review of 1-OPT-CH-001 and inform you of their results afterward. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 5: **CRITICAL TASK** 1-CH-P-1A PERFORMANCE TEST. *(Section 6.7)* **STANDARD:** a) Verifies proper place keeping on all steps, notes, and cautions. b) Verifies all associated data is recorded in Attachment 1. c) Verifies Attachment 2 used to record operating pump data. d) Per step 6.7.14, **identifies the Outboard Vibration Horizontal pt 22 (recorded in Attachment 4) exceeds the INOP range. (CRITICAL STEP)** **EVALUATOR'S NOTE:** • **Note:** The Candidate may identify the INOP pt 22 vibration during performance of step 7.1.1. • **If the Candidate reports the INOP vibration for pt 22,** direct the Candidate to complete the review of 1-OPT-CH-001 and inform you of their results afterward. **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 6: VERIFIES SECTIONS 6.8 AND 6.9 NOT PERFORMED. **STANDARD:** a) Verifies all steps of subsections 6.8 and 6.9 are entered "N/A". **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**

STEP 7: OBTAINING OIL SAMPLES. *(Section 6.10)* **STANDARD:** a) Verifies proper place keeping on all steps, notes, and cautions. b) Verifies steps performed for 1-CH-P-1C. **EVALUATOR'S NOTE:** **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 8: VERIFIES SECTION 6.11 NOT PERFORMED. **STANDARD:** a) Verifies all steps of subsections 6.11 are entered "N/A". **EVALUATOR'S NOTE:** **COMMENTS:**	

STEP 9: EVALUATES ACCEPTANCE CRITERIA. *(Step 7.1.1)* **STANDARD:** a) Determines the following acceptance criteria are MET: a. 1-CH-258 check valve open and closed tests. b. 1-CH-256 open test. c. 1-CH-230 open test. d. 1-CH-MOV-1275A open and closed travel times. e. 1-CH-MOV-1287A open and closed travel times. f. 1-SW-TCV-108A test position and stroke time. g. 1-SW-TCV-108A lube oil temperature below 160°F. b) Places a check (√) at each of the substeps listed above. c) Enters "N/A" at the substep for 1-CH-P-1C ALT FEED breaker interlock test. **EVALUATOR'S NOTE:** **COMMENTS:**	_______ **SAT** _______ **UNSAT**
STEP 10: CRITICAL TASK EVALUATES ACCEPTANCE CRITERIA. *(Step 7.1.1, continued)* **STANDARD:** a) **Identifies on Attachment 2 that the value recorded for Outboard Vibration Horizontal (pt 22) is in the INOP range. (CRITICAL TASK)** b) Determines the acceptance criteria substep for Charging Pump Vibration is NOT MET. c) **Identifies on Attachment 4 that the value recorded for 1-CH-MOV-1286A Open stroke time exceeds the Acceptable Range Time. (CRITICAL TASK)** d) Determines the acceptance criteria substep for 1-CH-MOV-1286A open stroke time is NOT MET. **EVALUATOR'S NOTE:** • **Note:** The Candidate may identify the INOP pt 22 vibration during review of step 6.7.14. • **Note:** The Candidate may identify the 1-CH-MOV-1286A stroke time during review of step 6.6.1.f.3. **COMMENTS:**	_______ **SAT** _______ **UNSAT**

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STEP 11:

DOCUMENTS TEST RESULTS. *(Step 7.1.2)*

STANDARD:

a) Places a check (√) at "Unsatisfactory" to document the test results.
b) Places a check (√) at each of the substeps listed above.
c) Enters "N/A" at the substep for 1-CH-P-1C ALT FEED breaker interlock test.

EVALUATOR'S NOTE:

COMMENTS:

</td><td>

_______ **SAT**

_______ **UNSAT**

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STEP 12: **CRITICAL TASK**

EVALUATES ACCEPTANCE CRITERIA. *(Step 7.1.1, continued)*

STANDARD:

a) **Identifies on Attachment 2 that the value recorded for Outboard Vibration Horizontal (pt 22) is in the INOP range. (CRITICAL TASK)**
b) Determines the acceptance criteria substep for Charging Pump Vibration is NOT MET.
c) **Identifies on Attachment 4 that the value recorded for 1-CH-MOV-1286A Open stroke time exceeds the Acceptable Range Time. (CRITICAL TASK)**
d) Determines the acceptance criteria substep for 1-CH-MOV-1286A open stroke time is NOT MET.

EVALUATOR'S NOTE:

- **Note:** The Candidate may identify the INOP pt 22 vibration during review of step 6.7.14.
- **Note:** The Candidate may identify the 1-CH-MOV-1286A stroke time during review of step 6.6.1.f.3.

COMMENTS:

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_______ **SAT**

_______ **UNSAT**

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STEP 13: REPORTS TO SHIFT MANAGER. *(Step 7.2.1)* **STANDARD:** a) Informs Shift Manager that 1-OPT-CH-001 result is UNSAT. b) Evaluates Tech Specs for applicability. **EVALUATOR'S NOTE:** • **If the Candidate only reports the status of 1-OPT-CH-001,** direct the Candidate to review Tech Specs for applicability and record their result, along with the reason a Tech Spec LCO is/is not applicable, in the Comments section of Section 7.3. **COMMENTS:**	**_______ SAT** **_______ UNSAT**
STEP 14: **CRITICAL TASK** REVIEWS TECH SPECS FOR APPLICABILITY. **STANDARD:** a) Determines the "B" and "C" Charging pumps are operable, with each Charging Pump aligned to one of the two emergency buses (i.e. two trains operable). **b) Determines a Tech Spec LCO is NOT in effect, based on having an OPERABLE Charging Pump powered by each train of emergency bus power (two trains) per T.S.3.2 and T.S.3.3. (CRITICAL TASK)** c) Records their Tech Spec determination in the Comments section of Section 7.3. **EVALUATOR'S NOTE:** **COMMENTS:**	**_______ SAT** **_______ UNSAT**

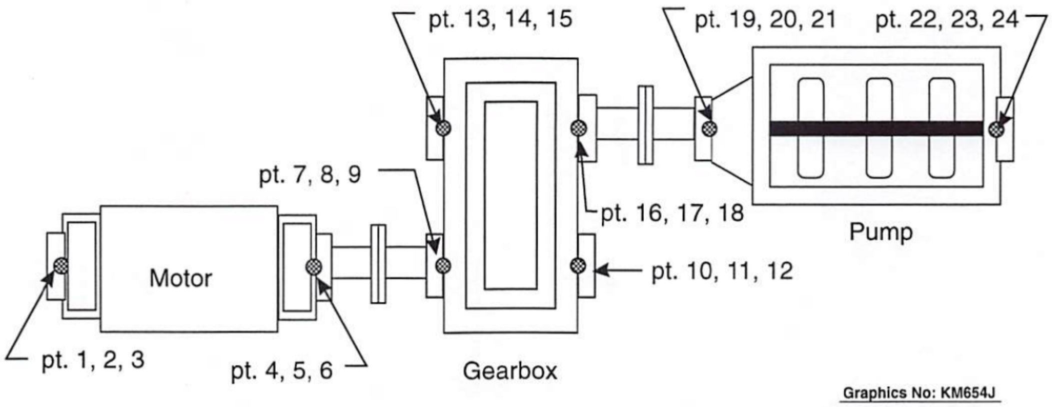
STOP TIME:

EXAMINER KEY

(Page 1 of 1)

Attachment 2

1-CH-P-1A VIBRATION, FLOW AND ΔP DATA TABLE (> 350°F)



NOTE: Represents the Horizontal, Vertical, and Axial Accelerometer Pads Mounted on the Bearing Housing and Indicated in Yellow on the Pump/Driver Assembly.

VIBRATION TESTING POINTS

Parameters in ALERT range are considered SATISFACTORY. Parameters in INOP are UNSATISFACTORY.

PARAMETER	REF VALUE	TEST VALUE	ACCEPT RANGE	ALERT RANGE	INOP RANGE	STATUS SAT, INOP, ALERT
Δ P Step 6.7.12 (Ref. 2.3.29)	psid 2469	2518.5	2435 to 2641	NONE	< 2435 OR > 2641	SAT
Inboard Vibration Horizontal (pt 19) Vertical (pt 20) Axial (pt 21)	in/sec 0.1430 0.0593 0.0726	 0.144 0.070 0.102	 ≤ 0.325 ≤ 0.148 ≤ 0.181	 > 0.325 to ≤ 0.700 > 0.148 to ≤ 0.355 > 0.181 to ≤ 0.435	 > 0.700 > 0.355 > 0.435	SAT
Outboard Vibration Horizontal (pt 22) Vertical (pt 23) Axial (pt 24)	in/sec 0.1913 0.0909 0.0801	 0.739 0.049 0.086	 ≤ 0.325 ≤ 0.227 ≤ 0.200	 > 0.325 to ≤ 0.700 > 0.227 to ≤ 0.545 > 0.200 to ≤ 0.480	 > 0.700 > 0.545 > 0.480	SAT
Recirc Flow Rate Step 6.7.15	43 gpm	46	≥ 35 to ≤ 80 gpm	N/A	< 35 or > 80 gpm	SAT

EXAMINER KEY

(Page 1 of 1)

Attachment 4

MOV AND LUBE OIL TCV STROKE TIME DATA TABLE

Stroke Test - Closed

Step	Valve	Stroke Position	Reference Time	Acceptable Range Time	Actual Time
6.6.1.d/6.9.3.a	1-CH-MOV-1286A	Closed	7.4 sec	5.6 to 9.2 sec	8.04 Seconds
6.6.1.d/6.9.3.b	1-CH-MOV-1287A	Closed	5.6 sec	4.2 to 7.0 sec	5.66 Seconds
6.6.1.d/6.9.3.c	1-CH-MOV-1275A	Closed	8.9 sec	6.7 to 11.1 sec	8.69 Seconds

Stroke Test - Open

Step	Valve	Stroke Position	Reference Time	Acceptable Range Time	Actual Time
6.6.1.f/6.9.4.a	1-CH-MOV-1286A	Open	7.0 sec	5.3 to 8.7 sec	7.12 Seconds
6.6.1.f/6.9.4.b	1-CH-MOV-1287A	Open	4.6 sec	3.5 to 5.7 sec	7.02 Seconds
6.6.1.f/6.9.4.c	1-CH-MOV-1275A	Open	9.0 sec	6.8 to 11.2 sec	8.73 Seconds

Step 6.6.5	Test Position (Substep 6.6.5.i)	Stroke Time in Seconds (Substep 6.6.5.i)	Reference Time	Maximum Time	As Left Position (Substep 6.6.5.m)
1-SW-TCV-108A	OPEN	4.59 sec	4.8 sec	30.0 sec	CLOSED

Performed by: M. Taylor (signature) / M / M. TAYLOE / [TODAY]
Signature Initial Print

Operator Directions Handout
(TO BE READ TO APPLICANT BY EXAMINER)

Initial Conditions

- Both Units are at 100% power.
- The Unit 1 team is performing 1-OPT-CH-001, Charging Pump Operability And Performance Test For 1-CH-P-1A.
- All applicable portions of Section 6.0, Instructions, have been performed.
- After Section 6.0 was completed, Charging Pump manipulations were made and the current lineup is as follows:
  - 1-CH-P-1C is running.
  - 1-CH-P-1A and 1-CH-P-1B are secured and in AUTO.

Initiating Cues

- You are to review the completed portions of 1-OPT-CH-001 and perform Subsection 7.1.
- If the OPT is Sat, then complete Subsection 7.1 and another operator will complete the OPT paperwork.
- If the OPT is Unsat, then determine if a Tech Spec Clock is in effect, and record this in the Subsection 7.3 comments section. Include in the comments section all applicable Tech Spec sections referenced to make your determination.

Operator Directions Handout
(TO BE GIVEN TO APPLICANT)

Initial Conditions

- Both Units are at 100% power.
- The Unit 1 team is performing 1-OPT-CH-001, Charging Pump Operability And Performance Test For 1-CH-P-1A.
- All applicable portions of Section 6.0, Instructions, have been performed.
- After Section 6.0 was completed, Charging Pump manipulations were made and the current lineup is as follows:
  - 1-CH-P-1C is running.
  - 1-CH-P-1A and 1-CH-P-1B are secured and in AUTO.

Initiating Cues

- You are to review the completed portions of 1-OPT-CH-001 and perform Subsection 7.1.
- If the OPT is Sat, then complete Subsection 7.1 and another operator will complete the OPT paperwork.
- If the OPT is Unsat, then determine if a Tech Spec Clock is in effect, and record this in the Subsection 7.3 comments section. Include in the comments section all applicable Tech Spec sections referenced to make your determination.

Surry Power Station

1-OPT-CH-001

Scheduled PT Cover Sheet

38103484035

Work Order: 38103484035

Procedure Number: 1-OPT-CH-001

Title: 84 Day Freq. PT: CH Pump Operability & Perf. Test for 1-CH-P-1A

Notes:

Mode Change: 0

Planner: Margaret Hangach

Supervisor:

Engineering Review: JOHN178 John Rayno

LAWRE19 Lawrence Mason

Schedule Date: 10/05/2021

Drop Dead Date: 10/12/2021

These dates reflect Maximo dates on the date printed. Dates should be verified in Maximo.

Ext. Drop Date:

Printed on 10/05/2021

Actual Start Date & Time: ____________________

Actual Finish Date & Time: ____________________

Completed by DDD in Maximo? Yes_____ No_____

Satisfactory______ Unsatisfactory______

____

Departmental Signature

Grace Entry Date: 09/12/2021

	EQ: N	RWP: Y
Scaffolding: N	PMT: N	Craft: OPER
Insulation: N	TAG: N	ASME: N

Dominion Energy	PROCEDURE NO: 1-OPT-CH-001
SURRY POWER STATION	REVISION NO: 61
PROCEDURE TYPE: OPERATIONS PERIODIC TEST	UNIT NO: 1

PROCEDURE TITLE:

CHARGING PUMP OPERABILITY AND PERFORMANCE TEST FOR 1-CH-P-1A

IST	PMT	PSA	REACT MGT			

REVISION SUMMARY:

Revised to incorporate OPFB-2019-CA7509144:

- Added Technical Reference 2.3.33.
- Modified items in Special Tools and Equipment.
- Modified Steps in 6.10.1 and 6.10.2 to enhance lube oil sampling.

Revised in response to Operations Feedback, OP FB 2018-01702:

- Changed Predictive Analysis Group to Systems Engineering.

Revised to incorporate OP FB 14-0238:

- Changed increase to more frequently.

Revised to incorporate OP FB 2019-011801:

- Deleted IVs for Steps 6.3.2, 6.4.2, 6.5.8, 6.6.1.c, and 6.8.21.

CONTINUOUS USE

TABLE OF CONTENTS

Section		Page
1.0	PURPOSE	4
2.0	REFERENCES	5
3.0	INITIAL CONDITIONS	9
4.0	PRECAUTIONS AND LIMITATIONS	9
5.0	SPECIAL TOOLS AND EQUIPMENT	12
6.0	INSTRUCTIONS	13
6.1	Work Preparation	13
6.2	Fill, Vent, and Return to Service Valve Alignment for 1-CH-P-1A	15
6.3	Placing 1-CH-P-1B in Service and Stopping 1-CH-P-1A	23
6.4	Placing 1-CH-P-1C, NORM FEED, in Service and Stopping 1-CH-P-1A	27
6.5	Placing 1-CH-P-1C, ALT FEED, in Service and Stopping 1-CH-P-1A	31
6.6	Discharge Check Valve Test, MOV Timing, Lube Oil TCV Timing and Starting 1-CH-P-1A	36
6.7	1-CH-P-1A Performance Test	46
6.8	1-CH-P-1C, ALT FEED, Breaker Damper Logic	53
6.9	Testing of Charging Pump MOVs	59
6.10	Obtaining Oil Samples	61
6.11	Discharge Check Valve Backleakage Test on Non-running Charging Pump	67
7.0	FOLLOW-ON	69

TABLE OF CONTENTS

Section		Page
ATTACHMENTS		
1	1-CH-P-1A Performance Test Data Sheet	75
2	1-CH-P-1A Vibration, Flow and ΔP Data Table (> 350°F)	78
3	1-CH-P-1A Vibration, Flow and ΔP Data Table (< 350°F)	79
4	MOV and Lube Oil TCV Stroke Time Data Table	80
5	Charging System External Leak Inspection Diagram	81
6	Venting 1-CH-FT-1181	82
7	Venting of Charging Pump Seals	84
8	Flushing Charging Pump To Reduce Boron Differential	85

1.0 PURPOSE

1.1 To demonstrate and document satisfactory performance of 1-CH-P-1A, CHARGING PUMP, once each quarter. **(Ref. 2.4.6)**

1.2 To demonstrate and document satisfactory performance of 1-CH-P-1A, CHARGING PUMP, for Return To Service after maintenance.

1.3 To document that the System External Leakage is within limits once each quarter.

1.4 To test 1-CH-258, Charging Pump Discharge Check Valve, in the closed and open position once each quarter, or to determine backleakage as required.

1.5 To test 1-CH-256, Charging Pump Miniflow Recirc Check Valve, in the open position once each quarter, or to determine backleakage as required.

1.6 To test 1-CH-230, VCT Supply Discharge Check Valve, in the open position once each quarter.

1.7 To demonstrate and document satisfactory performance of 1-CH-P-1C, ALT FEED, damper / breaker interlocks once each year.

1.8 To demonstrate and document satisfactory stroke once each quarter of:

- 1-CH-MOV-1286A, CHG PUMP A DISCH NORM
- 1-CH-MOV-1275A, CHG PUMP MINIFLOW RECIRC VALVES PUMP A
- 1-CH-MOV-1287A, CHG PUMP A DISCH ALT

1.9 To demonstrate and document satisfactory stroke of 1-SW-TCV-108A once each quarter.

1.10 Performance of this procedure satisfies the requirements of Technical Specifications listed in Subsection 2.2 and the Inservice Testing Program Plan for Pumps and Valves.

2.0 REFERENCES

2.1 Source Documents

2.1.1 UFSAR Section 9.1, Chemical and Volume Control System

2.1.2 UFSAR Section 6.2, Safety Injection System

2.2 Technical Specifications Surry Power Station Units 1 and 2

2.2.1 Technical Specifications, Section 3.2.B.1.a.2, Charging Pump Operability

2.2.2 Technical Specifications, Section 3.2.B.1.b.2, Charging Pump Operability

2.2.3 Technical Specifications, Section 3.2.B.2, Unit 2 Charging Pump Availability

2.2.4 Technical Specifications, Section 3.3.A.3.a, Safety Injection Subsystem Operability

2.2.5 Technical Specification 6.4.I, Inservice Testing Program

2.2.6 Technical Specification, 4.11.C.2

2.2.7 Technical Specifications, Section 6.4.K, Systems Integrity

2.3 Technical References

2.3.1 Inservice Testing Program Plan for Pumps and Valves

2.3.2 EWR 93-064, MI Pumps Acceptance Criteria OMa-1988 Part 6 Code

2.3.3 1-NPT-ZZ-001, Quantification of External System Leakage

2.3.4 11448-FM-088B, Chemical and Volume Control System

2.3.5 11448-FM-71B, Sheet 1 and 2, Circulating and Service Water System

2.3.6 11448-FM-075C, Sheet 1, Compressed Air System

2.3.7 Deviation Report S-92-0948, 2-SW-124 Blockage

2.3.8 DCP 88-037-1, ASME Section XI Instruments

2.3.9 EWR 89-442, Evaluate CH Pump Lube Oil System

2.3.10 1-OPT-CH-002, Charging Pump Operability and Performance Test for 1-CH-P-1B

2.3.11 1-OPT-CH-003, Charging Pump Operability and Performance Test for 1-CH-P-1C

2.3.12 DCP 92-064, Charging Pump Logic Modifications

2.3.13 EWR 94-013, CH Pumps Acceptance Criteria during Shutdown

2.3.14 EWR 94-015, IST Valves Acceptance Criteria Stroke Time

2.3.15 DCP 92-27-3, Installation of new Instrument Air valve for stroke timing 1-SW-TCV-108A

2.3.16 Deviation Report S-95-1877, Charging Pump 2C recirc flow rate

2.3.17 Memo from BW/IP International, Inc to Terri Stahl, Virginia Electric Power Co., June 30, 1988.

2.3.18 DCP 95-006, Charging Pump Service Water Pipe Replacement

2.3.19 Engineering Transmittal (ET) No. S-96-0263, Rev. 0, Stroke Time Acceptance Criteria for 1-SW-TCV-108A, B, C and 2-SW-TCV-208A, B, C.

2.3.20 Engineering Transmittal (ET) No. S-97-0271, CH Pump IST Reference Value Change

2.3.21 Engineering Transmittal (ET) No. S-97-0280, CH Pump IST Reference Value Change

2.3.22 ET S-01-0167, New IST Reference Vibration for I-CH-P-1A

2.3.23 DCP 01-008, Instrument and Controls Upgrade Project, Unit 1

2.3.24 DCP 01-011, ERF Computer System Replacement/Surry/Unit 1 & 2

2.3.25 ET S-04-0068, Effect of Starting an Idle Charging Pump on RCS Boron Concentration

2.3.26 ET S-05-0016, IST Acceptance Criteria for Charging Pump 1-CH-P-1A

2.3.27 ASME OM Code, Section IST, Rules for Inservice Testing of Light-Water Reactor Nuclear Power Plants

2.3.28 ET-CME-07-0012, Evaluation of CH Pump Discharge Check Valve Backleakage

2.3.29 Calculation ME-0771, Rev. 3, Minimum Delivered HHSI Flow for LOCA and MSLB Analyses and CH/HHSI Pump Flow Test Acceptance Criteria, Surry 1 & 2

2.3.30 DC SU-10-00005, Charging Pump Recirculation MOV Manual Isolation Valve Modification

2.3.31 ETE-CME-2012-0004, Implementation of ME-0771, Rev. 3, Addendum C Results for Permissible HHSI / LHSI Check Valve Backleakage

2.3.32 Reference stroke time change for 1-CH-MOV-1286A 0-NSP-VE-001 dated February 2017

2.3.33 CR1114014, Potential trend identified with oil samples

2.4 Commitment Documents

2.4.1 Station Commitment Action Request Form (SCARF) 88-5188, Hydrogen Buildup in a Confined Area

2.4.2 CTS 1317, Charging Pump Operation

2.4.3 CTS 1801, Charging Pump Temperature Control Valve

2.4.4 CTS 635, Verify damper operation and testing

2.4.5 Safety Evaluation 91-238

2.4.6 CTS 1809, CH Pump Configuration Outside Design Basis

2.4.7 Station Deviation S-92-1515

2.4.8 CTS 2646, Technical Specification Amendment #199

2.4.9 CTS 3368, Revise procedures that quantify external loop leakage to add 7-day Administrative Clock in the event of unsatisfactory leakage levels

2.4.10 Station Deviation S-96-0803

2.4.11 DR S-97-0049, Self Assessment of In Service Testing Program

2.4.12 CTS 4675, Maintenance activity performed with no prior PSA evaluation

2.4.13 DR S-2000-0532, External Leakage Quantification

2.4.14 PI S-2001-0466, Maintenance activity performed with no prior PSA evaluation

2.4.15 PI S-2002-0044, Add OPs requirement for oil sampling

2.4.16 PI S-2002-3606, Procedural inconsistencies with venting CHG pumps

2.4.17 PI S-2003-0707, Wrong Oil Sample Volume

2.4.18 PI-S-2003-2106, Pumps in PTL When Sampling Oil

2.4.19 PI S-2004-1773, No oil flow to pump bearings

2.4.20 PI S-2004-0495 (OE 17609), Reactivity Excursion when starting CHG Pump

2.4.21 PI S-2005-4176, ITC-SA-05-18 In-Service Testing (IST) Program for Pumps

2.4.22 CR 9110, Evaluate Charging Pump Discharge Check Valve Criteria

2.4.23 ACE356, Determining Recirc Check Valve Backleakage

2.4.24 CR010705, High Aux Lube Oil Pump Discharge Pressure

2.4.25 CR507671, Procedure Difference for Drops to cc Conversion

2.4.26 CA 3047264, Evaluate Operator Log Specification for Charging Pump Aux Lube Oil Pump Output Pressure Range

Init	Verif	

3.0 INITIAL CONDITIONS

X ____ 3.1 This procedure has PSA significance. IF this procedure is being performed on a day other than its POD scheduled date, THEN notify Shift Supervision that a PSA evaluation is required for the performance of this procedure. (**Ref. 2.4.14**)

X ____ 3.2 Unit 1 is at stable conditions and no power changes are anticipated.

X ____ 3.3 The Volume Control Tank (VCT) pressure is within the normal operating band (greater than 15 psig). Enter N/A if filling Charging Pump from RWST.

X ____ 3.4 With the Reactor critical, at least two boron injection subsystems shall be operable for performance of this procedure IAW Technical Specification 3.2. Performance with less than two pumps operable may result in entry into a six hour LCO IAW Technical Specification 3.0.1 and will require FSRC approval before a procedure change is implemented.

4.0 PRECAUTIONS AND LIMITATIONS

X ____ 4.1 No more than one Charging Pump may be tested at a time.

X ____ 4.2 This procedure assumes at least two Charging Pumps are operable when the Reactor is critical. Other conditions may require re-evaluation of applicable LCOs to determine the most Limiting Condition.

X ____ 4.3 The Charging Pump Miniflow Recirc Valves, 1-CH-MOV-1275A and 1-CH-MOV-1373, must remain open during pump operation to prevent pump damage during the performance of this test.

X ____ 4.4 To prevent damage to the pump, a Charging Pump should not be operated more than three hours with both discharge valves closed.

γ 4.5 The Charging Pump should be shut down as soon as possible if any of the following temperature limits are exceeded:

- Oil Cooler outlet oil temperature upper operating limit is 160°F.
- Oil Cooler outlet oil temperature lower operating limit is 28°F. Oil misting has been observed with temperature less than 60°F. Misting is expected to stop as lube oil temperature rises. Routine pump starts should be avoided until the temperature is above 60°F and preferably in the normal operating band between 80°F and 120°F.
- The upper administrative limit for the Charging Pump bearings is 180°F.

γ 4.6 The under voltage trip of Charging Pump A is automatically enabled when Charging Pump C, NORM FEED, is Racked In <u>and</u> Charging Pump C, NORM FEED, breaker is closed. The under voltage trip of Charging Pump A is automatically disabled when Charging Pump C, NORM FEED, is Racked Out <u>or</u> Charging Pump C, NORM FEED, breaker is open.

γ 4.7 Simultaneous operation of two Charging Pumps below 350°F shall be limited to the time required to swap from one Charging Pump to another.

γ 4.8 Shifting of Charging Pumps shall not be performed when the RCS is solid.

γ 4.9 This OPT may be performed with either RHR in service <u>or</u> the Unit at normal RCS operating pressure with approximately 105 gpm letdown.

4.10 The following Charging Pump Motor starting limitations must be observed to prevent motor damage:

- With the motor cold, TWO consecutive starts are allowed.
- With the motor hot, ONE stop and an immediate restart is allowed.

After either of the above conditions has occurred:

- Subsequent motor stop/start cycles may NOT be performed until the motor has been run for at least 15 minutes.

OR

- If the motor is stopped before the 15 minute run is complete, the motor shall stand idle for at least 60 minutes.

4.11 Shift Supervision shall be notified immediately if any malfunctions or abnormal conditions occur.

4.12 A dedicated Operator will be required to obtain oil samples in Subsection 6.10.

4.13 If the difference between RCS boron and Charging pump boron is greater than 360 ppm, the pump must be flushed before it is started to equalize boron concentration. This requirement ensures that the change in RCS temperature will be less than 0.2°F when the Charging pump is started. **(Ref. 2.4.20)**

4.14 The initials identification block in Subsection 7.3 must be completed before the procedure is closed out.

4.15 A Charging Pump may be started if Aux Lube Oil Pump discharge pressure is greater than 12 psig. In this case, a Condition Report shall be submitted. **(Ref. 2.4.24)**

4.16 Charging Pump breakers cannot be closed from the MCR while racked to the TEST position.

4.17 Subsections not required to be performed may be discarded.

5.0 SPECIAL TOOLS AND EQUIPMENT

5.1 Microlog Data Collector for vibration

5.2 Stopwatch, for leakage collection timing and stroke timing of MOVs and Lube Oil TCV

5.3 AirCet connection test fitting (only required if 1-SW-TCV-108A will be stroke tested)

5.4 HP approved catch container (for venting 1-CH-FT-1181)

5.5 Three 120 ml oil sample bottles and one flushing bottle

5.6 Two 120 ml bottles of motor replacement oil

5.7 One clean container of approximately 500 mls to purge drain line oil sample

Init Verif

6.0 INSTRUCTIONS

6.1 Work Preparation

NOTE: Charging pump discharge check valve data is found on the Surry Engineering Systems & Components webpage under System Monitoring Trends (CH).

γ 6.1.1 IF check valve backleakage testing in Subsection 6.6 or 6.11 required, THEN obtain the most recent backleakage (ΔP) test results for 1-CH-267 (1-CH-P-1B) and 1-CH-276 (1-CH-P-1C).

1-CH-267 Backleakage 0,000 psid Date of Test 08/08/2021

1-CH-276 Backleakage 1.000 psid Date of Test 07/25/2021

γ 6.1.2 Record the SQC Number and Cal Due Date for the Instrumentation and Test Equipment to be used on Attachment 1.

NOTE: This test may be performed at normal RCS operating pressure or with RHR in operation.

γ 6.1.3 Check the RCS/RHR status on Attachment 1. Enter N/A if filling Charging Pump from RWST.

γ
______ 6.1.4 Check Plant Conditions with Shift Supervision and perform all the associated actions. (✓) Enter N/A for actions not taken.

Status (✓)		Action to be Performed
N/A γ	• 1-CH-P-1A needs to be filled and vented OR Maintenance has been performed	Perform Subsection 6.2
	• Stop 1-CH-P-1A and start 1-CH-P-1B (so 1-CH-P-1A may be stopped for testing)	Perform Subsection 6.3
	• Stop 1-CH-P-1A and start 1-CH-P-1C, NORM FEED (so 1-CH-P-1A may be stopped for testing)	Perform Subsection 6.4
	• Stop 1-CH-P-1A and start 1-CH-P-1C, ALT FEED (so 1-CH-P-1A may be stopped for testing) (Not applicable if ≥ 350°F and 450 psig)	Perform Subsection 6.5
	• Check Valve test or Stroke test MOVs and Lube Oil TCV (1-CH-P-1A must be stopped)	Perform Subsection 6.6 or Subsection 6.9 (MOV stroke only)
	• Performance test of 1-CH-P-1A only (1-CH-P-1A already running)	Perform Subsection 6.7
✓	• 1-CH-P-1A needs the Quarterly Test (1-CH-P-1A must be stopped)	Perform Subsections 6.6 and 6.7
N/A γ	• If Quarterly Test performed for the first time for the year then perform 1-CH-P-1C, ALT FEED, breaker damper logic test	Perform Subsection 6.8
	• Check backleakage on non-running Charging Pump discharge check valve (Not required for Normal Quarterly test)	Perform Subsection 6.11

6.2 Fill, Vent, and Return to Service Valve Alignment for 1-CH-P-1A

N/A ______ 6.2.1 Have the Mechanics remove the blank flange and install the pump vent rig on the Charging Pump A casing vent flange. IF pump casing was NOT drained, THEN enter N/A for Steps 6.2.1 through 6.2.31.

______ 6.2.2 Close or check closed 1-CH-ICV-3514, CH Pump 1A Suct PI-1187 Vent.

______ ______ IV 6.2.3 Close 1-CH-244, Chg Pump A Disch Casing Drain.

______ ______ IV 6.2.4 Close 1-CH-245, Chg Pump A Suct Casing Drain.

______ ______ IV 6.2.5 Close 1-CH-401, Chg Pump A Casing Common Drain.

______ 6.2.6 Check closed 1-CH-252, Chg Pump A Disch Casing Vent.

______ 6.2.7 Check closed 1-CH-253, Chg Pump A Suct Casing Vent.

______ 6.2.8 Check that the pump vent rig is installed.

NOTE: The Aux Lube Oil Pump may be started without SW aligned to allow pump shaft rotation during venting.

______ 6.2.9 Check that the Charging Pump A gearbox oil level is in the operating range. (Gearbox oil level should be greater than $\frac{1}{4}$).

______ ______ IV 6.2.10 Check closed or close 1-EP-BKR-1H1-2N, Bkr 1D, 1-CH-P-110A, Aux Lube Oil Pump.

______ 6.2.11 Check or place Aux Lube Oil Pump in AUTO.

______ 6.2.12 Check that 1-CH-PI-110A, Aux Lube Oil Pump Discharge Pressure, is between 4 psig and 12 psig. Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig.

Lube Oil Pressure __________ psig

NOTE: A Charging Pump may be started if oil flow can not be checked to bearing(s). Contingency actions for monitoring bearing temperature are in place as a compensatory measure if pump will be started without oil flow to bearing(s).

N/A 8 ______ 6.2.13 Check oil flow to the pump bearings. Enter N/A if flow can not be checked to bearing(s).

WARNING

- Explosion or fire could result if hydrogen from venting is allowed to build up in a Confined Area. (**Ref. 2.4.1**)
- Radioactive gases present during venting will not be removed by the vent rig. Pump venting must be done slowly to prevent a buildup of high radioactive gas concentrations.

______ 6.2.14 Notify Health Physics that Charging Pump venting will be performed.

______ 6.2.15 IF 0-MCM-0109-01 will be used to fill and vent the CHG pump, THEN enter N/A for Steps 6.2.16 through 6.2.27. Otherwise, enter N/A for this step.

6.2.16 Align Charging Pump suction source:

a. IF filling from VCT, THEN check open or open the following MOVs. Otherwise, enter N/A.

______ • 1-CH-MOV-1115C, CHG PUMP SUCTION FROM VCT

______ • 1-CH-MOV-1115E, CHG PUMP SUCTION FROM VCT

b. IF filling from RWST, THEN check open or open the following MOVs. Otherwise, enter N/A.

______ • 1-CH-MOV-1115B, CHG PUMP SUCTION FROM RWST

______ • 1-CH-MOV-1115D, CHG PUMP SUCTION FROM RWST

N/A

6.2.17 Check open or open 1-EP-BKR-1H1-2S, Bkr 7A, 1-CH-MOV-1267A, CHG PUMP A SUCT NORM.

NOTE: Continuous communication shall be established with the Control Room during the performance of the following three steps to prevent the loss of VCT level.

6.2.18 Manually throttle open (ten turns) 1-CH-MOV-1267A, CHG PUMP A SUCT NORM.

NOTE: If the Charging Pump seal was replaced while the pump was out of service, some seal leakage may occur until the seal becomes seated. A small amount of leakage should be considered normal.

6.2.19 Check the pump shaft seals and other valve and piping boundaries for leakage. IF leakage is identified, THEN isolate the leak, if possible, AND notify Shift Supervision.

NOTE: Be prepared to vent 1-CH-PI-1187 as soon as the casing has been vented.

6.2.20 Vent the Charging Pump A casing by performing the following:

a. Vent the Charging Pump A casing by slowly opening the vents until water issues from the vent.

1. 1-CH-252

2. 1-CH-253

b. WHEN water issues from the vent, THEN close the vent valves.

1. 1-CH-252 ______ IV

2. 1-CH-253 ______ IV

6.2.21 Vent 1-CH-PI-1187 by throttling open 1-CH-ICV-3514.
WHEN 1-CH-ICV-3514 is air free, THEN close 1-CH-ICV-3514.

N/A

6.2.22 Check closed or close 1-EP-BKR-1H1-2S, Bkr 7A, 1-CH-MOV-1267A, CHG PUMP A SUCT NORM.

6.2.23 Check closed or close 1-EP-BKR-1H1-2S, Bkr 8B, 1-CH-MOV-1267B, CHG PUMP A SUCT ALT.

6.2.24 Electrically open 1-CH-MOV-1267A.

6.2.25 Electrically open 1-CH-MOV-1267B.

6.2.26 Check electrical operability of 1-CH-MOV-1267A by cycling suction valve twice.

a. Stroke 1-CH-MOV-1267A closed and return to OPEN.

b. Stroke 1-CH-MOV-1267A closed and return to OPEN.

NOTE: Be prepared to vent 1-CH-PI-1187 as soon as the casing has been vented.

6.2.27 Vent the Charging Pump A casing by performing the following:

a. Vent the Charging Pump A casing by slowly opening the vents until water issues from the vent.

1. 1-CH-252

2. 1-CH-253

b. WHEN water issues from the vent, THEN close the vent valves.

1. 1-CH-252 ______ IV

2. 1-CH-253 ______ IV

6.2.28 IF 0-MCM-0109-01 was used to fill and vent CHG pump, THEN check that the Mechanics have completed fill and vent. Otherwise, enter N/A.

N/A ______ IV

6.2.29 Vent 1-CH-PI-1187 by throttling open 1-CH-ICV-3514. WHEN 1-CH-ICV-3514 is air free, THEN close 1-CH-ICV-3514 AND install vent cap.

______

6.2.30 Have the Mechanics remove the pump vent rig and install the blank flange on the Charging Pump A casing vent flange.

______

6.2.31 Have the Mechanics do Attachment 7 for venting of Charging Pump seals. IF Mechanical Maintenance determines that seal venting is NOT required, THEN enter N/A for this step and have Mechanical Maintenance sign below, indicating concurrence that seal venting is NOT required.

______________________________ ______
Mechanical Maintenance Date

6.2.32 Perform the following breaker manipulations.

______ ______ IV

a. Check closed or close 1-EP-BKR-1H1-2S, Bkr 7A, 1-CH-MOV-1267A, CHG PUMP A SUCT NORM.

______ ______ IV

b. Check closed or close 1-EP-BKR-1H1-2S, Bkr 8B, 1-CH-MOV-1267B, CHG PUMP A SUCT ALT.

______ ______ IV

c. Check closed or close 1-EP-BKR-1H1-2S, Bkr 5A, 1-CH-MOV-1286A, CHG PUMP A DISCH NORM.

______ ______ IV

d. Check closed or close 1-EP-BKR-1H1-2S, Bkr 5C, 1-CH-MOV-1287A, CHG PUMP A DISCH ALT.

______ ______ IV

e. Check closed or close 1-EP-BKR-1H1-2N, Bkr 2B, 1-CH-MOV-1275A, CHG PUMP MINIFLOW RECIRC VALVES PUMP A.

______ ______ IV

6.2.33 Check closed or close 1-EP-BKR-1H1-2N, Bkr 1D, 1-CH-P-110A, Aux Lube Oil Pump. Enter N/A if Aux Lube Oil Pump already running.

N/A ____ 6.2.34 Perform the following:

____ a. Check open or open 1-CH-MOV-1267A.

____ b. Check open or open 1-CH-MOV-1267B.

____ c. Check open or open 1-CH-MOV-1286A.

____ d. Check open or open 1-CH-MOV-1287A.

____ e. Check open or open 1-CH-MOV-1275A.

____ ____ IV 6.2.35 Check closed or close 1-SW-188, Chg Pump LO Clr 5A SW Outlet Drain. IF pump Service Water was NOT tagged out, THEN enter N/A for Steps 6.2.35 through Step 6.2.42.

____ 6.2.36 Check removed or remove the hose from 1-SW-188.

____ ____ IV 6.2.37 Check closed or close 1-SW-166, Chg Pump LO Clr 5A SW Inlet Vent.

____ ____ IV 6.2.38 Check closed or close 1-SW-187, Chg Pump LO Clr 5A SW Inlet Drain.

____ ____ IV 6.2.39 Check closed or close 1-SW-164, Chg Pump LO Clr 5A SW Outlet Vent.

____ ____ IV 6.2.40 Check open or open 1-SW-121, Chg Pump LO Clr 5A SW Inlet.

____ 6.2.41 Vent air from the LO Clr Service Water System by opening vent valve 1-SW-166 until water issues from the vent and then close the vent. IF Service Water Cooling Water was not drained, THEN enter N/A.

____ ____ IV 6.2.42 Check open or open 1-SW-895, Chg Pump LO Clr 5A SW Outlet.

N/A ______ ______ IV

6.2.43 Check open or open 1-CC-765, Chg Pump A Seal Clr CC Inlet.

______ ______ IV

6.2.44 Check open or open 1-CC-997, Chg Pump A Flow Meter Inlet.

______ ______ IV

6.2.45 Throttle 1-CC-770, Chg Pump A Seal Clr CC Flowmeter Outlet, to greater than or equal to 7.5 gpm. (Charging Pump CC flow should be throttled to balance total flow approximately equally between pumps.)

______ ______ IV

6.2.46 Check locked open or lock open on backseat 1-CH-758, 1-CH-MOV-1275A Manual Isolation Valve.

______ ______ IV

6.2.47 Check open or open 1-CH-254, Chg Pump A Disch Hdr Sample Isol.

______

6.2.48 Check that the Charging Pump A gearbox oil level is in the operating range. (Gearbox oil level should be greater than $\frac{1}{4}$). Enter N/A for Steps 6.2.48 through 6.2.51 if Aux Lube Oil Pump already running.

______

6.2.49 Check or place Aux Lube Oil Pump in AUTO.

______

6.2.50 Check that 1-CH-PI-110A, Aux Lube Oil Pump Discharge Pressure, is between 4 psig and 12 psig. Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig.

Lube Oil Pressure ____________ psig

NOTE: A Charging Pump may be started if oil flow can not be checked to bearing(s). Contingency actions for monitoring bearing temperature are in place as a compensatory measure if pump will be started without oil flow to bearing(s).

______

6.2.51 Check oil flow to the pump bearings. Enter N/A if flow can not be checked to bearing(s).

N/A

6.2.52 IF 1-CH-P-1A is already connected to the Bus, THEN enter N/A for Steps 6.2.53 and 6.2.54. Otherwise, enter N/A for this step.

6.2.53 Check or place 1-CH-P-1A in PTL.

6.2.54 Rack 1-EP-BKR-15H5, 1-CH-P-1A, CHARGING PUMP, to the CONNECT position by performing the following:

a. Check that the ground straps for 1-EP-BKR-15H5 have been removed. ______ IV

b. Check that the charging spring motor toggle switch for 1-EP-BKR-15H5 is ON. ______ IV

N/A

c. Rack 1-EP-BKR-15H5, 1-CH-P-1A, to CONNECT. ______ IV

6.3 Placing 1-CH-P-1B in Service and Stopping 1-CH-P-1A

N/A

6.3.1 Check that the following isolation valves are OPEN:

IV a. 1-CH-MOV-1269A, CHG PUMP B SUCT NORM

IV b. 1-CH-MOV-1269B, CHG PUMP B SUCT ALT

IV c. 1-CH-MOV-1286B, CHG PUMP B DISCH NORM

IV d. 1-CH-MOV-1287B, CHG PUMP B DISCH ALT

IV e. 1-CH-MOV-1275B, CHG PUMP MINIFLOW RECIRC VALVES PUMP B

IV f. 1-CH-MOV-1373, CHG MINIFLOW RECIRC

6.3.2 Check locked open and on backseat 1-CH-759, 1-CH-MOV-1275B Manual Isolation Valve.

6.3.3 Check proper gear box and motor oil levels. (Oil levels should be greater than $\frac{1}{4}$).

6.3.4 IF the difference between RCS boron and Charging pump boron is greater than 360 ppm, OR it is desired to flush to further reduce boron differential, THEN initiate Attachment 8. Otherwise, enter N/A. **(Ref. 2.4.20)**

N/A ___ 6.3.5 Check that Aux Lube Oil Pump Discharge Pressure is between 4 psig and 12 psig as indicated on 1-CH-PI-110B. Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig.

Lube Oil Pressure __________ psig

NOTE: A Charging Pump may be started if oil flow can not be checked to bearing(s). Contingency actions for monitoring bearing temperature are in place as a compensatory measure if pump will be started without oil flow to bearing(s).

___ 6.3.6 Check oil flow to the pump bearings. Enter N/A if flow can not be checked to bearing(s).

___ 6.3.7 Record Lube Oil Temperature from 1-CH-TI-110B. Submit a Condition Report if Lube Oil Temperature is less than 60°F or greater than 120°F.

Lube Oil Temperature ____________________ °F

___ 6.3.8 Check that the Auxiliary Building Operator has determined that 1-CH-P-1B is ready to start and that all personnel are clear of the shaft.

CAUTION

- To ensure Tech Spec compliance, simultaneous operation of two Charging Pumps below 350°F shall be limited to the time required to swap from one Charging Pump to another. **(Ref. 2.4.2)**
- To prevent bearing damage, if pump bearing oil flow can NOT be checked, bearing temperature must be monitored closely upon pump start. If temperature rise greater than 30°F is observed during first minute of pump operation, the pump must be secured immediately.

___ 6.3.9 Start 1-CH-P-1B.

___ 6.3.10 Check Chg Pump AMPS stabilize between 50 amps and 65 amps.

N/A

6.3.11 IF pump started with no bearing oil flow observed prior to start, THEN do the following. Otherwise, enter N/A.

- Immediately after pump start, have Aux Building operator check oil flow. IF no oil flow observed, THEN immediately secure 1-CH-P-1B.
- Monitor temperature of pump bearing with no observable oil flow on PCS. IF temperature rises greater than 30°F during first minute of pump operation, THEN immediately secure 1-CH-P-1B.

6.3.12 Check that 1-VS-MOD-101B, Charging Pump Ventilation Suction Motor Operated Damper, is open.

6.3.13 Stop 1-CH-P-1A. IF less than 350°F and 450 psig, THEN place the Control Switch in PTL.

6.3.14 Monitor Charging Pump B bearing temperatures on the Plant computer.

6.3.15 IF either of the following temperature limits is exceeded when the Charging Pump is operating, THEN monitor the pump for degradation as soon as possible by performance of 1-OPT-CH-002, Charging Pump Operability and Performance Test for 1-CH-P-1B.

- Oil Cooler outlet oil temperature - 160°F
- Charging Pump bearing temperature - 180°F

6.3.16 Check that the Aux Lube Oil Pump is stopped.

6.3.17 Check that Lube Oil Pump Discharge Pressure is between 8 psig and 35 psig as indicated on 1-CH-PI-110B. Record Lube Oil Pressure.

Lube Oil Pressure __________ psig

6.3.18 WHEN Charging Pump Lube Oil temperatures have stabilized, THEN check that the TCV is controlling Lube Oil temperature between 100°F and 120°F. **(Ref. 2.4.3)**

N/A

6.3.19 Check that the Aux Lube Oil Pump for 1-CH-P-1A is running with a Lube Oil Pump Discharge Pressure between 4 psig and 12 psig. Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig.

Lube Oil Pressure __________ psig (1-CH-PI-110A)

6.3.20 Check that 1-VS-MOD-101A, 1-CH-P-1A Charging Pump Ventilation Suction Motor Operated Damper, is closed.

6.4 Placing 1-CH-P-1C, NORM FEED, in Service and Stopping 1-CH-P-1A

N/A

6.4.1 Check that the following isolation valves are open:

a. 1-CH-MOV-1270A, CHG PUMP C SUCT NORM ______ ______ IV

b. 1-CH-MOV-1270B, CHG PUMP C SUCT ALT ______ ______ IV

c. 1-CH-MOV-1286C, CHG PUMP C DISCH NORM ______ ______ IV

d. 1-CH-MOV-1287C, CHG PUMP C DISCH ALT ______ ______ IV

e. 1-CH-MOV-1275C, CHG PUMP MINIFLOW RECIRC VALVES PUMP C ______ ______ IV

f. 1-CH-MOV-1373, CHG MINIFLOW RECIRC ______ ______ IV

6.4.2 Check locked open and on backseat 1-CH-760, 1-CH-MOV-1275C Manual Isolation Valve. ______

6.4.3 Check proper gear box and motor oil levels. (Oil levels should be greater than $\frac{1}{4}$). ______

6.4.4 IF the difference between RCS boron and Charging pump boron is greater than 360 ppm, OR it is desired to flush to further reduce boron differential, THEN initiate Attachment 8. Otherwise, enter N/A. **(Ref. 2.4.20)** ______

6.4.5 Check that Aux Lube Oil Pump Discharge Pressure is between 4 psig and 12 psig is indicated on 1-CH-PI-110C. Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig. ______

Lube Oil Pressure ________ psig (1-CH-PI-110C)

NOTE: A Charging Pump may be started if oil flow can not be checked to bearing(s). Contingency actions for monitoring bearing temperature are in place as a compensatory measure if pump will be started without oil flow to bearing(s).

N/A ______ 6.4.6 Check oil flow to the pump bearings. Enter N/A if flow can not be checked to bearing(s).

______ 6.4.7 Record Lube Oil Temperature from 1-CH-TI-110C. Submit a Condition Report if Lube Oil Temperature is less than 60°F or greater than 120°F.

Lube Oil Temperature ____________________ °F

______ 6.4.8 Check that the Auxiliary Building Operator has determined that Charging Pump C is ready to start and that all personnel are clear of the shaft.

______ 6.4.9 IF the RCS is equal to or greater than 350°F and 450 psig, THEN check that 1-CH-P-1B is NOT in PTL.

CAUTION

- To ensure Tech Spec compliance, simultaneous operation of two Charging Pumps below 350°F shall be limited to the time required to swap from one Charging Pump to another. **(Ref. 2.4.2)**
- To prevent bearing damage, if pump bearing oil flow can NOT be checked, bearing temperature must be monitored closely upon pump start. If temperature rise greater than 30°F is observed during first minute of pump operation, the pump must be secured immediately.

______ 6.4.10 Start 1-CH-P-1C, NORM FEED.

______ 6.4.11 Check Chg Pump AMPS stabilize between 50 amps and 65 amps.

N/A

6.4.12 IF pump started with no bearing oil flow observed prior to start, THEN do the following. Otherwise, enter N/A.

- Immediately after pump start, have Aux Building operator check oil flow. IF no oil flow observed, THEN immediately secure 1-CH-P-1C.
- Monitor temperature of pump bearing with no observable oil flow on PCS. IF temperature rises greater than 30°F during first minute of pump operation, THEN immediately secure 1-CH-P-1C.

6.4.13 Check that 1-VS-MOD-101C, Charging Pump Ventilation Suction Motor Operated Damper, is open.

6.4.14 Stop 1-CH-P-1A. IF less than 350°F and 450 psig, THEN place the Control Switch in PTL.

6.4.15 Monitor Charging Pump C bearing temperatures on the Plant computer.

6.4.16 IF either of the following temperature limits is exceeded when the Charging Pump is operating, THEN monitor the pump for degradation as soon as possible by performance of 1-OPT-CH-003, Charging Pump Operability and Performance Test for 1-CH-P-1C.

- Oil Cooler outlet oil temperature - 160°F
- Charging Pump bearing temperature - 180°F

6.4.17 Check that the Aux Lube Oil Pump for 1-CH-P-1C is stopped.

6.4.18 Check that Lube Oil Pump discharge pressure is between 8 psig and 25 psig as indicated on 1-CH-PI-110C. Record Lube Oil Pressure.

Lube Oil Pressure __________ psig

6.4.19 WHEN Charging Pump Lube Oil temperatures have stabilized, THEN check that the TCV is controlling Lube Oil temperature between 100°F and 120°F. **(Ref. 2.4.3)**

N/A ___ 6.4.20 Check that the Aux Lube Oil Pump for 1-CH-P-1A is running with a Lube Oil Pump Discharge Pressure between 4 psig and 12 psig. Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig.

Lube Oil Pressure__________ psig (1-CH-PI-110A)

___ 6.4.21 Check that 1-VS-MOD-101A, 1-CH-P-1A Charging Pump Ventilation Suction Motor Operated Damper, is closed.

6.5 Placing 1-CH-P-1C, ALT FEED, in Service and Stopping 1-CH-P-1A

CAUTION

To ensure Tech Spec compliance, simultaneous operation of two Charging Pumps below 350°F shall be limited to the time required to swap from one Charging Pump to another. **(Ref. 2.4.2)**

N/A ____ 6.5.1 Check the RCS is less than 350°F and 450 psig.

6.5.2 Check or place the following Charging Pump Control Switches in PTL:

____ a. 1-CH-P-1B, CHARGING PUMP B

____ b. 1-CH-P-1C, CHARGING PUMP C NORM FEED

____ c. 1-CH-P-1C, CHARGING PUMP C ALT FEED

____ 6.5.3 Check the following pump and damper checks:

Pump	Aux LO Pump Running	Aux LO Pump Pressure (psig)	Ventilation Damper Closed	Initials
1-CH-P-1C	Yes	4 psig to 12 psig ____ psig	Closed	
1-CH-P-1B	Yes	4 psig to 12 psig ____ psig	Closed	

6.5.4 Rack 1-EP-BKR-15J5, 1-CH-P-1B CHARGING PUMP, to DISCONNECT as follows:

____ ____ IV a. Check that the mechanical position indicator for 1-EP-BKR-15J5 indicates OPEN with a green flag.

____ ____ IV b. Rack 1-EP-BKR-15J5, 1-CH-P-1B CHARGING PUMP, to DISCONNECT.

6.5.5 Rack 1-EP-BKR-15H6, 1-CH-P-1C CHARGING PUMP C NORM FEED, to DISCONNECT as follows:

N/A ____ ____ IV

a. Check that the mechanical position indicator for 1-EP-BKR-15H6 indicates OPEN with a green flag.

____ ____ IV

b. Rack 1-EP-BKR-15H6, 1-CH-P-1C NORM FEED, to DISCONNECT.

CAUTION

Racking in Breaker 15J2 (1-CH-P-1C ALT FEED) will trip/lockout Breaker 15H6 (1-CH-P-1C NORM FEED) and Breaker 15J5 (1-CH-P-1B).

6.5.6 Rack 1-EP-BKR-15J2, 1-CH-P-1C CHARGING PUMP C ALT FEED, to CONNECT as follows:

____ ____ IV

a. Check that the ground straps for 1-EP-BKR-15J2 have been removed.

____ ____ IV

b. Check that the charging spring motor toggle switch for 1-EP-BKR-15J2 is ON.

____ ____ IV

c. Rack 1-EP-BKR-15J2, 1-CH-P-1C ALT FEED, to CONNECT.

____

d. Check annunciators 1D-F6, CHG PP 1B 15J5 LOCKOUT and 1D-G6, CHG PP 1C 15H6 LOCKOUT received.

N/A ______ ______ IV

6.5.7 Check that the following isolation valves are open:

______ ______ IV a. 1-CH-MOV-1270A, CHG PUMP C SUCT NORM

______ ______ IV b. 1-CH-MOV-1270B, CHG PUMP C SUCT ALT

______ ______ IV c. 1-CH-MOV-1286C, CHG PUMP C DISCH NORM

______ ______ IV d. 1-CH-MOV-1287C, CHG PUMP C DISCH ALT

______ ______ IV e. 1-CH-MOV-1275C, CHG PUMP MINIFLOW RECIRC VALVES

______ ______ IV f. 1-CH-MOV-1373, CHG MINIFLOW RECIRC

______ 6.5.8 Check locked open and on backseat 1-CH-760, 1-CH-MOV-1275C Manual Isolation Valve. |

______ 6.5.9 Check proper gear box and motor oil levels. (Oil levels should be greater than $\frac{1}{4}$).

______ 6.5.10 IF the difference between RCS boron and Charging pump boron is greater than 360 ppm, OR it is desired to flush to further reduce boron differential, THEN initiate Attachment 8. Otherwise, enter N/A. **(Ref. 2.4.20)**

______ 6.5.11 Check that Aux Lube Oil Pump Discharge Pressure is between 4 psig and 12 psig as indicated on 1-CH-PI-110C. Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig.

Lube Oil Pressure__________ psig

NOTE: A Charging Pump may be started if oil flow can not be checked to bearing(s). Contingency actions for monitoring bearing temperature are in place as a compensatory measure if pump will be started without oil flow to bearing(s).

N/A ______ 6.5.12 Check oil flow to the pump bearings. Enter N/A if flow can not be checked to bearing(s).

______ 6.5.13 Record Lube Oil Temperature from 1-CH-TI-110C. Submit a Condition Report if Lube Oil Temperature is less than 60°F or greater than 120°F.

Lube Oil Temperature ____________________ °F

______ 6.5.14 Check that the Auxiliary Building Operator has determined that Charging Pump C is ready to start and that all personnel are clear of the shaft.

CAUTION

To prevent bearing damage, if pump bearing oil flow can NOT be checked, bearing temperature must be monitored closely upon pump start. If temperature rise greater than 30°F is observed during first minute of pump operation, the pump must be secured immediately.

______ 6.5.15 Start 1-CH-P-1C ALT FEED.

______ 6.5.16 Check Chg Pump AMPS stabilize between 50 amps and 65 amps.

6.5.17 IF pump started with no bearing oil flow observed prior to start, THEN do the following. Otherwise, enter N/A.

______ • Immediately after pump start, have Aux Building operator check oil flow. IF no oil flow observed, THEN immediately secure 1-CH-P-1C.

______ • Monitor temperature of pump bearing with no observable oil flow on PCS. IF temperature rises greater than 30°F during first minute of pump operation, THEN immediately secure 1-CH-P-1C.

N/A

6.5.18 Check that 1-VS-MOD-101C, Charging Pump Ventilation Suction Motor Operated Damper, is open.

6.5.19 Stop 1-CH-P-1A and return switch to PTL.

a. Check that the Aux Lube Oil Pump for 1-CH-P-1A is running with a Lube Oil Pump Discharge Pressure between 4 psig and 12 psig. Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig.

Lube Oil Pressure _______ psig (1-CH-PI-110A)

b. Check that 1-VS-MOD-101A, 1-CH-P-1A Charging Pump Ventilation Suction Motor Operated Damper, is closed.

6.5.20 Monitor Charging Pump C bearing temperatures on the Plant computer.

6.5.21 IF either of the following temperature limits is exceeded when the Charging Pump is operating, THEN monitor the pump for degradation as soon as possible by performance of 1-OPT-CH-003, Charging Pump Operability and Performance Test for 1-CH-P-1C.

- Oil Cooler outlet oil temperature - 160°F
- Charging Pump bearing temperature - 180°F

6.5.22 Check that the 1-CH-P-1C Aux Lube Oil Pump is stopped.

6.5.23 Check that Lube Oil Pump discharge pressure is between 8 psig and 25 psig as observed on 1-CH-PI-110C. Record Lube Oil Pressure.

Lube Oil Pressure __________ psig

6.5.24 Check the system for leaks. IF leakage is found, THEN isolate the leak, if possible, AND notify Shift Supervision.

6.5.25 WHEN Charging Pump Lube Oil temperatures have stabilized, THEN check that the TCV is controlling Lube Oil temperature between 100°F and 110°F. (**Ref.** 2.3.16) (**Ref. 2.4.3**)

6.6 Discharge Check Valve Test, MOV Timing, Lube Oil TCV Timing and Starting 1-CH-P-1A

NOTE: Steps 6.6.1 through 6.6.9 may be performed simultaneously.

6.6.1 Test the charging pump discharge check valve, the stroke time of MOVs and Lube Oil TCV by performing the following. IF Check Valve testing, MOV stroke time testing, and Lube Oil TCV stroke time testing do NOT have to be performed, THEN enter N/A for steps in this subsection.

NOTE:
- If individual MOV(s) being returned to service, Subsection 6.9 may be used, if desired.
- If only one other Charging Pump is operable, the performance of the following substep will result in the entry into a Tech Spec LCO clock due to operating with less than the minimum number of operable Charging Pumps.

a. Check 1-CH-P-1A stopped and place pump in PTL.

b. Check open the following isolation valves:

1. 1-CH-MOV-1267A, CHG PUMP A SUCT NORM
2. 1-CH-MOV-1267B, CHG PUMP A SUCT ALT
3. 1-CH-MOV-1286A, CHG PUMP A DISCH NORM
4. 1-CH-MOV-1287A, CHG PUMP A DISCH ALT
5. 1-CH-MOV-1275A, CHG PUMP MINIFLOW RECIRC VALVES PUMP A
6. 1-CH-MOV-1373, CHG MINIFLOW RECIRC

6.6.1 (continued)

μ ____ c. Check locked open or lock open on backseat 1-CH-758, 1-CH-MOV-1275A Manual Isolation Valve.

NOTE: Full stroke time is defined as the interval from initiation of the actuating signal (initiation of manual actuation of the control panel switch) to the end of the actuating cycle (final control panel light extinguished).

d. From the Control Room, close the following. Using Control Room indication, check each valve travels from full open to full closed. Record time required for each valve to travel closed on Attachment 4.

γ ____ 1. Close and time 1-CH-MOV-1286A, CHG PUMP A DISCH NORM.

γ ____ 2. Close and time 1-CH-MOV-1287A, CHG PUMP A DISCH ALT.

γ ____ 3. Close and time 1-CH-MOV-1275A, CHG PUMP MINIFLOW RECIRC VALVES PUMP A.

γ ____ 4. Close 1-CH-MOV-1267A, CHG PUMP A SUCT NORM. (Valve exercise only. Do not record the stroke time on Attachment 4.)

γ ____ e. Record discharge pressure of running Charging pump from Plant Computer Point P0142A, Chg Pump Discharge Header Press or the normal discharge gauge on Attachment 1.

f. From the Control Room, open the following. Using Control Room indication, check each valve travels from full closed to full open. Record time required for each valve to travel open on Attachment 4.

γ ____ 1. Open 1-CH-MOV-1267A, CHG PUMP A SUCT NORM. (Valve exercise only. Do not record the stroke time on Attachment 4.)

γ ____ 2. Open and time 1-CH-MOV-1275A, CHG PUMP MINIFLOW RECIRC VALVES PUMP A.

6.6.1.f (continued)

γ ____ 3. Open and time 1-CH-MOV-1286A, CHG PUMP A DISCH NORM. WHEN 1-CH-MOV-1286A is opened, THEN check the following parameters indicate no charging pump discharge check valve leakage: (✓)

✓ Record discharge pressure of running pump on Attachment 1 using the instrument used in Substep 6.6.1.e.

NOTE: The following are additional parameters to assist the System Engineer in determining the magnitude of check valve leakage, however the acceptance criteria is not based on these parameters.

✓ 1D-E5, CHRG PP TO REGEN HX HI-LO FLOW NOT LIT.

✓ 1D-F5, CHRG PP TO REGEN HX LO PRESS NOT LIT.

✓ CHG PUMP AMPS do not rise.

____ IF Plant Computer point F0128A, Charging Header Flow, is being trended, THEN check that charging flow does not lower.

γ ____ 4. Open and time 1-CH-MOV-1287A, CHG PUMP A DISCH ALT.

NOTE: Values less than 5.4 psid include ANY negative values.

γ ____ g. Calculate the Discharge Pressure Differential on Attachment 1. (If the differential is less than or equal to 5.4 psid, the close test for 1-CH-258, Charging Pump A Discharge Check Valve, is satisfactory, and 1-CH-256 backleakage is acceptable)

N/A γ ____ h. IF the differential is greater than 5.4 psid, THEN add the HIGHEST backleakage (ΔP) value recorded in Step 6.1.1 to backleakage from Step 6.6.1.g and calculate on Attachment 1. (If the total differential is less than or equal to 10.8 psid, the close test for 1-CH-258, Charging Pump A Discharge Check Valve, is satisfactory, and 1-CH-256 backleakage is acceptable). Otherwise, enter N/A.

M 6.6.2 Check 1-CH-P-110A, Auxiliary Oil Pump, is running with pressure on 1-CH-PI-110A, Aux Lube Oil Pump Discharge Pressure, between 4 psig and 12 psig. IF Lube Oil Pressure is greater than 12 psig, THEN submit a Condition Report.

M 6.6.3 Record Lube Oil Temperature from 1-CH-TI-110A, CHG Pump 1A Gearbox LO Sup Temp Ind. IF Lube Oil Temperature is less than 60°F or greater than 120°F, THEN submit a condition report.

Lube Oil Temperature 91 °F

NOTE: For a Charging Pump which has just been shut down, the respective TCV will normally remain open or throttled until the oil temperature has been reduced below the operating range of 100°F to 120°F.

6.6.4 Evaluate status of 1-SW-TCV-108A and perform the corresponding actions. (✓) Enter N/A for actions not taken.

Status	Criteria	Actions	Initials
✓	1-SW-TCV-108A Closed	Continue with Step 6.6.5.	M
N/A Y	1-SW-TCV-108A Not full closed	a) IF 1-CH-P-1A was recently shut down AND 1-SW-TCV-108A remains partially open, THEN wait until 1-SW-TCV-108A goes full closed AND continue with Step 6.6.5.	N/A M
		b) IF 1-CH-P-1A was NOT recently shut down, THEN adjust controller until 1-SW-TCV-108A closes AND continue with Step 6.6.5.	
		c) IF 1-SW-TCV-108A can NOT be closed by adjusting controller, THEN write a Condition Report AND do NOT continue until 1-SW-TCV-108A is operational.	

6.6.5 Stroke test 1-SW-TCV-108A by performing the following:

M a. Obtain the AirCet test fitting.

M b. Check 1-CH-P-1A stopped.

M c. Close or check closed the valve on the AirCet test fitting.

6.6.5 (continued)

NOTE: The test fitting must be connected at the proper disconnect fitting. If the AirCet test fitting is connected to the wrong disconnect, then the valve will open, however, the stroke time will be significantly longer.
(Ref. **2.4.10**)

d. Connect the AirCet test fitting to the quick disconnect fitting on the air supply tubing leading to 1-SW-TCV-108A actuator dome.

e. Check closed 1-SW-TCV-108A.

f. Station an operator to track the stroke time of 1-SW-TCV-108A.

g. Close 1-IA-1600, Chg Pump A 1-SW-TCV-108A Positioner IA Isol.

NOTE: Stroke time is defined as the time required for the valve local position indicator to travel to the opposite extreme. Stroke timing will start when stem starts to move.

h. Quickly open the isolation valve on the AirCet test fitting and begin timing.

NOTE: The TCV is open at greater than or equal to 87.5%. (14/16 on position indicator)

i. Check 1-SW-TCV-108A opens, as indicated on the local position indicator. Record the stroke time and Test position on Attachment 4.

j. Close the isolation valve on the AirCet test fitting.

k. Remove the AirCet test fitting from 1-SW-TCV-108A.

IV

l. Open 1-IA-1600.

6.6.5 (continued)

M m. Check 1-SW-TCV-108A strokes fully closed and record the As Left position on Attachment 4. IF 1-SW-TCV-108A does NOT fully close, THEN initiate a Condition Report to check the operation of the controller.

N/A M 6.6.6 IF the controller for 1-SW-TCV-108A was adjusted in Step 6.6.4, THEN perform 1-IPM-SW-TCV-108A to adjust controller setpoint. Otherwise, enter N/A.

M 6.6.7 Check that the Charging Pump gearbox oil level is in the operating range.

M 6.6.8 Check oil flow to the pump bearings. Enter N/A if flow can not be observed to bearing(s).

6.6.9 Check the following before starting 1-CH-P-1A:

N/A γ a. IF the difference between RCS boron and Charging pump boron is greater than 360 ppm, OR it is desired to flush to further reduce boron differential, THEN initiate Attachment 8. Otherwise, enter N/A. **(Ref. 2.4.20)**

M b. Check that 1-CH-PI-110A, Aux Lube Oil Pump Discharge Pressure, is between 4 psig and 12 psig. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig.

M c. Check that LO temperature is greater than 28°F and preferably in the normal operating band between 80°F and 120°F.

M d. Record Lube Oil Temperature from 1-CH-TI-110A. Submit a Condition Report if Lube Oil Temperature is less than 60°F or greater than 120°F.

Lube Oil Temperature 89 °F

M e. Check that 1-VS-MOD-101A, Charging Pump Ventilation Suction Damper, is closed by noting no significant airflow through the duct.

NOTE: If any of the following temperature limits are exceeded on the Charging Pump being tested, the pump should be immediately shutdown:

- Oil Cooler outlet oil temperature upper operating limit is 160°F.
- Oil Cooler outlet oil temperature lower operating limit is 28°F.
- The upper administrative limit for the Charging Pump bearings is 180°F.

N/A γ 6.6.10 IF only valve stroke timing is to be performed, THEN place 1-CH-P-1A in AUTO and enter N/A for the remaining steps in Subsection 6.6.

CAUTION

To prevent bearing damage, if pump bearing oil flow can NOT be checked, bearing temperature must be monitored closely upon pump start. If temperature rise greater than 30°F is observed during first minute of pump operation, the pump must be secured immediately.

NOTE:
- Performance of the next step may remove the Unit from the LCO clock entered in Substep 6.6.1.a.
- If a Return to Service test of 1-CH-P-1A is being performed, the next step may place Unit 1 in a LCO clock (because Charging Pump A UV trip will be disabled when Charging Pump C is secured) until Charging Pump A is declared operable, placed in PTL, or the UV trip is enabled. **(Ref. 2.4.6)**

γ 6.6.11 Start 1-CH-P-1A.

γ 6.6.12 Check Chg Pump AMPS stabilize between 50 amps and 65 amps.

N/A ____ 6.6.13 IF pump started with no bearing oil flow observed prior to start, THEN do the following. Otherwise, enter N/A.

- Immediately after pump start, have Aux Building operator check oil flow. IF no oil flow observed, THEN immediately secure 1-CH-P-1A.
- Monitor temperature of pump bearing with no observable oil flow on PCS. IF temperature rises greater than 30°F during first minute of pump operation, THEN immediately secure 1-CH-P-1A.

____ 6.6.14 Check 1-VS-MOD-101A is open by noting airflow through the duct. **(Ref. 2.4.4)**

____ 6.6.15 IF the RCS is equal to or greater than 350°F and 450 psig, THEN check plant status AND perform one of the associated actions below. (✓) Enter N/A for actions not taken.

NOTE: Subsection 6.10 should be performed as soon as possible after pump stop.

Status		Actions	Initials
N/A	1-CH-P-1B is to be STOPPED and placed in AUTO	a) Stop 1-CH-P-1B and place in AUTO. b) Continue with Step 6.6.17. c) Perform Subsection 6.10	N/A ____ ____
✓	1-CH-P-1C, NORM FEED, is to be STOPPED and placed in AUTO	a) Stop 1-CH-P-1C, NORM FEED, and place in AUTO. b) Continue with Step 6.6.17. c) Perform Subsection 6.10	____ ____ ____
N/A	1-CH-P-1C, ALT FEED, is to be STOPPED and placed in AUTO	a) Check 1-CH-P-1A is declared operable. b) Stop 1-CH-P-1C, ALT FEED, and place in AUTO. This places the Unit in a LCO clock if Critical. c) Continue with Step 6.6.17. d) Perform Subsection 6.10	N/A ____ ____ ____

N/A ____ 6.6.16 IF the RCS is less than 350°F and 450 psig, THEN place the operating pump (1-CH-P-1B or 1-CH-P-1C) in PTL. Otherwise, enter N/A.

____ 6.6.17 Monitor Charging Pump A bearing temperatures on the Plant computer.

γ ____ 6.6.18 Check that the Aux Lube Oil Pump is stopped.

γ ____ 6.6.19 Check that Lube Oil Pump Discharge Pressure is between 8 psig and 25 psig as indicated on 1-CH-PI-110A. Record Lube Oil Pressure.

Lube Oil Pressure __20__ psig

CAUTION
To prevent bearing damage, oil temperatures MUST NOT be allowed to exceed 160°F.

NOTE: Setpoint adjustments to 1-SW-TCV-108A MUST NOT be made during a pump start.

N/A γ ____ 6.6.20 Monitor oil pressure and temperature. IF it is anticipated that Lube Oil Pump Discharge Pressure will drop below 8 psig OR Lube Oil temperature will reach 160°F, THEN start the operable standby pump AND secure 1-CH-P-1A. Otherwise, enter N/A.

NOTE: During hot weather a TCV may be full open with temperature above 120°F.

γ ____ 6.6.21 WHEN Charging Pump Lube Oil temperatures have stabilized, THEN check that the TCV is controlling Lube Oil temperature between 100°F and 120°F. **(Ref. 2.4.3)**

- IF oil temperature is greater than 120°F, AND the TCV is full open, THEN submit a Condition Report and inform System Engineering.
- IF oil temperature is greater than 120°F, AND the TCV is not full open, THEN write a Condition Report for I & C to adjust the setpoint.
- IF oil temperature is less than 100°F, THEN write a CR for I & C to adjust the setpoint.

γ 6.6.22 Check the following pump and damper checks:

Pump	Aux LO Pump Running	Aux LO Pump Pressure (psig)	Ventilation Damper Closed	Initials
1-CH-P-1B	Yes	4 psig to 12 psig 7 psig	Closed	γ
1-CH-P-1C	Yes	4 psig to 12 psig 8 psig	Closed	γ

6.7 **1-CH-P-1A Performance Test**

NOTE: Charging flow may require manual adjustment to maintain Przr level at normal operating level.

✓ 6.7.1 Check Pressurizer level is at the desired Program band level and stable.

NOTE: When Charging flow is adjusted, Pressurizer level may deviate from program level. RCS pressure should be closely monitored.

✓ 6.7.2 Close 1-CH-MOV-1267B, CHG PUMP A SUCT ALT.

N/A ✓ 6.7.3 IF the RCS is less than 350°F and 450 psig, THEN adjust the total Charging Flow to 131 gpm. Otherwise, enter N/A.

a. Check or place 1-CH-FC-1122C, CHG FLOW CNTRL, in MANUAL.

b. Using 1-CH-FC-1122C and 1-RH-HCV-1142, RHR LETDOWN FLOW, adjust the flow through the Charging Pump until 1-CH-FI-1181, 1-CH-P-1A Suction Flow, indicates between 129 gpm and 133 gpm. (Target Flow 131 gpm)

✓ 6.7.4 IF the RCS is greater than 350°F and 450 psig, THEN check or place 1-CH-FC-1122C, CHG FLOW CNTRL, in AUTO. Otherwise, enter N/A.

CAUTION

Adjustment of charging flow will affect Przr level, letdown temperature, and letdown pressure. These parameters must be continuously monitored to prevent flashing in the letdown line, relief valve lifting, and excessive temperature changes to the letdown flowstream.

6.7.5 Record the following indications:

γ • Przr Level 54 %

γ • VCT Level 51 %

γ • LTDN Relief Line Temperature (1-CH-TI-1141) 106 °F

γ • Non-Regen Hx Temperature (1-CH-TI-1144) 97 °F

γ • Letdown Line Pressure (1-CH-PI-1145) 311 psi

γ 6.7.6 Record charging flow. (1-CH-FT-1122) PCS point F0128A 84.2 gpm

γ 6.7.7 Record suction flow. (1-CH-FI-1181 from local indicator) 158.1 gpm. If suction flow is oscillating excessively, vent 1-CH-FT-1181 in accordance with Attachment 6.

NOTE:
- Pump performance test takes approximately 20 minutes. Przr Level Program band should be maintained.
- In order to remain within the Przr level program band of +/- 5% for the duration of the test, adjustment must not exceed 7 gpm. Inability to obtain the required target flowrate with a +/- 7 gpm adjustment does not affect pump operability.

γ 6.7.8 Check or place 1-CH-LC-1459G, PRZR LEVEL CNTRL, in Manual.

γ 6.7.9 Check or place 1-CH-FC-1122C, CHG FLOW CONTROL, in Manual.

γ 6.7.10 Adjust total charging flow:

a. Adjust 1-CH-FC-1122C until 1-CH-FI-1181 indicates a target range of between 147.3 and 162.7 gpm.

N/A γ b. IF required adjustment exceeds +/- 7 gpm of the flow recorded in Step 6.7.7, THEN adjust to not more than +/- 7 gpm AND note in Operator Comments, Subsection 7.3. Otherwise, enter N/A.

NOTE: 1-CH-P-1A must run for at least 2 minutes to stabilize parameters before recording data.

γ 6.7.11 Record the following information on Attachment 1, 1-CH-P-1A Performance Test Data Sheet:

- VCT Level
- VCT Pressure
- RCP A Seal Flow (1-CH-FT-1130) Plant Computer Point U0983)
- RCP B Seal Flow (1-CH-FT-1127) Plant Computer Point U0982)
- RCP C Seal Flow (1-CH-FT-1124) Plant Computer Point U0981)
- 1-CH-P-1A Discharge Pressure (1-CH-PI-1151)
- 1-CH-P-1A Suction Pressure (1-CH-PI-1187)
- 1-CH-P-1A Suction Flow (1-CH-FI-1181) from Local Indicator
- Charging Flow (1-CH-FT-1122) Plant Computer Point F0128A)

NOTE: Attachment 2 is to be used for plant conditions greater than 350°F and Attachment 3 for plant conditions less than 350°F.

γ 6.7.12 Calculate the Pump Differential Pressure (ΔP) on Attachment 1 and record the calculated value on Attachment 2 or Attachment 3. (If the ΔP is in the acceptable range, the partially open test for 1-CH-258 is satisfactory.)

γ ____ 6.7.13 Check 1-CH-PI-110A, Lube Oil Pump Discharge Pressure, and record Lube Oil Pressure on Attachment 1. (Reference pressure range is 8 psig to 25 psig.)

NOTE:
- Points measured but not recorded on Attachment 2 or Attachment 3 will be used by Engineering.
- The specified flow rate must be maintained while suction pressure, discharge pressure, and vibration points 19 through 24 are recorded. Flow adjustments may be made after these data points are collected.

ɣ ____ 6.7.14 Using the Microlog Data Collector, measure the bearing vibration of the pump, driver, and speed increaser at points 1 through 24 of Attachment 2 or Attachment 3. Record the measured data for points 19 through 24 on Attachment 2 or Attachment 3.

γ ____ 6.7.15 Calculate the Charging Pump Miniflow Recirc flow rate on Attachment 1 and record the calculated value on Attachment 2 or Attachment 3. (If the flow rate is in acceptable range, the open test for 1-CH-256, Charging Pump Miniflow Check Valve, and 1-CH-230, VCT Supply Discharge Check Valve, is satisfactory.)

γ ____ 6.7.16 Call up the 1-CH-P-1A Inboard, Outboard, and Thrust Bearing temperatures on the Plant Computer and record on Attachment 1.

N/A γ ____ 6.7.17 IF any bearing temperature is above 170°F, THEN notify System Engineering within 24 hours AND record name of person notified on Attachment 1. Monitor bearing temperature closely while the pump is operating. IF bearing temperatures are below 170°F, THEN enter N/A.

N/A γ ____ 6.7.18 IF the RCS is less than 350°F and 450 psig, THEN, using 1-CH-FC-1122C and 1-RH-HCV-1142, return the RHR Letdown Flow to a value specified by Shift Supervision. Otherwise, enter N/A.

γ ____ 6.7.19 IF the RCS is greater than 350°F and 450 psig, THEN, using 1-CH-FC-1122C, adjust charging flow AND establish Przr level to within Program band. Otherwise, enter N/A.

____ 6.7.20 Place 1-CH-FC-1122C in Auto.

____ 6.7.21 WHEN Przr level is at the desired level AND stable, THEN place 1-CH-LC-1459G in Auto.

6.7.22 Record the following indications. Enter N/A if RCS is less than 350°F and 450 psig.

- Przr Level 53.4 %
- VCT Level 50.4 %
- LTDN Relief Line Temperature (1-CH-TI-1141) 107 °F
- Non-Regen Hx Temperature (1-CH-TI-1144) 97 °F
- Letdown Line Pressure (1-CH-PI-1145) 311 psi

____ 6.7.23 Open 1-CH-MOV-1267B.

____ 6.7.24 Check that 1-CH-P-1A operating parameters are normal.

____ 6.7.25 Inspect all piping outlined on Attachment 5. Collect any leakage found for a two minute period. Record the leak location and the quantity collected on Attachment 1 (10 drops = 1 cc). **(Ref. 2.4.25)**

N/A 6.7.26 Record Condition Report number on Attachment 1 for each leak found.

CAUTION

To prevent bearing damage, if pump bearing oil flow can NOT be checked, bearing temperature must be monitored closely upon pump start. If temperature rise greater than 30°F is observed during first minute of pump operation, the pump must be secured immediately.

NOTE: The performance of the next step may allow the Unit to exit a LCO clock.

6.7.27 IF 1-CH-P-1C, ALT FEED, is the only other operable pump, THEN perform the following. Otherwise, enter N/A.

N/A

a. IF the difference between RCS boron and Charging pump boron is greater than 360 ppm, OR it is desired to flush to further reduce boron differential, THEN initiate Attachment 8. Otherwise, enter N/A. **(Ref. 2.4.20)**

b. Start 1-CH-P-1C, ALT FEED.

c. Check Chg Pump AMPS stabilize between 50 amps and 65 amps.

d. IF pump started with no bearing oil flow observed prior to start, THEN do the following. Otherwise, enter N/A.

- Immediately after pump start, have Aux Building operator check oil flow. IF no oil flow observed, THEN immediately secure 1-CH-P-1C.
- Monitor temperature of pump bearing with no observable oil flow on PCS. IF temperature rises greater than 30°F during first minute of pump operation, THEN immediately secure 1-CH-P-1C.

e. Check that 1-VS-MOD-101C, Charging Pump Ventilation Suction Motor Operated Damper, is open. **(Ref. 2.4.4)**

f. Stop 1-CH-P-1A and place in AUTO.

g. Monitor Charging Pump C bearing temperatures on the Plant computer.

N/A 8

6.7.27 (continued)

h. IF either of the following temperature limits is exceeded when the Charging Pump is operating, THEN monitor the pump for degradation as soon as possible by performance of 1-OPT-CH-003, Charging Pump Operability and Performance Test for 1-CH-P-1C.

- Oil Cooler outlet oil temperature - 160°F
- Charging Pump bearing temperature - 180°F

i. Check that the Aux Lube Oil Pump for 1-CH-P-1C is stopped.

j. Check that Lube Oil Pump, discharge pressure is between 8 psig and 25 psig as indicated on 1-CH-PI-110C. Record Lube Oil Pressure.

Lube Oil Pressure _______ psig

k. WHEN Charging Pump Lube Oil temperatures have stabilized, THEN check that the TCV is controlling Lube Oil temperature between 100°F and 120°F. **(Ref. 2.4.3)**

l. Check that the Aux Lube Oil Pump for 1-CH-P-1A is running with a Lube Oil Pump Discharge Pressure between 4 psig and 12 psig. Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig.

Lube Oil Pressure _______ psig (1-CH-PI-110A)

m. Check that 1-VS-MOD-101A, 1-CH-P-1A Charging Pump Ventilation Suction Motor Operated Damper, is closed.

6.8 1-CH-P-1C, ALT FEED, Breaker Damper Logic

NOTE: If Unit 1 is critical, 1-CH-P-1A must be operable prior to performing this section. **(Ref. 2.4.6)**

N/A 8 ____ 6.8.1 IF either Subsection 6.5 or Step 6.7.27 has been performed, THEN enter N/A for Subsection 6.8. Otherwise, continue with Step 6.8.2. **(Ref. 2.4.4)**

____ 6.8.2 Check 1-CH-P-1A is running.

6.8.3 Check or place the following Charging Pump Control Switches in PTL. IF the Reactor is critical, THEN the performance of this step will place the Unit in a LCO clock.

____ a. 1-CH-P-1B, CHARGING PUMP B

____ b. 1-CH-P-1C, CHARGING PUMP C NORM FEED

____ c. 1-CH-P-1C, CHARGING PUMP C ALT FEED

____ 6.8.4 Check the following pump and damper checks:

Pump	Aux LO Pump Running	Aux LO Pump Pressure (psig)	Ventilation Damper Closed	Initials
1-CH-P-1C	Yes	4 psig to 12 psig _____ psig	Closed	________
1-CH-P-1B	Yes	4 psig to 12 psig _____ psig	Closed	________

6.8.5 Rack 1-EP-BKR-15H6, 1-CH-P-1C NORM FEED, to DISCONNECT as follows:

____ ____ IV a. Check that the mechanical position indicator for 1-EP-BKR-15H6 indicates OPEN with a green flag.

____ ____ IV b. Rack 1-EP-BKR-15H6, 1-CH-P-1C NORM FEED, to DISCONNECT.

CAUTION

Racking in Breaker 15J2 (1-CH-P-1C ALT FEED) will trip/lockout Breaker 15H6 (1-CH-P-1C NORM FEED) and Breaker 15J5 (1-CH-P-1B).

6.8.6 Rack 1-EP-BKR-15J2, 1-CH-P-1C CHARGING PUMP C ALT FEED, to TEST as follows:

N/A ____ IV a. Check that the ground straps for 1-EP-BKR-15J2 have been removed.

____ ____ IV b. Check the charging spring motor toggle switch for 1-EP-BKR-15J2 is ON.

____ ____ IV c. Rack 1-EP-BKR-15J2, 1-CH-P-1C ALT FEED, to TEST.

____ 6.8.7 Place Control Room switch for 1-CH-P-1C, ALT FEED, to AUTO.

____ 6.8.8 Locally place 1-CH-P-1C, ALT FEED, to CLOSE and return to AUTO.

____ 6.8.9 Check that 1-VS-MOD-101C, Charging Pump Ventilation Suction Motor Operated Damper, is open.

____ 6.8.10 Locally place 1-CH-P-1C, ALT FEED, to TRIP and return to AUTO.

____ 6.8.11 Check that 1-VS-MOD-101C, Charging Pump Ventilation Suction Motor Operated Damper, is closed.

____ 6.8.12 Place Control Room switch for 1-CH-P-1C, ALT FEED, to PTL.

6.8.13 Rack 1-EP-BKR-15J2, 1-CH-P-1C CHARGING PUMP C ALT FEED, to DISCONNECT.

N/A 8

a. Check that the mechanical position indicator for 1-EP-BKR-15J2 indicates OPEN with a green flag. ____ ____ IV

b. Rack 1-EP-BKR-15J2, 1-CH-P-1C CHARGING PUMP C ALT FEED, to DISCONNECT. ____ ____ IV

6.8.14 Check that the following isolation valves are OPEN:

a. 1-CH-MOV-1269A, CHG PUMP B SUCT NORM ____ ____ IV

b. 1-CH-MOV-1269B, CHG PUMP B SUCT ALT ____ ____ IV

c. 1-CH-MOV-1286B, CHG PUMP B DISCH NORM ____ ____ IV

d. 1-CH-MOV-1287B, CHG PUMP B DISCH ALT ____ ____ IV

e. 1-CH-MOV-1275B, CHG PUMP MINIFLOW RECIRC VALVES PUMP B ____ ____ IV

f. 1-CH-MOV-1373, CHG MINIFLOW RECIRC ____ ____ IV

6.8.15 Check that Aux Lube Oil Pump Discharge Pressure for 1-CH-P-1B is between 4 psig and 12 psig as indicated on 1-CH-PI-110B. Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig. ____

Lube Oil Pressure __________ psig

NOTE: A Charging Pump may be started if oil flow can not be checked to bearing(s). Contingency actions for monitoring bearing temperature are in place as a compensatory measure if pump will be started without oil flow to bearing(s).

N/A ______ 6.8.16 Check oil flow to the pump bearings. Enter N/A if flow can not be checked to bearing(s).

______ 6.8.17 Record Lube Oil Temperature from 1-CH-TI-110B. Submit a Condition Report if Lube Oil Temperature is less than 60°F or greater than 120°F.

Lube Oil Temperature ____________________ °F

______ 6.8.18 Place 1-CH-P-1B in AUTO and exit the LCO clock.

CAUTION

Racking in Breaker 15H6 (1-CH-P-1C NORM FEED) will trip/lockout Breaker 15J2 (1-CH-P-1C ALT FEED).

6.8.19 Rack 1-EP-BKR-15H6, 1-CH-P-1C NORM FEED, to CONNECT. <u>IF</u> Shift Supervision desires to leave breaker racked out, <u>THEN</u> enter N/A for this step.

______ ______ IV a. Check that the ground straps for 1-EP-BKR-15H6 have been removed.

______ ______ IV b. Check the charging spring motor toggle switch for 1-EP-BKR-15H6 is ON.

✓ ______ ______ IV c. Rack 1-EP-BKR-15H6, 1-CH-P-1C NORM FEED, to CONNECT.

6.8.20 Check that the following isolation valves are open:

N/A 08 ______ IV
a. 1-CH-MOV-1270A, CHG PUMP C SUCT NORM

______ ______ IV
b. 1-CH-MOV-1270B, CHG PUMP C SUCT ALT

______ ______ IV
c. 1-CH-MOV-1286C, CHG PUMP C DISCH NORM

______ ______ IV
d. 1-CH-MOV-1287C, CHG PUMP C DISCH ALT

______ ______ IV
e. 1-CH-MOV-1275C, CHG PUMP MINIFLOW RECIRC VALVES

______ ______ IV
f. 1-CH-MOV-1373, CHG MINIFLOW RECIRC

______
6.8.21 Check locked open and on backseat 1-CH-760, 1-CH-MOV-1275C Manual Isolation Valve.

______
6.8.22 Check that Aux Lube Oil Pump Discharge Pressure for 1-CH-P-1C is between 4 psig and 12 psig as indicated on 1-CH-PI-110C.
Record Lube Oil Pressure. Submit a Condition Report if Lube Oil Pressure is greater than 12 psig.

Lube Oil Pressure __________ psig

NOTE: A Charging Pump may be started if oil flow can not be checked to bearing(s). Contingency actions for monitoring bearing temperature are in place as a compensatory measure if pump will be started without oil flow to bearing(s).

______
6.8.23 Check oil flow to the pump bearings. Enter N/A if flow can not be checked to bearing(s).

N/A

6.8.24 Record Lube Oil Temperature from 1-CH-TI-110C. Submit a Condition Report if Lube Oil Temperature is less than 60°F or greater than 120°F.

Lube Oil Temperature ____________________ °F

6.8.25 Place 1-CH-P-1C NORM FEED in AUTO.

6.9 Testing of Charging Pump MOVs

NOTE: This section allows testing of MOVs individually following Maintenance. If return to service testing of a Charging Pump is required, refer to Step 6.1.4 for required actions.

N/A ____ 6.9.1 Check all Maintenance has been completed on MOV(s) being tested.

____ 6.9.2 Notify Maintenance Personnel if required.

NOTE: Full stroke time is defined as the interval from initiation of the actuating signal (initiation of manual actuation of the control panel switch) to the end of the actuating cycle (final control panel light extinguished).

6.9.3 From the Control Room, close the following MOV(s). Using Control Room indication, check each valve travels from full open to full closed. Record time required for each valve to travel closed on Attachment 4. Enter N/A for valve(s) not being stroked.

____ a. Close and time 1-CH-MOV-1286A, CHG PUMP A DISCH NORM.

____ b. Close and time 1-CH-MOV-1287A, CHG PUMP A DISCH ALT.

____ c. Close and time 1-CH-MOV-1275A, CHG PUMP MINIFLOW RECIRC VALVES PUMP A.

____ d. Close 1-CH-MOV-1267A, CHG PUMP A SUCT NORM.
(Valve exercise only. Do not record stroke time on Attachment 4.)

6.9.4 From the Control Room, open the following MOV(s). Using Control Room indication, check each valve travels from full closed to full open. Record time required for each valve to travel open on Attachment 4. Enter N/A for valve(s) not being stroked.

N/A ____ a. Open and time 1-CH-MOV-1286A, CHG PUMP A DISCH NORM.

____ b. Open and time 1-CH-MOV-1287A, CHG PUMP A DISCH ALT.

____ c. Open and time 1-CH-MOV-1275A, CHG PUMP MINIFLOW RECIRC VALVES PUMP A.

____ d. Open 1-CH-MOV-1267A, CHG PUMP A SUCT NORM. (Valve exercise only. Do not record stroke time on Attachment 4.)

✓ ____ 6.9.5 Continue with Pump / valve maintenance or return to service, whichever applies.

6.10 **Obtaining Oil Samples**

NOTE:
- This procedure may continue while oil samples are taken.
- Oil samples should be taken as soon as possible after stopping pump, but may be delayed per Shift Supervision until 1-CH-P-1A is returned to service.

6.10.1 Obtain oil samples for 1-CH-P-1B IAW the following steps. Enter N/A if sampling 1-CH-P-1C.

N/A

a. Check that 1-CH-P-1A is fully operable prior to performing Step 6.10.1.c.

b. Review T.S Section 3.2. B, Charging Pump Operability, and T.S. Section 3.3.A, Safety Injection System Operability, to determine if any actions are required before placing 1-CH-P-1B in PTL.

c. Enter any required T.S. clock for placing 1-CH-P-1B in PTL.

d. Place 1-CH-P-1B in PTL.

e. Obtain reservoir oil sample IAW the following steps:

1. Check auxiliary oil pump running.

2. Remove downstream pipe cap from 1-CH-496, CHG Pump B LO Sample Isol.

3. Perform the following steps:

   (a) Open 1-CH-496 and drain approximately 500 mls to clean container.

   (b) Obtain reservoir oil sample of 120 mls. (completely fill bottle)

   (c) Close 1-CH-496.

4. Replace downstream pipe cap at 1-CH-496.

N/A ________ 6.10.1.e (continued)

________ 5. Remove the speed increaser fill cap <u>and</u> carefully pour the 500 mls flush sample into the speed increaser.

________ 6. Check the oil reservoir level and replenish as necessary.

________ 7. Replace speed increaser fill cap.

f. Obtain motor inboard bearing oil sample IAW the following steps:

________ 1. Remove the inboard bearing chicken feeder.

________ 2. Remove the inboard bearing drain valve cap.

________ 3. Open inboard bearing drain valve to flush approximately 60 ml into flush bottle, <u>THEN</u> close the drain valve.

________ 4. Open inboard bearing drain valve to obtain one 120 ml inboard bearing oil sample in a clean bottle, <u>THEN</u> close the drain valve. (completely fill bottle)

________ 5. Replace inboard bearing drain valve cap.

________ 6. Pour the flush sample <u>plus</u> 120 mls of the approved oil through the chicken feeder base.

________ 7. Replace the inboard bearing chicken feeder.

g. Obtain motor outboard bearing oil sample IAW the following steps:

________ 1. Remove the outboard bearing chicken feeder.

________ 2. Remove the outboard bearing drain valve cap.

________ 3. Open outboard bearing drain valve to flush approximately 60 ml into flush bottle, <u>THEN</u> close the drain valve.

N/A ɣ ______ 6.10.1.g (continued)

______ 4. Open outboard bearing drain valve to obtain one 120 ml outboard bearing oil sample in a clean bottle, <u>THEN</u> close the drain valve. (completely fill bottle)

______ 5. Replace outboard bearing drain valve cap.

______ 6. Pour the flush sample <u>plus</u> 120 mls of the approved oil through the chicken feeder base.

______ 7. Replace the outboard bearing chicken feeder.

______ ______ IV h. Place 1-CH-P-1B in AUTO.

______ i. Exit any clock entered in Step 6.10.1.c.

______ j. Label the oil samples with the following information:

- Equipment Location
- Name of sample
- Date and time of sample
- Name and initials of person taking sample

______ k. Deliver the oil samples to Count Room window.

6.10.2 Obtain oil samples for 1-CH-P-1C IAW the following steps. Enter N/A if sampling 1-CH-P-1B.

ɣ ______ a. Review T.S Section 3.2. B, Charging Pump Operability, and T.S. Section 3.3.A, Safety Injection System Operability, to determine if any actions are required before placing 1-CH-P-1C in PTL.

ɣ ______ b. Enter any required T.S. clock for placing 1-CH-P-1C in PTL.

c. Place 1-CH-P-1C in PTL.

d. Obtain reservoir oil sample IAW the following steps:

1. Check auxiliary oil pump running.

2. Remove downstream pipe cap from 1-CH-497, CHG Pump C LO Sample Isol.

3. Perform the following steps:

   (a) Open 1-CH-497 and drain approximately 500 mls to clean container.

   (b) Obtain reservoir oil sample of 120 mls. (completely fill bottle)

   (c) Close 1-CH-497.

4. Replace downstream pipe cap at 1-CH-497.

5. Remove the speed increaser fill cap and carefully pour the 500 mls flush sample into the speed increaser.

6. Check the oil reservoir level and replenish as necessary.

7. Replace speed increaser fill cap.

e. Obtain motor inboard bearing oil sample IAW the following steps:

1. Remove the inboard bearing chicken feeder.

2. Remove the inboard bearing drain valve cap.

3. Open inboard bearing drain valve to flush approximately 60 ml into flush bottle, <u>THEN</u> close the drain valve.

6.10.2.e (continued)

4. Open inboard bearing drain valve to obtain one 120 ml inboard bearing oil sample in a clean bottle, THEN close the drain valve. (completely fill bottle)

5. Replace inboard bearing drain valve cap.

6. Pour the flush sample plus 120 mls of the approved oil through the chicken feeder base.

7. Replace the inboard bearing chicken feeder.

f. Obtain motor outboard bearing oil sample IAW the following steps:

1. Remove the outboard bearing chicken feeder.

2. Remove the outboard bearing drain valve cap.

3. Open outboard bearing drain valve to flush approximately 60 ml into flush bottle, THEN close the drain valve.

4. Open outboard bearing drain valve to obtain one 120 ml outboard bearing oil sample in a clean bottle, THEN close the drain valve. (completely fill bottle)

5. Replace outboard bearing drain valve cap.

6. Pour the flush sample plus 120 mls of the approved oil through the chicken feeder base.

7. Replace the outboard bearing chicken feeder.

IV

g. Place 1-CH-P-1C in AUTO.

h. Exit any clock entered in Step 6.10.2.b.

i. Label the oil samples with the following information:

- Equipment Location
- Name of sample
- Date and time of sample
- Name and initials of person taking sample

j. Deliver the oil samples to Count Room window.

6.11 Discharge Check Valve Backleakage Test on Non-running Charging Pump

NOTE:
- This Subsection is not required during the normal quarterly Charging Pump run. This Subsection is to be used as required for augmented monitoring of a suspected leaking discharge check valve.
- If only one other Charging Pump is operable, the performance of this Subsection will result in the entry into a Tech Spec LCO due to operating with less than the minimum number of operable Charging Pumps.

N/A ___ 6.11.1 Check 1-CH-P-1A secured and place pump in PTL.

6.11.2 From the Control Room, close the following MOV(s):

___ a. 1-CH-MOV-1286A, CHG PUMP A DISCH NORM

___ b. 1-CH-MOV-1287A, CHG PUMP A DISCH ALT

___ c. 1-CH-MOV-1275A, CHG PUMP MINIFLOW RECIRC VALVES PUMP A

___ 6.11.3 Record discharge pressure of running Charging pump from Plant Computer Point P0142A, Chg Pump Discharge Header Press or the normal discharge gauge.

____________ psig

6.11.4 From the Control Room, open the following MOV(s):

___ a. 1-CH-MOV-1286A, CHG PUMP A DISCH NORM

___ b. 1-CH-MOV-1287A, CHG PUMP A DISCH ALT

___ c. 1-CH-MOV-1275A, CHG PUMP MINIFLOW RECIRC VALVES PUMP A

N/A 8

6.11.5 Record discharge pressure of running Charging pump from Plant Computer Point P0142A, Chg Pump Discharge Header Press or the normal discharge gauge.

_______________ psig

6.11.6 Place 1-CH-P-1A in Automatic and stop any clock previously started.

NOTE: Values less than 5.4 psid include ANY negative values.

6.11.7 Calculate the discharge pressure differential. (Reference - less than or equal to 5.4 psid)

_______________ - _______________ = ___________ psid
(Step 6.11.3) (Step 6.11.5)

6.11.8 IF the difference calculated in Step 6.11.7 is greater than 5.4 psid, THEN perform Step 6.11.9. Otherwise, enter N/A for Steps 6.11.8 and 6.11.9.

NOTE: If the total differential is less than or equal to 10.8 psid, the close test for 1-CH-258, Charging Pump A Discharge Check Valve, is satisfactory, and 1-CH-256 backleakage is acceptable.

6.11.9 IF the differential is greater than 5.4 psid, THEN add the highest backleakage (ΔP) value recorded in Step 6.1.1 to backleakage from Step 6.11.7.

_______________ + _______________ = ___________ psid
(Step 6.1.1) (Step 6.11.7)

7.0 FOLLOW-ON

7.1 Acceptance Criteria

____ 7.1.1 Evaluate the test results by reviewing the Acceptance Criteria for the components tested. (✓) Enter N/A for components not tested.

- ___ 1-CH-258, Charging Pump Discharge Check Valve, operated in the partially open direction as evidenced by an acceptable pump differential pressure. (Attachment 2 or Attachment 3, Step 6.7.12)

NOTE: Values less than 5.4 psid include ANY negative values.

- ___ 1-CH-258, Charging Pump Discharge Check Valve, operated in the fully closed direction as evidenced by a discharge pressure differential for the running charging pump of less than or equal to 5.4 psid. (Attachment 1, Step 6.6.1.g), OR the total differential is less than or equal to 10.8 psid (Attachment 1, Step 6.6.1.h)
- ___ 1-CH-256, Charging Pump Miniflow Recirc Header Check Valve, operated in the open direction as evidenced by an acceptable recirculation flow rate. (Attachment 2 or Attachment 3, Step 6.7.15)
- ___ 1-CH-230, VCT Supply Discharge Check Valve, operated in the open direction as evidenced by an acceptable recirculation flow rate. (Attachment 2 or Attachment 3, Step 6.7.15)
- ___ Charging Pump ΔP and Vibration status determinations are not INOP. (Attachment 2 or Attachment 3)
- ___ 1-CH-P-1C ALT FEED breaker is interlocked with the 1-CH-P-1C damper. Enter N/A if not performed.
- ___ 1-CH-MOV-1286A, CHG PUMP A DISCH NORM, traveled full open and closed within the acceptable range. (Attachment 4)
- ___ 1-CH-MOV-1275A, CHG PUMP MINIFLOW RECIRC VALVES PUMP A, traveled full stroke open and closed within the acceptable range. (Attachment 4)

7.1.1 (continued)

- ___ 1-CH-MOV-1287A, CHG PUMP A DISCH ALT, traveled full stroke open and closed within the acceptable range. (Attachment 4)
- 1-SW-TCV-108A recorded data is as follows. (Attachment 4) (✓)

  ____ Test position - OPEN

  ____ Stroke Time - Less than Maximum Time

- ___ 1-SW-TCV-108A opens and controls charging pump lube oil temperature out of the cooler below 160°F.

______ 7.1.2 Document the test results. (✓)

___ Satisfactory ___ Unsatisfactory

7.2 Follow-On Tasks

7.2.1 IF the test was unsatisfactory, THEN perform the following: Otherwise, enter N/A.

______ a. Notify Shift Supervision.

______ b. Initiate a Condition Report, and record the CR Number.

CR No. ______________________________

______ c. Notify the IST and System Engineer of the unsatisfactory condition and record the names of the personnel notified.

______________________________ IST Engineer ________ Date

______________________________ System Engineer ________ Date

______ 7.2.2 IF the test results, and the PMT requirements are satisfactory, THEN the LCO entered in Step 6.6.11 may be exited. Otherwise, enter N/A.

______ 7.2.3 Notify STA to compare new Total System External Leakage as determined by Attachment 1 to maximum allowed by 1-NPT-ZZ-001. IF leakage is greater than limit, THEN perform the following substeps. Otherwise, enter N/A.

______ a. Notify the System Engineer of the unsatisfactory condition and record the name of the person notified.

______________________________ __________
System Engineer Date

______ b. Initiate a Condition Report and record the CR Number.

CR No. ______________________________

______ c. Start a 7-day Administrative Clock to reduce the SI external loop leakage to within satisfactory values. **(Ref. 2.4.9)**

______ 7.2.4 IF a partial operability test was performed, THEN document the reason for the partial test in Operator Comments, Subsection 7.3. Otherwise, enter N/A.

7.2.5 IF the test or partial test was satisfactory but in ALERT, THEN perform the following. Otherwise, enter N/A.

______ a. Notify Shift Supervision.

______ b. Notify the IST and System Engineer of the ALERT condition and record the names of the personnel notified.

______________________________ __________
IST Engineer Date

______________________________ __________
System Engineer Date

______ 7.2.6 Make or check an entry in the M & TE Usage Log for each SQC device used during this test.

7.2.7 IF test flow could not be achieved, THEN perform the following:

______ a. Notify Shift Supervision.

______ b. Notify the IST Engineer and record name of person notified.

____ ____________
IST Engineer Date

______ c. Initiate a Condition Report and record CR number.
(Failure to achieve flow within range DOES NOT, by itself, make this test UNSAT.)

Condition Report No. ____

7.2.8 IF Charging Pump discharge check valve backleakage recorded in Attachment 1 Step 6.6.1.g was greater than 2.5 psid, THEN perform the following. Otherwise, enter N/A.

______ a. Notify Shift Supervision.

______ b. Initiate a Condition Report and record the CR Number.

Condition Report No. ____

______ c. Notify the IST and System Engineer of the condition so that a more frequent performance can be evaluated. Record the names of the personnel notified.

____ ____________
IST Engineer Date

____ ____________
System Engineer Date

7.3 Notification, Documentation, and Procedure Closeout

7.3.1 Notify Shift Supervision that the test is complete.

The Initials in this procedure will be identified by the Printed Name.

Initials	Printed Name
	G. GERSHWIN
	M. TAYLOE
	Al Smith
	Brad Burcher
	NICHOLAS SMITH

Comments:

Completed by: Date:

7.4 Review

Comments: ____

____

____

____

____

Reviewed by: ______________________________ Date: __________
Shift Supervision

Forward original procedure to Engineering Testing.

______
IST Eng

7.4.1 Make IDDEAL Data entry. **(Ref. 2.4.21)**

______
Sys Eng

7.4.2 Check IDDEAL Data entry. **(Ref. 2.4.21)**

Comments: ____

____

____

____

Reviewed by: ______________________________ Date: __________
IST Engineer

Comments: ____

____

____

____

1-NPT-ZZ-001 Updated __________Yes __________No __________ N/A

Reviewed by: ______________________________ Date: __________
System Engineer

Attachment 1

1-CH-P-1A PERFORMANCE TEST DATA SHEET

Step 6.1.2

	SQC Number	Cal Due Date
Vibration detector	7820	1/4/2022
Stopwatch	7690	4/8/2022
Stopwatch	7691	3/20/2022
Stopwatch		

Step 6.1.3 ✓ RCS at normal operating pressure OR ___ RHR in service (✓one.)

Step 6.6.1.e Discharge Pressure (Plant Computer Pt P0142A, 1-CH-PI-1152 or 1-CH-PI-1153) 2488.8 psig

Step 6.6.1.f Discharge Pressure (Plant Computer Pt P0142A, 1-CH-PI-1152 or 1-CH-PI-1153) 2488.3 psig

~~**NOTE:**~~ Values less than 5.4 psid include ANY negative values.

Step 6.6.1.g Discharge Pressure differential (Reference - less than or equal to 5.4 psid)

2488.8 (Step 6.6.1.e) – 2488.3 (Step 6.6.1.f) = 0.5 psid

Step 6.6.1.h Total Discharge Pressure differential (Reference - less than or equal to 10.8 psid)

N/A (Step 6.6.1.g) + N/A (Step 6.1.1) = N/A ≤ 10.8 psid

(Page 2 of 3)

Attachment 1

1-CH-P-1A PERFORMANCE TEST DATA SHEET

Step 6.7.11 VCT Level 61.7 %

VCT Pressure 24 psig

Discharge Pressure (1-CH-PI-1151) 2550 psig

Suction Pressure (1-CH-PI-1187) 31.5 psig

Suction Flow (1-CH-FI-1181) 157.3 gpm (from local indicator)

Charging Flow (1-CH-FT-1122) 84 gpm (Plant Computer Pt F0128A)

RCP A Seal Flow (1-CH-FT-1130) 9.2 gpm (Plant Computer Pt U0983)

RCP B Seal Flow (1-CH-FT-1127) 9.0 gpm (Plant Computer Pt U0982)

RCP C Seal Flow (1-CH-FT-1124) 9.1 gpm (Plant Computer Pt U0981)

Step 6.7.12 Pump Differential Pressure

2550 (1-CH-PI-1151) – 31.5 (1-CH-PI-1187) = 2518.5 psid

Step 6.7.13 Lube Oil Pressure 15 psig

Step 6.7.15 Mini-flow Recirculation Flow Rate

157.3 (FI-1181) – 9.2 (FT-1130) – 9.0 (FT-1127) – 9.1 (FT-1124) – 84 (FT-1122) = 46 gpm

Step 6.7.16

- Inboard Bearing Plant Computer Pt T0106A 132.6 °F (Reference 120°F)
- Outboard Bearing Plant Computer Pt T0107A 147.9 °F (Reference 130°F)
- Thrust Bearing Plant Computer Pt T0108A 119.1 °F (Reference 130°F)

Attachment 1

1-CH-P-1A PERFORMANCE TEST DATA SHEET

Step 6.7.17 Name of System Engineer Notified N/A

Step 6.7.25 Record locations of any leakage found.

NONE

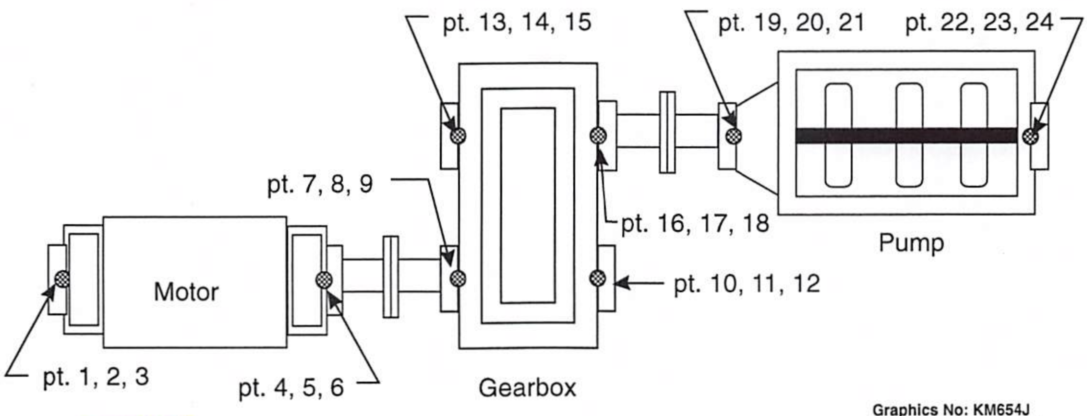
Step 6.7.26 Condition Report numbers

NONE

Performed by: ______ Signature ______ Initial G. GERSHWIN Print [TODAY]

Attachment 2

1-CH-P-1A VIBRATION, FLOW AND ΔP DATA TABLE (> 350°F)



NOTE: ⊗ Represents the Horizontal, Vertical, and Axial Accelerometer Pads Mounted on the Bearing Housing and Indicated in Yellow on the Pump/Driver Assembly.

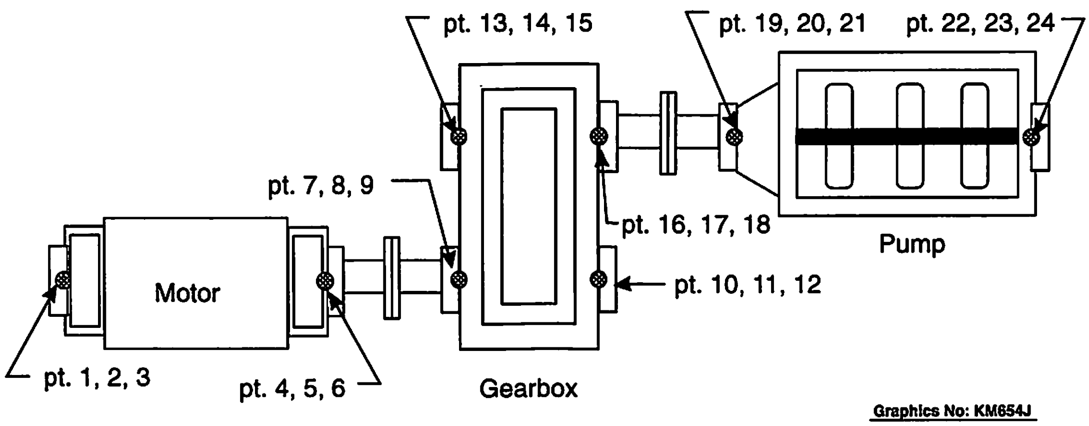
VIBRATION TESTING POINTS

Parameters in ALERT range are considered SATISFACTORY. Parameters in INOP are UNSATISFACTORY.

PARAMETER	REF VALUE	TEST VALUE	ACCEPT RANGE	ALERT RANGE	INOP RANGE	STATUS SAT, INOP, ALERT
Δ P Step 6.7.12 (Ref. 2.3.29)	psid 2469	2518.5	2435 to 2641	NONE	< 2435 OR > 2641	SAT
Inboard Vibration Horizontal (pt 19) Vertical (pt 20) Axial (pt 21)	in/sec 0.1430 0.0593 0.0726	0.144 0.070 0.102	≤ 0.325 ≤ 0.148 ≤ 0.181	> 0.325 to ≤ 0.700 > 0.148 to ≤ 0.355 > 0.181 to ≤ 0.435	> 0.700 > 0.355 > 0.435	SAT
Outboard Vibration Horizontal (pt 22) Vertical (pt 23) Axial (pt 24)	in/sec 0.1913 0.0909 0.0801	0.739 0.049 0.086	≤ 0.325 ≤ 0.227 ≤ 0.200	> 0.325 to ≤ 0.700 > 0.227 to ≤ 0.545 > 0.200 to ≤ 0.480	> 0.700 > 0.545 > 0.480	SAT
Recirc Flow Rate Step 6.7.15	43 gpm	46	≥ 35 to ≤ 80 gpm	N/A	< 35 or > 80 gpm	SAT

Attachment 3

1-CH-P-1A VIBRATION, FLOW AND ΔP DATA TABLE (< 350°F)



NOTE: ⊗ Represents the Horizontal, Vertical, and Axial Accelerometer Pads Mounted on the Bearing Housing and Indicated in Yellow on the Pump/Driver Assembly.

VIBRATION TESTING POINTS

Parameters in ALERT range are considered SATISFACTORY. Parameters in INOP are UNSATISFACTORY.

PARAMETER	REF VALUE	TEST VALUE	ACCEPT RANGE	ALERT RANGE	INOP RANGE	STATUS SAT, INOP, ALERT
Δ P Step 6.7.12 (Ref. 2.3.29)	psid 2469	____	2460 to 2735	NONE	< 2460 OR > 2735	____
Inboard Vibration Horizontal (pt 19) Vertical (pt 20) Axial (pt 21)	in/sec 0.169 0.057 0.064	____ ____ ____	≤ 0.325 ≤ 0.142 ≤ 0.160	> 0.325 to ≤ 0.700 > 0.142 to ≤ 0.342 > 0.160 to ≤ 0.384	> 0.700 > 0.342 > 0.384	____
Outboard Vibration Horizontal (pt 22) Vertical (pt 23) Axial (pt 24)	in/sec 0.208 0.126 0.099	____ ____ ____	≤ 0.325 ≤ 0.315 ≤ 0.248	> 0.325 to ≤ 0.700 > 0.315 to ≤ 0.700 > 0.248 to ≤ 0.594	> 0.700 > 0.700 > 0.594	____
Recirc Flow Rate Step 6.7.15	40gpm	____	≥ 35 to ≤ 80 gpm	N/A	< 35 or > 80 gpm	____

(Page 1 of 1)

Attachment 4
MOV AND LUBE OIL TCV STROKE TIME DATA TABLE

Stroke Test - Closed

Step	Valve	Stroke Position	Reference Time	Acceptable Range Time	Actual Time
6.6.1.d/6.9.3.a	1-CH-MOV-1286A	Closed	7.4 sec	5.6 to 9.2 sec	8.04 Seconds
6.6.1.d/6.9.3.b	1-CH-MOV-1287A	Closed	5.6 sec	4.2 to 7.0 sec	5.66 Seconds
6.6.1.d/6.9.3.c	1-CH-MOV-1275A	Closed	8.9 sec	6.7 to 11.1 sec	8.69 Seconds

Stroke Test - Open

Step	Valve	Stroke Position	Reference Time	Acceptable Range Time	Actual Time
6.6.1.f/6.9.4.a	1-CH-MOV-1286A	Open	7.0 sec	5.3 to 8.7 sec	9.12 Seconds
6.6.1.f/6.9.4.b	1-CH-MOV-1287A	Open	4.6 sec	3.5 to 5.7 sec	5.02 Seconds
6.6.1.f/6.9.4.c	1-CH-MOV-1275A	Open	9.0 sec	6.8 to 11.2 sec	8.73 Seconds

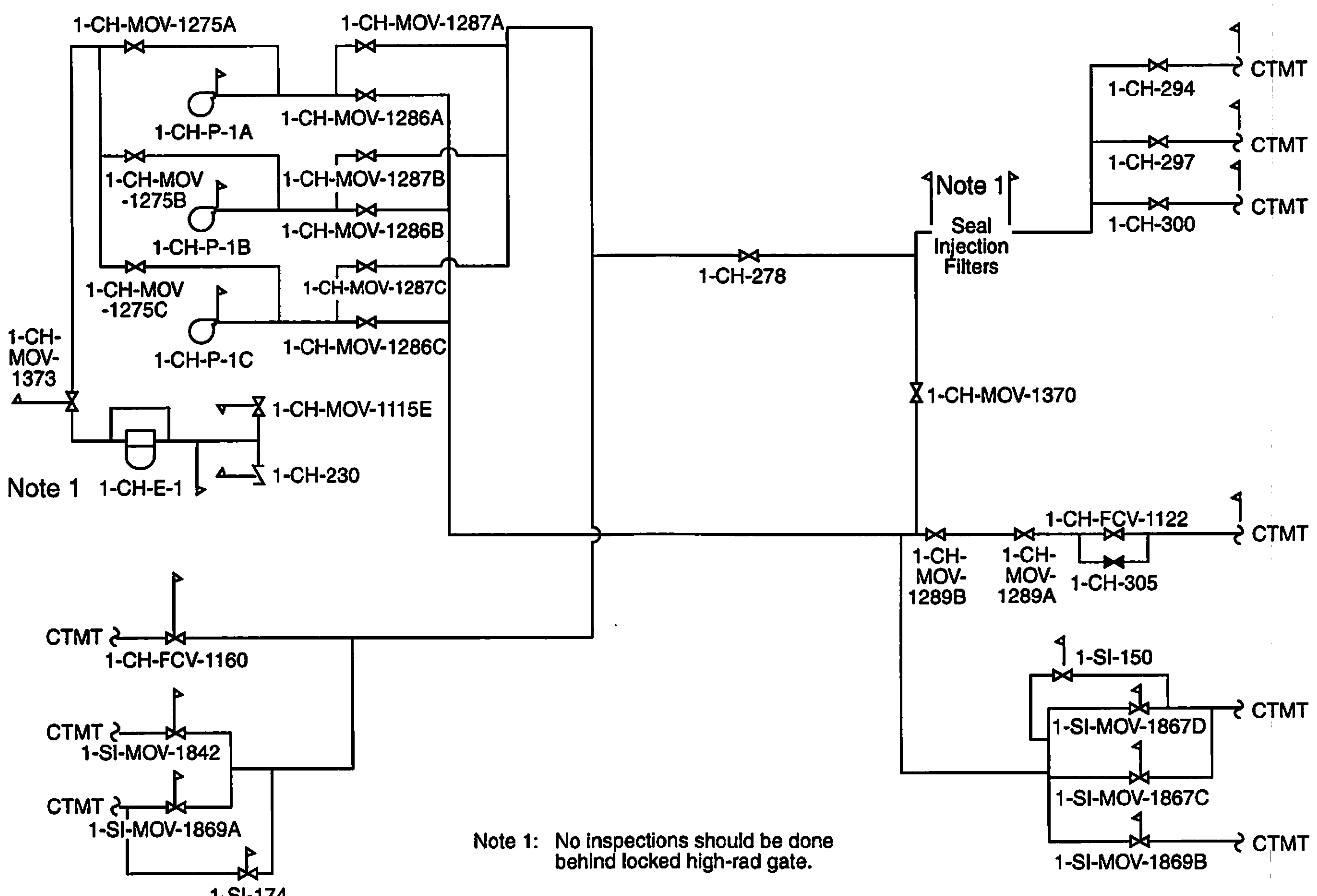
Step 6.6.5	Test Position (Substep 6.6.5.i)	Stroke Time in Seconds (Substep 6.6.5.i)	Reference Time	Maximum Time	As Left Position (Substep 6.6.5.m)
1-SW-TCV-108A	OPEN	4.59	4.8 sec	30.0 sec	CLOSED

Performed by: [signature] Signature   M Initial   M. TAYLOE Print   [TODAY]

(Page 1 of 1)

Attachment 5

CHARGING SYSTEM EXTERNAL LEAK INSPECTION DIAGRAM



Note 1: No inspections should be done behind locked high-rad gate.

Graphics No: LD792A

(Page 1 of 2)

Attachment 6
VENTING 1-CH-FT-1181

NOTE: The water and gas vented is potentially contaminated. Appropriate HP precautions shall be taken to prevent the spread of contamination.

NOTE: An HP approved catch container shall be used to collect any water that is vented.

______ 1. Open 1-CH-ICV-3528, CH Pump 1A Suct FT-1181 Equalizing Valve.

______ 2. Uncap and open 1-CH-ICV-3526, CH Pump 1A Suct FT-1181 (L) Test Isol.

______ ______ IV 3. WHEN a solid stream of water is obtained, THEN close and cap 1-CH-ICV-3526.

______ 4. Uncap and open 1-CH-ICV-3527, CH Pump 1A Suct FT-1181 (H) Test Isol.

______ ______ IV 5. WHEN a solid stream of water is obtained, THEN close and cap 1-CH-ICV-3527.

______ ______ IV 6. Close 1-CH-ICV-3528, CH Pump 1A Suct FT-1181 Equalizing Valve.

______ 7. IF additional venting is required to stabilize 1-CH-P-1A suction flow, THEN perform Steps 8 through 18. IF additional venting NOT required, THEN enter N/A for Steps 8 through 18.

______ 8. Open 1-CH-ICV-3528, CH Pump 1A Suct FT-1181 Equalizing Valve.

______ 9. Uncap and open 1-CH-ICV-3530, CH Pump 1A Suct FT - 1181 (L) Vent.

______ ______ IV 10. WHEN a solid stream of water is obtained, THEN close and cap 1-CH-ICV-3530.

______ 11. Uncap and open 1-CH-ICV-3529, CH Pump 1A Suct FT - 1181 (H) Vent.

______ ______ IV 12. WHEN a solid stream of water is obtained, THEN close and cap 1-CH-ICV-3529.

______ 13. Uncap and open 1-CH-ICV-3534, CH Pump 1A Suct FT - 1181 (L) Vent.

Attachment 6
VENTING 1-CH-FT-1181

______ ______ IV 14. WHEN a solid stream of water is obtained, THEN close and cap 1-CH-ICV-3534.

______ 15. Uncap and open 1-CH-ICV-3533, CH Pump 1A Suct FT - 1181 (H) Vent.

______ ______ IV 16. WHEN a solid stream of water is obtained, THEN close and cap 1-CH-ICV-3533.

______ ______ IV 17. Close 1-CH-ICV-3528, CH Pump 1A Suct FT-1181 Equalizing Valve.

______ 18. IF additional venting is required to stabilize 1-CH-P-1A suction flow, THEN repeat Step 1 through Step 18 as necessary.

Attachment 7

VENTING OF CHARGING PUMP SEALS

____ MECH 1. Manually rotate pump shaft.

____ MECH 2. Vent the inboard seal by breaking loose the high point tubing connection.

____ MECH 3. Vent the outboard seal by breaking loose the high point tubing connection.

____ MECH 4. Tighten tubing connections.

____ MECH 5. Remove the pump vent rig and install the blank flange on the CHG Pump casing vent flange.

Attachment 8
FLUSHING CHARGING PUMP TO REDUCE BORON DIFFERENTIAL

NOTE: A Charging Pump contains approximately 30 gallons.

_____ 1. Notify Chemistry that pump will be flushed and to standby to take sample for boron.

_____ 2. Check or place Auxiliary Building General ventilation system in service IAW 0-OP-VS-002, Auxiliary Building Ventilation System.

3. Check open or open sample isolation valve for pump to be started. (✓)

   ____ 1-CH-254, Chg Pump A Disch Sample Isol

   ____ 1-CH-263, Chg Pump B Disch Sample Isol

   ____ 1-CH-272, Chg Pump C Disch Sample Isol

4. Open sample HCV for pump to be started. (✓).

   ____ 1-SS-HCV-103A, Chg Pump 1A Disch Sample Isol

   ____ 1-SS-HCV-103B, Chg Pump 1B Disch Sample Isol

   ____ 1-SS-HCV-103C, Chg Pump 1C Disch Sample Isol

_____ 5. Open 1-SS-14, Chg Pump Disch Sample Isol.

_____ 6. Open 1-SS-13, Chg Pump Disch Sample Throttle Valve.

_____ 7. Check flow to Sample Sink.

_____ 8. WHEN approximately ten gallons have been flushed, THEN notify Chemistry to obtain sample.

_____ 9. Continue flushing pump and obtaining samples until difference between Charging Pump Boron and RCS Boron is less than 360 ppm. IF the difference between RCS boron and pump boron is less than 360 ppm AND it is desired to flush to further reduce boron differential, THEN continue to flush IAW Shift Supervision direction.

Attachment 8

FLUSHING CHARGING PUMP TO REDUCE BORON DIFFERENTIAL

10. WHEN ready to secure flush, THEN do the following:

______ ______ IV

a. Close 1-SS-13, Chg Pump Disch Sample Throttle Valve.

______ ______ IV

b. Close 1-SS-14, Chg Pump Disch Sample Isol.

______ ______ IV

c. Close sample HCV opened in Step 4.