

Facility Name: Millstone Unit 2														Date of Exam: 09/05/2016			
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	2	1	4	N/A			5	2	N/A			4	18	2	4	6
	2	1	1	3				2	1				1	9	2	2	4
	Tier Totals	3	2	7				7	3				5	27	4	6	10
2. Plant Systems	1	2	2	3	4	2	1	5	3	1	0	5	28	4	1	5	
	2	0	0	2	0	1	2	1	1	1	2	0	10	0	2	3	
	Tier Totals	2	2	5	4	3	3	6	4	2	2	5	38	6	2	8	
3. Generic Knowledge and Abilities Categories				1	2		3		4		10		1	2	3	4	7
				3	2		2		3				1	2	2	2	

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 outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).

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 associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems 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' importance ratings (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 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.

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000007 Reactor Trip / 1									1
CE/E02 Reactor Trip Recovery / 1				0 1			Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.7	
000008 Pressurizer Vapor Space Accident / 3			0 5				ECCS termination or throttling criteria	4.0	1
000009 Small Break LOCA / 3						04. 04	Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.	4.5	1
000011 Large Break LOCA / 3									0
000015 RCP Malfunctions / 4 000017 RCP Malfunctions (Loss of RC Flow) / 4	0 3						The basis for operating at a reduced power level when one RCP is out of service	3.0	1
000017 RCP Malfunctions (Loss of RC Flow) / 4									
000022 Loss of Rx Coolant Makeup / 2				0 2			CVCS charging low flow alarm, sensor, and indicator	3.0	1
000025 Loss of RHR System / 4		0 3					Service water or closed cooling water pumps	2.7	1
000026 Loss of Component Cooling Water / 8			0 4				Effect on the CCW flow header of a loss of CCW	3.5	1
000027 Pressurizer Pressure Control System Malfunction / 3						04. 20	Knowledge of the operational implications of EOP warnings, cautions, and notes.	3.8	1
000029 ATWS / 1					0 5		System component valve position indications	3.4	1
000038 Steam Gen. Tube Rupture / 3	0 2						Leak rate vs. pressure drop	3.2	1
000040 Steam Line Rupture / 4									1
CE/E05 Excessive Steam Demand / 4				0 2			Operating behavior characteristics of the facility.	3.5	
000054 Loss of Main Feedwater / 4									0
CE/E06 Loss of Feedwater / 4									
000055 Station Blackout / 6				0 5			Battery, when approaching fully discharged	3.3	1
000056 Loss of Off-site Power / 6					1 7		Operational status of PZR backup heaters	3.4	1
000057 Loss of Vital AC Inst. Bus / 6			0 1				Actions contained in EOP for loss of vital ac electrical instrument bus	4.1	1
000058 Loss of DC Power / 6			0 1				Use of dc control power by ED/Gs	3.4	1
000062 Loss of Nuclear Svc Water / 4				0 7			Flow rates to the components and systems that are serviced by the SWS; interactions among the components	2.9	1
000065 Loss of Instrument Air / 8						01. 20	Ability to interpret and execute procedure steps.	4.6	1
000077 Generator Voltage and Electric Grid Disturbances / 6						04. 18	Knowledge of the specific bases for EOPs.	3.3	1
K/A Category Totals:	2	1	4	5	2	4	Group Point Total:		18

ES-401		PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)										
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000001 Continuous Rod Withdrawal / 1									0	
000003 Dropped Control Rod / 1									0	
000005 Inoperable/Stuck Control Rod / 1					01		Stuck or inoperable rod from in-core and ex-core NIS, in-core or loop temperature measurements	3.3	1	
000024 Emergency Boration / 1									0	
000028 Pressurizer Level Malfunction / 2									0	
000032 Loss of Source Range NI / 7									0	
000033 Loss of Intermediate Range NI / 7									0	
000036 Fuel Handling Accident / 8									0	
000037 Steam Generator Tube Leak / 3									0	
000051 Loss of Condenser Vacuum / 4			01				Loss of steam dump capability upon loss of condenser vacuum	2.8	1	
000059 Accidental Liquid RadWaste Rel. / 9									0	
000060 Accidental Gaseous Radwaste Rel. / 9									0	
000061 ARM System Alarms / 7			02				Guidance contained in alarm response for ARM system	3.4	1	
000067 Plant Fire On-site / 9 8									0	
000068 Control Room Evac. / 8				01			S/G atmospheric relief valve	4.3	1	
000069 Loss of CTMT Integrity / 5	01						Effect of pressure on leak rate	2.6	1	
000074 Inad. Core Cooling / 4						04. 02	Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.	4.5	1	
000076 High Reactor Coolant Activity / 9			05				Corrective actions as a result of high fission-product radioactivity level in the RCS	2.9	1	
CE/A13 Natural Circ. / 4									0	
CE/A11 RCS Overcooling / 4									0	
CE/A16 Excess RCS Leakage / 2		01					Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.2	1	
CE/E09 Functional Recovery				01			Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	4.2	1	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
									0	
K/A Category Totals:	1	1	3	2	1	1	Group Point Total:	9		

ES-401		PWR Examination Outline												Form ES-401-2	
Plant Systems - Tier 2/Group 1 (RO)															
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#	
003 Reactor Coolant Pump					0 2			0 5				Effects of RCP coastdown on RCS parameters; Effects of VCT pressure on RCP seal leakoff flows	2.8; 2.5	2	
004 Chemical and Volume Control				0 3		0 1						Protection of ion exchangers (high letdown temperature will isolate ion exchangers); Spray/heater combination in PZR to assure uniform boron concentration	2.8; 3.1	2	
005 Residual Heat Removal					0 9							Dilution and boration considerations	3.2	1	
006 Emergency Core Cooling		0 2									04. 03	Valve operators for accumulators; Ability to identify post-accident instrumentation.	2.5; 3.7	2	
007 Pressurizer Relief/Quench Tank							0 2					Maintaining quench tank pressure	2.7	1	
008 Component Cooling Water									0 1			Setpoints on instrument signal levels for normal operations, warnings, and trips that are applicable to the CCWS	3.2	1	
010 Pressurizer Pressure Control			0 1					0 2				RCS; Spray valve failures	3.8; 3.9	2	
012 Reactor Protection				0 2								Automatic reactor trip when RPS setpoints are exceeded for each RPS function; basis for each	3.9	1	
013 Engineered Safety Features Actuation		0 1										ESFAS/safeguards equipment control	3.6	1	
022 Containment Cooling											04. 50	Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	4.2	1	
025 Ice Condenser														0	
026 Containment Spray							0 6					Containment spray pump cooling	2.7	1	
039 Main and Reheat Steam	0 8											MFW	2.7	1	
059 Main Feedwater							0 3					Power level restrictions for operation of MFW pumps and valves	2.7	1	
061 Auxiliary/Emergency Feedwater			0 1								02. 38	RCS; Knowledge of conditions and limitations in the facility license.	4.4; 3.6	2	
062 AC Electrical Distribution								0 4				Effect on plant of de-energizing a bus	3.4	1	
063 DC Electrical Distribution			0 2	0 1								Components using DC control power; Manual/automatic transfers of control	3.5; 2.7	2	
064 Emergency Diesel Generator							0 4					Crankcase temperature and pressure	2.8	1	
073 Process Radiation Monitoring				0 1			0 1					Release termination when radiation exceeds setpoint; Radiation levels	4; 3.2	2	
076 Service Water	0 8											RHR system	3.5	1	
078 Instrument Air											04. 46	Ability to verify that the alarms are consistent with the plant conditions.	4.2	1	
103 Containment											02. 39	Knowledge of less than or equal to one hour Technical Specification action statements for systems.	3.9	1	
K/A Category Totals:	2	2	3	4	2	1	5	3	1	0	5	Group Point Total:	28		

PWR Examination Outline												Form ES-401-2		
Plant Systems - Tier 2/Group 2 (RO)														
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive			0 2									RCS	3.4	1
002 Reactor Coolant														0
011 Pressurizer Level Control			0 3									PZR PCS	3.2	1
014 Rod Position Indication														0
015 Nuclear Instrumentation														0
016 Non-nuclear Instrumentation										0 1		NNI channel select controls	2.9	1
017 In-core Temperature Monitor										0 2		Temperature values used to determine RCS/RCP operation during inadequate core cooling (i.e., if applicable, average of five highest values)	3.8	1
027 Containment Iodine Removal														0
028 Hydrogen Recombiner and Purge Control														0
029 Containment Purge														0
033 Spent Fuel Pool Cooling														0
034 Fuel Handling Equipment														0
035 Steam Generator						0 1						MSIVs	3.2	1
041 Steam Dump/Turbine Bypass Control					0 1							Relationship of no-load T-ave. to saturation pressure relief setting on valves	2.9	1
045 Main Turbine Generator														0
055 Condenser Air Removal														0
056 Condensate														0
068 Liquid Radwaste						1 0						Radiation monitors	2.5	1
071 Waste Gas Disposal							0 6					Ventilation system	2.5	1
072 Area Radiation Monitoring									0 1			Changes in ventilation alignment	2.9	1
075 Circulating Water														0
079 Station Air														0
086 Fire Protection							0 1					Manual shutdown of the FPS	2.9	1
K/A Category Totals:	0	0	2	0	1	2	1	1	1	2	0	Group Point Total:		10

ES-401		PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (SRO)										
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000007 Reactor Trip / 1										0
CE/E02 Reactor Trip Recovery / 1										
000008 Pressurizer Vapor Space Accident / 3										0
000009 Small Break LOCA / 3										0
000011 Large Break LOCA / 3										0
000015 RCP Malfunctions / 4						01. 23	Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.4		1
000017 RCP Malfunctions (Loss of RC Flow) / 4										
000022 Loss of Rx Coolant Makeup / 2						04. 08	Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	4.5		1
000025 Loss of RHR System / 4						04. 06	Knowledge of EOP mitigation strategies.	4.7		1
000026 Loss of Component Cooling Water / 8										0
000027 Pressurizer Pressure Control System Malfunction / 3										0
000029 ATWS / 1						0 2	Reactor trip alarm	4.4		1
000038 Steam Gen. Tube Rupture / 3										0
000040 Steam Line Rupture / 4										1
CE/E05 Excessive Steam Demand / 4						02. 36	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	4.2		
000054 Loss of Main Feedwater / 4										0
CE/E06 Loss of Feedwater / 4										
000055 Station Blackout / 6										0
000056 Loss of Off-site Power / 6					2 1		ED/G frequency and voltage indicators	3.8		1
000057 Loss of Vital AC Inst. Bus / 6										0
000058 Loss of DC Power / 6										0
000062 Loss of Nuclear Svc Water / 4										0
000065 Loss of Instrument Air / 8										0
000077 Generator Voltage and Electric Grid Disturbances / 6										0
K/A Category Totals:	0	0	0	0	2	4	Group Point Total:			6

ES-401		PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (SRO)										
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000001 Continuous Rod Withdrawal / 1									0	
000003 Dropped Control Rod / 1									0	
000005 Inoperable/Stuck Control Rod / 1									0	
000024 Emergency Boration / 1									0	
000028 Pressurizer Level Malfunction / 2									0	
000032 Loss of Source Range NI / 7									0	
000033 Loss of Intermediate Range NI / 7									0	
000036 Fuel Handling Accident / 8									0	
000037 Steam Generator Tube Leak / 3						04	Comparison of RCS fluid inputs and outputs, to detect leaks	3.7	1	
000051 Loss of Condenser Vacuum / 4						04. 09	Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.	4.2	1	
000059 Accidental Liquid RadWaste Rel. / 9									0	
000060 Accidental Gaseous Radwaste Rel. / 9									0	
000061 ARM System Alarms / 7									0	
000067 Plant Fire On-site / 9 8						14	Equipment that will be affected by fire suppression activities in each zone	4.3	1	
000068 Control Room Evac. / 8									0	
000069 Loss of CTMT Integrity / 5									0	
000074 Inad. Core Cooling / 4									0	
000076 High Reactor Coolant Activity / 9									0	
CE/A13 Natural Circ. / 4									0	
CE/A11 RCS Overcooling / 4									0	
CE/A16 Excess RCS Leakage / 2						04. 45	Ability to prioritize and interpret the significance of each annunciator or alarm.	4.3	1	
CE/E09 Functional Recovery									0	
K/A Category Totals:	0	0	0	0	2	2	Group Point Total:		4	

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Plant Systems - Tier 2/Group 1 (SRO)														
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
003 Reactor Coolant Pump														0
004 Chemical and Volume Control								1 4				Emergency boration	3.9	1
005 Residual Heat Removal														0
006 Emergency Core Cooling														0
007 Pressurizer Relief/Quench Tank														0
008 Component Cooling Water														0
010 Pressurizer Pressure Control														0
012 Reactor Protection								0 1				Faulty bistable operation	3.6	1
013 Engineered Safety Features Actuation														0
022 Containment Cooling														0
025 Ice Condenser														0
026 Containment Spray														0
039 Main and Reheat Steam														0
059 Main Feedwater														0
061 Auxiliary/Emergency Feedwater														0
062 AC Electrical Distribution														0
063 DC Electrical Distribution														0
064 Emergency Diesel Generator								0 1				Failure modes of water, oil, and air valves	3.3	1
073 Process Radiation Monitoring														0
076 Service Water											04. 30	Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator.	4.1	1
078 Instrument Air								0 1				Air dryer and filter malfunctions	2.9	1
103 Containment														0
K/A Category Totals:	0	0	0	0	0	0	0	4	0	0	1	Group Point Total:		5

ES-401		PWR Examination Outline												Form ES-401-2	
Plant Systems - Tier 2/Group 2 (SRO)															
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#	
001 Control Rod Drive														0	
002 Reactor Coolant								0 2				Loss of coolant pressure	4.4	1	
011 Pressurizer Level Control														0	
014 Rod Position Indication											04. 11	Knowledge of abnormal condition procedures.	4.2	1	
015 Nuclear Instrumentation														0	
016 Non-nuclear Instrumentation														0	
017 In-core Temperature Monitor														0	
027 Containment Iodine Removal														0	
028 Hydrogen Recombiner and Purge Control														0	
029 Containment Purge								0 1				Maintenance or other activity taking place inside containment	3.6	1	
033 Spent Fuel Pool Cooling														0	
034 Fuel Handling Equipment														0	
035 Steam Generator														0	
041 Steam Dump/Turbine Bypass Control														0	
045 Main Turbine Generator														0	
055 Condenser Air Removal														0	
056 Condensate														0	
068 Liquid Radwaste														0	
071 Waste Gas Disposal														0	
072 Area Radiation Monitoring														0	
075 Circulating Water														0	
079 Station Air														0	
086 Fire Protection														0	
K/A Category Totals:	0	0	0	0	0	0	0	2	0	0	1	Group Point Total:		3	

Facility Name: Millstone Unit 2 Date of Exam: 09/05/2016

Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1. 25	Ability to interpret reference materials, such as graphs, curves, tables, etc.	3.9	1		
	2.1. 05	Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.	2.9	1		
	2.1. 31	Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.	4.6	1		
	2.1. 36	Knowledge of procedures and limitations involved in core alterations.			4.1	1
	2.1.					
	2.1.					
	Subtotal			3		1
2. Equipment Control	2.2. 02	Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.	4.6	1		
	2.2. 01	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.	4.5	1		
	2.2. 17	Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.			3.8	1
	2.2. 44	Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.			4.4	1
	2.2.					
	2.2.					
	Subtotal			2		2
3. Radiation Control	2.3. 07	Ability to comply with radiation work permit requirements during normal or abnormal conditions.	3.5	1		
	2.3. 11	Ability to control radiation releases.	3.8	1		
	2.3. 05	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.			2.9	1
	2.3. 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.			3.8	1
	2.3.					
	2.3.					
	Subtotal			2		2
4. Emergency Procedures / Plan	2.4. 39	Knowledge of RO responsibilities in emergency plan implementation.	3.9	1		
	2.4. 27	Knowledge of "fire in the plant" procedures.	3.4	1		
	2.4. 01	Knowledge of EOP entry conditions and immediate action steps.	4.6	1		
	2.4. 47	Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.			4.2	1
	2.4. 49	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.			4.4	1
	2.4.					
	Subtotal			3		2
Tier 3 Point Total				10		7

Facility: <u>Millstone Unit 2</u>		Date of Examination: <u>09/05/2016</u>
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: <u>ES16LI</u>

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations (JPM-292-R-RO)	R, M	K/A 2.1.18 Ability to make accurate, clear, and concise logs, records and reports. Perform Shutdown Safety Assessment for the predicted Decay Heat Removal Key Safety Function when in Reduced Inventory.
Conduct of Operations (JPM-291-R-RO)	R, N	K/A 2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management. Perform a batch make up calculation to raise VCT level 10%
Equipment Control (JPM-290-R-RO)	R, N	K/A 2.2.42 Ability to recognize system parameters that are entry-level conditions for Technical Specifications. Review a Computer Printout and refer to SP 2602B to determine if cooldown rates are within the Tech. Spec Limits.
Radiation Control (JPM-293-R-RO)	R, D, P	K/A 2.3.7 Ability to comply with radiation work permit requirements during normal or abnormal conditions. Review the applicable RWP and survey map to determine the radiological requirements to perform the assigned task.

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 & Criteria:

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

Facility: <u>Millstone Unit 2</u>	Date of Examination: <u>09/05/2016</u>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>	Operating Test Number: <u>ES16LI</u>

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations (JPM-295-R-SRO)	R, N	K/A 2.1.23 Perform specific system and integrated plant procedures during all modes of plant operation. Perform a SSA review for predicted condition for RCS in Reduced Inventory
Conduct of Operations (JPM-297-R-SRO)	R, M	K/A 2.1.42 Knowledge of new and spent fuel movement procedures. Examinee will have determined the type of door affected and state the required actions for suspending fuel movement.
Equipment Control (JPM-294-R-SRO)	R, N	K/A 2.2.40 Ability to apply Technical Specifications for a system. Determined that both PORVs are NOT OPERABLE for MODE 4 requiring entering Tech. Spec. Action Statement and suspending the cooldown.
Radiation Control (JPM-296-R-SRO)	R, M	K/A 2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. Review conditions and designate which PEO should perform what task based on radiological concerns.
Emergency Plan (JPM-298-R-SRO)	R, D	K/A 2.4.41 Knowledge of the emergency action level thresholds and classifications. Correctly classifies the proposed event and provided the appropriate Protective Action Recommendation.

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 & Criteria:

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

Facility: <u>Millstone Unit 2</u>		Date of Examination: <u>09/05/2016</u>
Exam Level: RO <input checked="" type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test No.: <u>ES16LI</u>
Control Room Systems: * 8 for RO; 7 for SRO-I; 2 or 3 for SRO-U		
System / JPM Title	Type Code*	Safety Function
a. [S1] JPM-270; EOP-2532 LOCA Cooldown	D, A, S, E, L	4(S)
b. [S2] JPM-284; Respond to a 10 Step CEA Misalignment	N, A, S	1
c. [S3] JPM-243; SP-2604T, ESAS Actuation Test	D, EN, S	7
d. [S4] JPM-211; Pumping the Containment Sump {RO Only}	D, S	5
e. [S5] JPM-285; Energizing 24E from Unit 3	N, A, S, E, L	6
f. [S6] JPM-288; Control PZR Level from C-21	N, S, E, L	2
g. [S7] JPM-011; Evaluate "A" RCP Seal Failure w/o PPC	D, S, E	4(P)
h. [S8] JPM-230; LPSI Pump Failure to Trip Post-SRAS	D, A, S, L	3
Sp [S9] JPM156; LOCA Sump Clogging	D, E, S, L	4(P)
Sp [S10] JPM041; Feed S/G from C-21	D, E, S, L	4(S)
Sp [S11] JPM-283; Low VCT Level Control Post-Trip	N, A, S, E, L	2
In-Plant Systems * (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. [P1] JPM-287; EDG Low Oil Pressure	N, A, E, L	6
j. [P2] JPM-245; CAR RBCCW Valve to Local-Manual	D, R, E	8
k. [P3] JPM-265; Turbine Building Sump Alignment	D, E	9
Sp [P4] JPM-286; Cross-Tie EDG Fuel Oil Tanks	N, E, L	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; in-plant systems and functions may overlap those tested in the control room.		
* Type Codes	Criteria for RO / SRO-I / SRO-U	
A)lternate path (C)ontrol room (D)irect from bank (E)mergency or abnormal in-plant (EN)gineered safety feature (L)ow-Power / Shutdown (N)ew or (M)odified from bank including 1(A) (P)revious 2 exams (R)CA (S)imulator	4-6 / 4-6 / 2-3 $\leq 9 / \leq 8 / \leq 4$ $\geq 1 / \geq 1 / \geq 1$ $\geq 1 / \geq 1 / \geq 1$ (control room system) $\geq 1 / \geq 1 / \geq 1$ $\geq 2 / \geq 2 / \geq 1$ $\leq 3 / \leq 3 / \leq 2$ (randomly selected) $\geq 1 / \geq 1 / \geq 1$	

Facility: <u>Millstone Unit 2</u>		Date of Examination: <u>09/05/2016</u>
Exam Level: RO <input type="checkbox"/> SRO-I <input checked="" type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test No.: <u>ES16LI</u>
Control Room Systems: 8 for RO; 7 for SRO-I ; 2 or 3 for SRO-U		
System / JPM Title	Type Code*	Safety Function
a. [S1] JPM-270; EOP-2532 LOCA Cooldown	D, A, S, E, L	4(S)
b. [S2] JPM-284; Respond to a 10 Step CEA Misalignment	N, A, S	1
c. [S3] JPM-243; SP-2604T, ESAS Actuation Test	D, EN, S	7
d. [S4] JPM-211; Pumping the Containment Sump {RO Only}	D, S	5
e. [S5] JPM-285; Energizing 24E from Unit 3	N, A, S, E, L	6
f. [S6] JPM-288; Control PZR Level from C-21	N, S, E, L	2
g. [S7] JPM-011; Evaluate "A" RCP Seal Failure w/o PPC	D, S, E	4(P)
h. [S8] JPM-230; LPSI Pump Failure to Trip Post-SRAS	D, A, S, L	3
Sp [S9] JPM156; LOCA Sump Clogging	D, E, S, L	4(P)
Sp [S10] JPM041; Feed S/G from C-21	D, E, S, L	4(S)
Sp [S11] JPM-283; Low VCT Level Control Post-Trip	N, A, S, E, L	2
In-Plant Systems (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. [P1] JPM-287; EDG Low Oil Pressure	N, A, E, L	6
j. [P2] JPM-245; CAR RBCCW Valve to Local-Manual	D, R, E	8
k. [P3] JPM-265; Turbine Building Sump Alignment	D, E	9
Sp [P4] JPM-286; Cross-Tie EDG Fuel Oil Tanks	N, E, L	6
<p>* 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; in-plant systems and functions may overlap those tested in the control room.</p>		
* Type Codes	Criteria for RO / SRO-I / SRO-U	
A)lternate path (C)ontrol room (D)irect from bank (E)mergency or abnormal in-plant (EN)gineered safety feature (L)ow-Power / Shutdown (N)ew or (M)odified from bank including 1(A) (P)revious 2 exams (R)CA (S)imulator	4-6 / 4-6 / 2-3 $\leq 9 / \leq 8 / \leq 4$ $\geq 1 / \geq 1 / \geq 1$ $\geq 1 / \geq 1 / \geq 1$ (control room system) $\geq 1 / \geq 1 / \geq 1$ $\geq 2 / \geq 2 / \geq 1$ $\leq 3 / \leq 3 / \leq 2$ (randomly selected) $\geq 1 / \geq 1 / \geq 1$	

Facility: Millstone Unit 2Date of Examination: 09/05/2016Exam Level: RO ☐ SRO-I ☐ SRO-U ☒Operating Test No.: ES16LI

Control Room Systems: 8 for RO; 7 for SRO-I; 2 or 3 for SRO-U

System / JPM Title	Type Code*	Safety Function
a. [S1] JPM-270; EOP-2532 LOCA Cooldown	D, A, S, E, L	4(S)
b. [S2] JPM-284; Respond to a 10 Step CEA Misalignment	N, A, S	1
c. [S3] JPM-243; SP-2604T, ESAS Actuation Test {U-SRO}	D, EN, S	7
d. [S4] JPM-211; Pumping the Containment Sump {RO Only}	D, S	5
e. [S5] JPM-285; Energizing 24E from Unit 3 {U-SRO}	N, A, S, E, L	6
f. [S6] JPM-288; Control PZR Level from C-21	N, S, E, L	2
g. [S7] JPM-011; Evaluate "A" RCP Seal Failure w/o PPC	D, S, E	4(P)
h. [S8] JPM-230; LPSI Pump Failure to Trip Post-SRAS	D, A, S, L	3
Sp [S9] JPM156; LOCA Sump Clogging	D, E, S, L	4(P)
Sp [S10] JPM041; Feed S/G from C-21	D, E, S, L	4(S)
Sp [S11] JPM-283; Low VCT Level Control Post-Trip	N, A, S, E, L	2

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

i. [P1] JPM-287; EDG Low Oil Pressure {U-SRO}	N, A, E, L	6
j. [P2] JPM-245; CAR RBCCW Valve to Local-Manual {U-SRO}	D, R, E	8
k. [P3] JPM-265; Turbine Building Sump Alignment {U-SRO}	D, E	9
Sp [P4] JPM-286; Cross-Tie EDG Fuel Oil Tanks	N, E, L	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; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / SRO-U
A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	
(D)irect from bank	$\leq 9 / \leq 8 / \leq 4$
(E)mergency or abnormal in-plant	$\geq 1 / \geq 1 / \geq 1$
(EN)gineered safety feature	$\geq 1 / \geq 1 / \geq 1$ (control room system)
(L)ow-Power / Shutdown	$\geq 1 / \geq 1 / \geq 1$
(N)ew or (M)odified from bank including 1(A)	$\geq 2 / \geq 2 / \geq 1$
(P)revious 2 exams	$\leq 3 / \leq 3 / \leq 2$ (randomly selected)
(R)CA	$\geq 1 / \geq 1 / \geq 1$
(S)imulator	

Facility: Millstone Unit 2	Scenario No.: 1	Op-Test No.: ES16LI1	
Examiners: _____	Operators: _____	SRO	
_____	_____	ATC	
_____	_____	BOP	
Initial Conditions: 100% Power IC, No Equipment OOS, Ch-Y PZR Level in service.			
Turnover: 100% Power, steady state, no equipment OOS. 24E is aligned to 24C.			
Critical Tasks: <ol style="list-style-type: none"> 1. SPTA-5; Manually shutdown the reactor. The operator is observed taking action to insert CEAs or borate the RCS. 2. 2260 - 2525 TCOA-3; Start the TDAFP within 10 minutes following a loss of normal feedwater. 3. LOAF-4; Establish a primary to secondary heat sink. 			
Event No.	Malf. No.	Event Type*	Event Description
1 (0 min)	N/A	N (BOP/S)	Start "B" TBCCW Pump, Secure "A" TBCCW Pmp.
2 (+? min)	03A1A5S2 C04L-B11B	C (ATC/S)	Trip "A" CEDM Cool Fan.
3 (+? min)	RP10A	TS (S)	Ch. "A" PZR Pressure fails low (TS)
4 (+25 min)	RX04A	I (ATC/S)	Ch-X PZR Level (LT110X) (non-selected) fails to 0% level.
5 (+? min)	FW01	C (BOP/S)	Main Condenser Vacuum leak.
6 (+? min)	N/A	R (All)	Downpower due to vacuum leak.
7 (+? min)	RC11A, RP04A-D	M (All)	"A" RCP seizes and trips, TCBs fail to open (ATWS), manual Rx trip.
8 (+? min)	FW33, ES01A, ES01B	C (BOP/S)	Rapid loss of condenser vacuum and failure of AFAS to trigger.
9 (+? min)	FW36A, FW36B	C (BOP/S) TS (S)	AFW pipe rupture at FW-44, inops both headers, results in LOAF.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Op-Test No.: <u>ES16LI1</u> Scenario No.: <u>1</u> Event No.: <u>1</u>		
Event Description: Start the "B" TBCCW Pump and secure the "A"		
Time	Position	Applicant's Actions or Behavior

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual
1. Total malfunctions (5–8)	6
2. Malfunctions after EOP entry (1–2)	2
3. Abnormal events (2–4)	3
4. Major transients (1–2)	1
5. EOPs entered/requiring substantive actions (1–2)	1
6. EOP contingencies requiring substantive actions (0–2)	0
7. Critical tasks (2–3)	3

NRC 2016, Scenario 1 Summary:

The crew will take the shift with the unit at 100% power, steady state, with no equipment out of service (IC-30). TBCCW Pumps: "A" and "C" running, "B" in standby and ready to be started. The crew has been instructed to start the "B" TBCCW pump (Standby Equipment) and secure the "A" TBCCW pump.

Event 1: Upon taking the shift, the crew has been instructed to swap a running TBCCW with the Standby pump. The BOP will be directed to start the "B" TBCCW pump (Standby Equipment) and secure the "A" TBCCW pump, verifying no change in TBCCW flow. Once this is accomplished, Event 2 will be triggered.

Event 2: The "A" CEDM Cooling Fan will trip, triggering the CEDM Cooling Fan Trip annunciator. The crew will respond per ARP 2590C-082 and the ATC will be directed to start the standby ("B") CEDM cooling fan. Once this is accomplished, Event 3 will be triggered.

Event 3: The "A" Safety Channel of Pressurizer Pressure will fail low as a Tech. Spec. only event. The US should address the applicable Tech. Specs. and ARP, which directs all systems affected by the transmitter failure be "bypassed". Once the crew has bypassed Ch. "A" on RPS, ESAS and AFAS, Event 4 is triggered.

Event 4: The Non-Selected (Ch. "X") pressurizer level detector (LT-110X) will fail to 0%, causing all pressurizer heaters to trip. The crew will respond per ARP 2590B-215, de-select the failed channel and reset all pressurizer heaters. Once the crew has restored normal RCS pressure control, Event 5 will be triggered.

Event 5: Main Condenser Vacuum will begin to degrade. The crew should enter AOP 2574 for Loss Of Condenser Vacuum, and take the applicable actions to increase condenser air removal capacity. Once this proves ineffective, the US will enter AOP 2575, Rapid Downpower, and commence a plant shutdown.

Event 6: The crew will commence a plant shutdown using AOP 2575, Rapid Downpower, in an attempt to stabilize condenser vacuum by lower the energy load on the main condenser. The crew will insert CEAs to start the power reduction and then continue the downpower by boric acid injection into the RCS. This will be accomplished by aligning charging pump suction directly to the RWST (instead of the VCT). When the power change evaluation is completed, Event 7 will be triggered.

Op-Test No.: ES16LI1 Scenario No.: 1 Event No.: 1

Event Description: Start the "B" TBCCW Pump and secure the "A"

Time	Position	Applicant's Actions or Behavior
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Event 7: "A" RCP will seize and trip, but the TCBs will fail to open (ATSW). The crew should recognize the ATWS and immediately trip the reactor manually by either pressing the four TCB manual trip buttons or opening the MG Set supply breakers. The crew should then verify all CEAs are inserting (reactor trip successful), the main turbine has tripped and commence Standard Post Trip Actions per EOP 2525.

Event 8: During the performance of SPTA, Main Condenser vacuum will degrade rapidly, causing the loss of Main Feedwater Pumps and Condenser Steam Dumps. This will require the use of the Auxiliary Feedwater System to feed the S/Gs. The AFAS will fail to automatically start AFW flow to the S/Gs, requiring manual actuation of AFW flow. Once Aux. Feedwater is manually aligned to feed both S/Gs, Event 9 is triggered.

Event 9: Shortly after the feed flow has been established to the S/Gs using Auxiliary Feedwater, a rupture will occur on both sides of 2-FW-44 (normally open x-tie between AFW headers), resulting in the loss of both Auxiliary Feedwater headers. Once STPA are completed, and the LOAF is diagnosed, the crew will transition to EOP 2537, Loss Of All Feed, and discuss using a Condensate Pump to feed the S/Gs. This will require a plant cooldown using the available SG inventory, to lower SG pressure below the shutoff head of the condensate pumps.

The scenario will ended when the crew has recovered SG feed flow using a Condensate Pump, or at the Examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Time	Sev or Value	Final Value	Rel Order
MALFUNCTIONS							
REMOTE FUNCTIONS							
OVERRIDES							

Facility: Millstone Unit 2	Scenario No.: 2	Op-Test No.: ES16LI2
Examiners: _____	Operators: _____	SRO
_____	_____	ATC
_____	_____	BOP

Initial Conditions: 90% Power IC, No Equipment OOS, Ch-Y PZR Level in service.

Turnover: 90% Power, Xenon building in, no equipment OOS. 24E is aligned to 24C. Raise Power IAW OP2204 to 100%.

Critical Tasks:

1. SGTR-7; Perform a Plant cooldown. The Crew is observed coordinating action to cooldown the RCS to less than 515°F by T_{COLD} to isolate the affected S/G.
2. SGTR-2; Establish RCS pressure control. The ATC is observed maintain RCS pressure within the applicable curves and lowering RCS and S/G D/P.
3. SGTR-6; Manually establish the minimum design Safety Injection System flow. The ATC is observed reducing SI injection flow IAW HPSI Stop and Throttle conditions.

Event No.	Malf. No.	Event Type*	Event Description
1 (0 min)	N/A	R, N (ATC/S) (BOP/S)	Raise Reactor Power to 100%.
2 (+? min)	RP19C	I, TS (ATC/S)	'C' RPS Lower NI Fails low.
3 (+? min)	CW02D	C (BOP/S)	"D" Traveling Screen D/P high, requires securing "D" Circ. Pump.
4 (+? min)	RM01O	I (ATC/S)	CRAC Radiation Monitor, RM-9799A, fails high.
5 (+? min)	SG01A	C, TS (BOP/S)	SGTL in #1 SG (TS).
6 (+? min)	N/A	R (All)	Down power due to SGTL.
7 (+? min)	SG02B	M (All)	SG Tube Rupture. Manual plant trip.
8 (+? min)	ES03J / SI05A	C (ATC/S)	"C" HPSI pump fails to start on SIAS. "A" HPSI pump is degraded (100%)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Op-Test No.: ES16LI2 Scenario No.: 2 Event No.: 1

Event Description: Raise Power to 100%

Time	Position	Applicant's Actions or Behavior
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Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual
1. Total malfunctions (5–8)	6
2. Malfunctions after EOP entry (1–2)	1
3. Abnormal events (2–4)	4
4. Major transients (1–2)	1
5. EOPs entered/requiring substantive actions (1–2)	1
6. EOP contingencies requiring substantive actions (0–2)	0
7. Critical tasks (2–3)	3

NRC 2016, Scenario 2 Summary:

The crew will take the shift with the unit at 90% Xenon slowly building in, with no equipment out of service (IC-30). The crew will begin the shift by raising power to 100%.

Event 1: The crew takes the shift and begins the power ascension to 100% power. Xenon concentration will be slowly rising requiring the Crew to initiate a dilution or reduce Turbine load to maintain RCS temperature. The Crew will be referring to OP 2204, OP 2302A, OP 2304 and OP 2208 to dilute, with draw CEAs and raise Turbine load.

Event 2: After the dilutions to raise power and at the discretion of the Examiners "C" RPS Nuclear Instrument fails requiring ARP actions to bypass the affected Reactor Trip Modules on Channel "C" and the U.S. will enter the applicable Tech. Spec.

Event 3: At the discretion of the Examiners the malfunction for the "D" Traveling Screen DP will be initiated causing the Traveling Screen for "D" Water box to ramp in above high setpoint requiring the securing of "D" Circ. Pump. The Crew will enter AOP 2517 for Circulating Water Malfunction and take actions to cross-tie "C" and "D" Water boxes by closing the "D" Water box inlet valve and place the tripped Circ Pump handswitch in PTL and lastly the Crew will verify Condenser vacuum <4.5" Hg.

Event 4: At the discretion of the Examiners the malfunction for RM-9799A causing it to fail high will initiate placing the Control Room Air Conditioning System in Recirculation Mode. The Crew will refer to the ARP 2590A-159 will place hand switches for Facility 1 CRAC in Recirc to match the actual condition of CRAC. The U.S. will enter Tech. Spec. 3.3.3.1 Radiation monitoring instrumentation channels not OPERABLE and submit a CR.

Event 5: At the discretion of the Examiners the malfunction for a S/G tube leak is inserted. The Crew will be alerted to a SGTL by C06/07 Alarm for N-16 HIGH and carry out the actions for the ARP and will enter AOP 2569 SGTL, the Crew will verify Reactor Trip Criteria is not exceeded but, the Tech. Spec. of 75 gpd will be exceeded requiring a Reactor down power. The Crew will transition to AOP 2575 Rapid Downpower.

Op-Test No.: ES16LI2 Scenario No.: 2 Event No.: 1

Event Description: Raise Power to 100%

Time	Position	Applicant's Actions or Behavior
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Event 6: The crew will enter AOP 2575 Rapid Downpower. The first action for the rapid down power will require the Crew to force PZR sprays then insert Group 7 Rods 10 steps while reducing Turbine load to maintain RCS T_{COLD}. The Crew will then align for boration from the RWST requiring the ATC operator to start an additional Charging pump if not already started and the BOP to setup the Turbine HMI to lower load to maintain RCS T_{COLD}.

Event 7: During the Rapid Downpower at the discretion of the Examiner an S/G tube rupture will be inserted requiring the Crew to verify actual rupture using plant parameters and the Main Steam Line Hi alarm and direct a manually trip the Reactor.

Event 8: After the completion of EOP 2525 SPTA the crew will enter EOP 2534 SGTR and upon SIAS the "C" HPSI pump will fail to start and the "A" HPSI will be fully degraded requiring the ATC to manually start the "C" HPSI pump and or start the "B" HPSI pump to meet SI flow criteria.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Time	Sev or Value	Final Value	Rel Order
MALFUNCTIONS							
RP19C	"C" Channel Power Range RPS fail						
CW02D	"D" Traveling Screen D/P						
RM01O	RM-9799A CNTRL RM Radmon						
SG01A	#1 S/G tube leak						
SG02B	#1 S/G tube rupture						
ES03J	"C" HPSI start fail on SIAS						
SI05A	"A" HPSI pump degradation						
REMOTE FUNCTIONS							
OVERRIDES							

Facility: Millstone Unit 2

Scenario No.: 3

Op-Test No.: ES16LI3

 Examiners: _____

 Operators: _____ SRO
 _____ ATC
 _____ BOP

Initial Conditions: 100% Power IC, "A" Aux Feed Pump OOS for bearing replacement.

Turnover: 100% Power, steady state, no equipment OOS. 24E is aligned to 24C.

Critical Tasks:

1. LOCA-13 Trip two RCPs with SIAS actuation and a LOCA in progress.
2. 2260 2536 TCOA (ESDE-6); Isolate Aux Feed Water to the affected SG within 30 minutes following an MSI actuation.
3. LOCA-2; Start the TDAFP.

Event No.	Malf. No.	Event Type*	Event Description
1 (0 min)	RHLI-3004	TS (S)	"A" Ch. RWST Level fails to zero (0%)
2 (+min)	C03-A18B	C (ATC/S)	"A" RCP Anti Rev Rot Flow Low
3 (+min)	RC20A	C,TS (ATC/S)	"A" RCP Seal Cooler Leak of ~28 gpm (5%)
4 (+min)	N/A	R (ALL)	Plant shutdown due to RCS leak
5 (+min)	RC20A (1005)	M (ALL)	"A" RCP Seal Cooler Rupture (100%) resulting in an Inter-System SB-LOCA of 550 gpm
6 (+min)	MS02B	C (ALL)	ESD outside CTMT, upstream of #2 MSIV on the trip.
7 (+min)	FW20B	C (BOP/S)	"B" AFW pump trips. Start the TDAFW pump.

Op-Test No.: <u>ES16LI3</u> Scenario No.: <u>3</u> Event No.: <u>1</u>		
Event Description: "A" Ch. RWST Level Failure		
Time	Position	Applicant's Actions or Behavior

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual
1. Total malfunctions (5–8)	5
2. Malfunctions after EOP entry (1–2)	1
3. Abnormal events (2–4)	2
4. Major transients (1–2)	1
5. EOPs entered/requiring substantive actions (1–2)	1
6. EOP contingencies requiring substantive actions (0–2)	1
7. Critical tasks (2–3)	3

NRC 2016, Scenario 3 Summary:

The crew will take the shift with the unit at 100% power, steady state, with "A" Motor Driven Aux Feed Water Pump out of service for bearing replacement (IC-30).

Event 1: The crew takes the shift then at the discretion of the Examiner malfunction for "D" RWST level channel fails to 0. Crew will refer to an ARP 2590A-068 and bypass the level indicator then log into a T.S.A.S.

Event 2: At the discretion of the Examiner a malfunction for "A" RCP Anti Reverse Rotation flow alarm will annunciate providing the prelude to the "A" RCP Seal Cooler leak. The Crew will refer to ARP 2590B-074 and start the "A" RCP Lift pump, evaluate the need for a Reactor Trip and then submit a CR.

Event 3: At the discretion of the Examiner a malfunction for RCP "A" seal cooler leak into RBCCW of approximately 28 gpm. The Crew will enter AOP 2568 Reactor Coolant System Leak and validate by stabilizing PZR level, may start an additional Charging Pump and manually adjusting the bias on letdown. The U.S. will enter a Shutdown T.S.A.S and monitor for EAL Classification threshold. U.S. will direct a shutdown and transition to AOP 2575.

Event 4: The crew will enter AOP 2575 Rapid Downpower per the RCS Leak T.S.A.S. and commence a downpower. ATC will insert Group 7 Rods 10 steps while BOP reduces Turbine load to maintain RCS T_{COLD}. The Crew will then align for boration from the RWST requiring the ATC operator to start an additional Charging pump if not already started and the BOP to setup the Turbine HMI to lower load to maintain RCS T_{COLD}.

Event 5: At the discretion of the Examiner the malfunction for "A" RCP Seal Cooler rupture will causing a small break LOCA of approximately 550 gpm requiring the crew will validate using RCS parameter imitate and initiate a Reactor Trip and transition to perform EOP 2525 SPTA.

Event 6: On the Reactor trip during the performance of EOP 2525 an Excess Steam Demand Event will be initiated downstream of #2 S/G MSIV requiring the BOP stop steaming to the condenser by closing both MSIVs and to secure feed the #2 S/G. When the S/G blows dry the BOP will stabilize RCS temperature using the

Op-Test No.: ES16LI3 Scenario No.: 3 Event No.: 1

Event Description: "A" Ch. RWST Level Failure

Time	Position	Applicant's Actions or Behavior
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unaffected S/G ADV. The U.S. will diagnose 2 events and enter EOP 2540 and implement the Resource Assessment Trees.

Event 7: After entry into the Functional Emergency Procedures EOP 2540 the Crew will be addressing the CTMT Isolation Safety Function the "B" Motor driven Aux Feedwater will trip requiring the BOP to start the Turbine driven Aux Feedwater pump if not already started in EOP 2525.

The crew is required to isolate the RCS leak and Isolate the #2 S/G while stabilizing RCS temperature after the #2 S/G blowdown.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Time	Sev or Value	Final Value	Rel Order
MALFUNCTIONS							
REMOTE FUNCTIONS							
OVERRIDES							

Facility: Millstone Unit 2

Scenario No.: 4

Op-Test No.: ES16LI4

Examiners: _____

Operators: _____

SRO

ATC

BOP

Initial Conditions: 45% Power IC, "A" Main Feed pump in service. "A" & "B" Condensate pumps and "A" & "B" TBCCW pumps operating. Aux Feed Pump OOS for bearing replacement.

Turnover: 45% Power, steady state, no equipment OOS. 24E is aligned to 24C. Raise Reactor power to 60% IAW OP2321 and OP2204.

Critical Tasks:

1. LOOP-1; Establish RCS Inventory Control.
2. 2260 2536 TCOA (ESDE-6); Isolate Aux Feed Water to the affected SG within 30 minutes following an MSI actuation.
3. ESDE-7; Maintain Containment Temperature and Pressure Control.

Event No.	Malf. No.	Event Type*	Event Description
1 (0 min)		R.N (ATC/S) (BOP/S)	Raise power to 60%.
2 (+? min)	CV28A	I (ATC/S)	PMW Addition Valve, CH-210X, fails open.
3 (+? min)	RX12C	I BOP/S	#2 S/G "Main" Level Control Channel failure
4 (+? min)	WD03	TS S	CTMT Sump Level Detector Failure
5 (+?min)	TP02B	C BOP/S	"B" TBCCW Pump trip (start "C" TBCCW pump).
6 (+? min)	ED16A	C All (TS/S)	Loss of Vital Instrument Bus, VA-10 (TS).
7 (+? min)	ED03A- ED03D	M All	Loss Of Offsite Power (LOOP), plant trip.
8 (+? min)	MS01A	C (BOP/S)	ESD in CTMT on #1 S/G.
9 (+? min)	RH06B	C (ATC/S)	Failure of the "B" CTMT Spray Pump.

Op-Test No.: ES16LI4 Scenario No.: 4 Event No.: 1

Event Description: Raise Power to 60%

Time	Position	Applicant's Actions or Behavior
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Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual
1. Total malfunctions (5–8)	7
2. Malfunctions after EOP entry (1–2)	2
3. Abnormal events (2–4)	4
4. Major transients (1–2)	1
5. EOPs entered/requiring substantive actions (1–2)	2
6. EOP contingencies requiring substantive actions (0–2)	1
7. Critical tasks (2–3)	3

NRC 2016, Scenario 4 Summary:

The crew will take the shift with the unit at ~45% power, 24E aligned to 24C, “A” & “B” Condensate Pumps operating and the “A” Main Feed Pump in service. A plant startup is in progress using OP 2204, Load Changes, with the intent of raising power to approximately 60%, awaiting the return of the “B” MFW pump.

Event 1: The crew takes the shift and raises power to 60%, or until terminated at the discretion of the Examiners by triggering Event 2.

Event 2: Before completion of the power ascension, at the discretion of the Examiner, the PMW Addition Valve, CH-210X, will fail to close when the selected amount of PMW has been added to the RCS. This will require the crew to terminate the positive reactivity addition by closing one of two other valves in the CVCS flow path. Once power is stabilized, Event 3 is triggered.

Event 3: The #2 S/G “Main” Level Control Channel will fail low, requiring operator action to stabilize SG levels. After level control is recovered manually, the failed transmitter input into SGWLC is deselected and S/G water level control is returned to automatic mode. After SGWLC is returned to normal, Event 4 is triggered.

Event 4: The CTMT normal sump level detector will fail high, requiring RCS Leak Detection System TS entry. There are no board operator actions (other than verification of indications) and Event 5 is triggered by Examiner direction.

Event 5: The “B” TBCCW pump will trip, requiring the crew to start the standby TBCCW pump before the Main Turbine trips on high Stator Water Cooling temperature. Once TBCCW system flow is restored to normal, Event 6 is triggered.

Event 6: VIAC bus VA-10 will de-energize, requiring the crew to immediately secure charging and letdown flow IAW AOP 2585, Immediate Operator Actions. Once the crew verifies the actions taken per AOP 2585, AOP 2504C, Loss of 120 VAC Instrument Panel VA-10, will be entered. When the crew has completed the initial actions of AOP 2504C, or at the Examiners discretion, trigger Event 7.

Op-Test No.: ES16LI4 Scenario No.: 4 Event No.: 1

Event Description: Raise Power to 60%

Time	Position	Applicant's Actions or Behavior
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Event 7: A Loss Of Offsite Power will occur, causing a plant trip and transition to EOP 2525, SPTA where charging flow should be reestablished to maintain the RCS Inventory Safety Function. Upon completion of EOP 2525, the crew will transition to EOP 2528, Loss Of Offsite Power, Loss Of Forced Circulation. After transition to EOP 2528, and at the Examiner's discretion, trigger Event 8.

Event 8: The "A" Main Steam Header will rupture in CTMT, requiring the crew to transition to EOP 2536, Excess Steam Demand Event. The mitigating strategy and required actions will be complicated by the previous loss of VA-10. AFW Reg. Valve to the affected SG will fail open due to the loss of VA-10, requiring the crew to manually isolate the flow path. In addition, Facility 1 of ESAS will fail to automatically initiate, requiring all safety equipment to be manually actuated.

Event 9: On CSAS, the "B" CS Pump will fail to start and cannot be manually started. The loss of VA-10 will prevent the actuation of all Facility 1 equipment, requiring manual start of the "A" CS Pump to mitigate the rising CTMT pressure.

The crew is required to isolate all feed to the #1 S/G, stabilizing RCS temperature after the #1 S/G blows down and start the "A" CS pump. Procedural driven complete isolation of the #1 S/G is at the Examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Time	Sev or Value	Final Value	Rel Order
MALFUNCTIONS							
REMOTE FUNCTIONS							
OVERRIDES							