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	5				5	2			3	18	2		4		6
	2	1	1	3	N/A			2	1	N/A		1	9	2		2		4
	Tier Totals	3	2	8				7	3			4	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	1		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)

Q#	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
1	CE/E02 Reactor Trip Recovery / 1				01			Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.7	
2	000008 Pressurizer Vapor Space Accident / 3			05				ECCS termination or throttling criteria	4.0	1
3	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
8	000011 Large Break LOCA / 3			08				Flowpath for sump recirculation	3.9	1
4	000015 RCP Malfunctions / 4 000017 RCP Malfunctions (Loss of RC Flow) / 4	03						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									
5	000022 Loss of Rx Coolant Makeup / 2				02			CVCS charging low flow alarm, sensor, and indicator	3.0	1
6	000025 Loss of RHR System / 4		03					Service water or closed cooling water pumps	2.7	1
7	000026 Loss of Component Cooling Water / 8			04				Effect on the CCW flow header of a loss of CCW	3.5	1
	000027 Pressurizer Pressure Control System Malfunction / 3									0
9	000029 ATWS / 1					05		System component valve position indications	3.4	1
10	000038 Steam Gen. Tube Rupture / 3	02						Leak rate vs. pressure drop	3.2	1
	000040 Steam Line Rupture / 4									1
11	CE/E05 Excessive Steam Demand / 4				02			Operating behavior characteristics of the facility.	3.5	
	000054 Loss of Main Feedwater / 4									0
	CE/E06 Loss of Feedwater / 4									
12	000055 Station Blackout / 6				05			Battery, when approaching fully discharged	3.3	1
13	000056 Loss of Off-site Power / 6					17		Operational status of PZR backup heaters	3.4	1
14	000057 Loss of Vital AC Inst. Bus / 6			01				Actions contained in EOP for loss of vital ac electrical instrument bus	4.1	1
15	000058 Loss of DC Power / 6			01				Use of dc control power by ED/Gs	3.4	1
16	000062 Loss of Nuclear Svc Water / 4				07			Flow rates to the components and systems that are serviced by the SWS; interactions among the components	2.9	1
17	000065 Loss of Instrument Air / 8						01.20	Ability to interpret and execute procedure steps.	4.6	1
18	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	5	5	2	3	Group Point Total:		18

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

Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)

Q#	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
21	**000003 Dropped Control Rod / 1**			**04**				**Actions contained in EOP for dropped control rod**	3.8	1
19	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
20	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									0
	000067 Plant Fire On-site / 9 8									0
22	000068 Control Room Evac. / 8				01			S/G atmospheric relief valve	4.3	1
23	000069 Loss of CTMT Integrity / 5	01						Effect of pressure on leak rate	2.6	1
	000074 Inad. Core Cooling / 4									0
25	000076 High Reactor Coolant Activity / 9			05				Corrective actions as a result of high fission-product radioactivity level in the RCS	2.9	1
24	CE/A13 Natural Circ. / 4						04. 02	Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.	4.5	1
	CE/A11 RCS Overcooling / 4									0
26	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
27	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)

Q#	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	#
28,29	003 Reactor Coolant Pump					02			05				Effects of RCP coastdown on RCS parameters; Effects of VCT pressure on RCP seal leakoff flows	2.8; 2.5	2
30,31	**004 Chemical and Volume Control**				03		**04**						Protection of ion exchangers (high letdown temperature will isolate ion exchangers); Pumps	2.8; 2.8	2
32	005 Residual Heat Removal					09							Dilution and boration considerations	3.2	1
33,34	006 Emergency Core Cooling		02									04. 03	Valve operators for accumulators; Ability to identify post-accident instrumentation.	2.5; 3.7	2
35	007 Pressurizer Relief/Quench Tank							02					Maintaining quench tank pressure	2.7	1
36	008 Component Cooling Water									01			Setpoints on instrument signal levels for normal operations, warnings, and trips that are applicable to the CCWS	3.2	1
37,38	010 Pressurizer Pressure Control			01					02				RCS; Spray valve failures	3.8; 3.9	2
39	012 Reactor Protection				02								Automatic reactor trip when RPS setpoints are exceeded for each RPS function; basis for each	3.9	1
40	013 Engineered Safety Features Actuation		01										ESFAS/safeguards equipment control	3.6	1
41	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
42	026 Containment Spray							06					Containment spray pump cooling	2.7	1
43	039 Main and Reheat Steam	08											MFW	2.7	1
44	059 Main Feedwater							03					Power level restrictions for operation of MFW pumps and valves	2.7	1
45,46	061 Auxiliary/Emergency Feedwater			01								02. 38	RCS; Knowledge of conditions and limitations in the facility license.	4.4; 3.6	2
47	062 AC Electrical Distribution								04				Effect on plant of de-energizing a bus	3.4	1
48,49	063 DC Electrical Distribution			02	01								Components using DC control power; Manual/automatic transfers of control	3.5; 2.7	2
50	064 Emergency Diesel Generator							04					Crankcase temperature and pressure	2.8	1
51,52	073 Process Radiation Monitoring				01			01					Release termination when radiation exceeds setpoint; Radiation levels	4; 3.2	2
53	076 Service Water	08											RHR system	3.5	1
54	078 Instrument Air											04. 46	Ability to verify that the alarms are consistent with the plant conditions.	4.2	1
55	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

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

Plant Systems - Tier 2/Group 2 (RO)

Q#	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	#
56	001 Control Rod Drive			02									RCS	3.4	1
	002 Reactor Coolant														0
57	011 Pressurizer Level Control			03									PZR PCS	3.2	1
	014 Rod Position Indication														0
	015 Nuclear Instrumentation														0
58	016 Non-nuclear Instrumentation										01		NNI channel select controls	2.9	1
59	017 In-core Temperature Monitor										02		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
60	035 Steam Generator						01						MSIVs	3.2	1
61	041 Steam Dump/Turbine Bypass Control					01							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
62	068 Liquid Radwaste						10						Radiation monitors	2.5	1
63	071 Waste Gas Disposal							06					Ventilation system	2.5	1
64	072 Area Radiation Monitoring									01			Changes in ventilation alignment	2.9	1
	075 Circulating Water														0
	079 Station Air														0
65	086 Fire Protection								01				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)

Q#	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
76	000015 RCP Malfunctions / 4 000017 RCP Malfunctions (Loss of RC Flow) / 4						01.23	Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.4	1
77	000022 Loss of Rx Coolant Makeup / 2						04.08	Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	4.5	1
78	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
79	000029 ATWS / 1					02		Reactor trip alarm	4.4	1
	000038 Steam Gen. Tube Rupture / 3									0
	000040 Steam Line Rupture / 4									1
80	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
81	000056 Loss of Off-site Power / 6					14		Operational status of ED/Gs (A and B)	4.6	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)

Q#	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
82	000037 Steam Generator Tube Leak / 3					04		Comparison of RCS fluid inputs and outputs, to detect leaks	3.7	1
83	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
84	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
85	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

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

Plant Systems - Tier 2/Group 1 (SRO)

Q#	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
86	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
87	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
89	**026 Containment Spray**											**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
	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
88	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														0
90	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)

Q#	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
91	002 Reactor Coolant								02				Loss of coolant pressure	4.4	1
	011 Pressurizer Level Control														0
92	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
93	029 Containment Purge								01				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

ES-401 **Generic Knowledge and Abilities Outline (Tier 3)** **Form ES-401-3**

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

Q#	Category	K/A #	Topic	RO IR	RO #	SRO-Only IR	SRO-Only #
66	1. Conduct of Operations	2.1. 25	Ability to interpret reference materials, such as graphs, curves, tables, etc.	3.9	1		
67		2.1. 05	Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.	2.9	1		
68		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		
94		2.1. 36	Knowledge of procedures and limitations involved in core alterations.			4.1	1
		2.1.					
		2.1.					
		Subtotal			3		1
69	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		
70		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		
95		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
96		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
71	3. Radiation Control	2.3. 07	Ability to comply with radiation work permit requirements during normal or abnormal conditions.	3.5	1		
72		2.3. 11	Ability to control radiation releases.	3.8	1		
97		**2.3. 11**	Ability to control radiation releases.			4.3	1
98		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
73	4. Emergency Procedures / Plan	2.4. 39	Knowledge of RO responsibilities in emergency plan implementation.	3.9	1		
74		2.4. 27	Knowledge of "fire in the plant" procedures.	3.4	1		
75		2.4. 01	Knowledge of EOP entry conditions and immediate action steps.	4.6	1		
99		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
100		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: Millstone Unit 2 Date of Examination: 09/05/2016

Examination Level: RO ☒ SRO ☐ Operating Test Number: ES16LI .

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: Millstone Unit 2 Date of Examination: 09/05/2016

Examination Level: RO ☐ SRO ☒ Operating Test Number: ES16LI

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: Millstone Unit 2 Date of Examination: 09/05/2016

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

Simulator JPMS

a.	[S1] JPM-270; EOP-2532 LOCA Cooldown **K/A 039 A2.01 Main Steam** flow paths during a LOCA. Commence a cooldown using the "A" steam dump bypass valve then a loss of condenser vacuum will require the Examinee to transition the cooldown to the ADV's.	D, A, S, E, L	4(S)
b.	[S2] JPM-284; Respond to a 10 Step CEA Misalignment **K/A 001 A2.03 Control Rod Drive System** impact or malfunction on a misaligned rod. Commence a down power by inserting GP 7 rods 10 steps and a malfunction will cause Rod #1 to slip 10 steps.	N, A, S	1
c.	[S3] JPM-243; SP-2604T, ESAS Actuation Test **K/A 013 A4.03 ESFAS** manually initiate. [Test of DC Switchgear room cooling] Perform a surveillance to initiate DC SWGR cooling and reports F54A fails to start.	D, EN, S	7
d.	[S4] JPM-211; Pumping the Containment Sump {RO Only} **K/A 103 K1.02 Containment Systems** relationship to CTMT isolation and integrity. Pump the CTMT normal sump receive high discharge pressure secures pumping with a failure of an isolation valve to close.	D, S	5
e.	[S5] JPM-285; Energizing 24E from Unit 3 **K/A 062 A.C. Electrical Distribution** restoration of power with a fault. Energize Bus 24E recognizing a ground fault on Bus 24E	N, A, S, E, L	6
f.	[S6] JPM-288; Control PZR Level from C-21 **K/A 011 A1.01PZR Level Control System** monitor changes in PZR level and pressure. From remote shutdown panel C-21 maintain level and pressure with a failed PZR level instrument.	N, S, E, L	2
g.	[S7] JPM-011; Evaluate "A" RCP Seal **K/A 003 A4.04 Reactor Coolant Pump System** monitor and operate RCP Oil Level instrumentation. Determine "A" RCP Oil leak with lowering level	D, S, E	4(P)
h.	[S8] JPM-230; LPSI Pump Failure to Trip Post-SRAS **K/A 013 A4.01 ESFAS** manually operate or monitor equipment which fails to actuate. Monitor ECCS components for a Sump Recirc. Signal with a failure of the "A" LPSI pump to stop.	D, A, S, L	3

In Plant JPMs

i.	[P1] JPM-287; EDG Low Oil Pressure **K/A 064 A1.01 E/DG** to monitor ED/G lube oil temperature and pressure. EOP 2541 APP26 EDG operations attempts reset of alarms and notes low lube oil pressure requiring an EDG manual trip. Outside the RCA	N, A, E, L	6
j.	[P2] JPM-245; CAR RBCCW Valve to Local-Manual **K/A 022 A4.04 CCS** to manually operate valves in the CCS. ESDE event requires local manual isolation of a RBCCW CAR Cooler valve. Inside the RCA	D, R, E	8
k.	[P3] JPM-265; Turbine Building Sump Alignment **K/A 2.3.11 Radiation Control** ability to control radiation releases. Steam Generator Tube Rupture event requires manually aligning the Turbine Building Sumps to the CPF to prevent unmonitored release. Outside the RCA	D, E	9

Facility: Millstone Unit 2 Date of Examination: 09/05/2016
Exam 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	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 Failure	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	4-6 / 4-6 / 2-3
(C)ontrol room	
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	≥1 / ≥1 / ≥ 1 (control room system)
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(**N**)ew or (**M**)odified from bank including 1(A)	**≥ 2 / ≥ 2 / ≥ 1**
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

Facility: Millstone Unit 2 Date of Examination: 09/05/2016
Exam 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 Failure	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	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / **≥ 1**
(EN)gineered safety feature	≥1 / ≥1 / ≥ **1** (control room system)
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / **≥ 1**
(**N**)ew or (**M**)odified from bank including 1(A)	≥ 2 / ≥ 2 / **≥ 1**
(P)revious 2 exams	≤ 3 / ≤ 3 / **≤** 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ **1**
(S)imulator	

SIMULATOR SCENARIO #1

Facility: Millstone Unit 2	Scenario No.: 1	Op-Test No.: ES16LI1
Examiners: _____	Operators: _____	SRO
_____	_____	ATC
_____	_____	BOP

Initial Conditions: 100% Power IC-139, No Equipment OOS, Ch-Y PZR Level in service.

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

Critical Tasks:

1. SPTA-5; Manually shutdown the reactor
2. Fully implement Once Thru Cooling prior to either SG reaching 32"

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (BOP/S)	Start "B" TBCCW Pump, Secure "A" TBCCW Pmp.
2	03A1A5S2 C04L-B11B	C (ATC/S)	Trip "A" CEDM Cool Fan.
3	RP10A	I (ATC/S)	Ch. "A" PZR Pressure fails low (TS)
4	RX04A	I (ATC/S)	Ch-X PZR Level (LT110X) (non-selected) fails to 0% level. (TS)
5	FW01	C (BOP/S)	Main Condenser Vacuum leak.
6	N/A	R (All)	Downpower due to vacuum leak.
7	RC11A, RP04A-D, RP27B	M (All)	"A" RCP seizes and trips, TCBs fail to open (ATWS), manual Rx trip pushbuttons fail, manually trip by opening MG set breakers.
8	FW33, ES01A, ES01B	C (BOP/S)	Rapid loss of condenser vacuum and failure of AFAS to trigger.
9	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

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)	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 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.

Event 7: "A" RCP will seize and trip, but the TCBs will fail to open (ATWS). The crew should recognize the ATWS and immediately trip the reactor manually by pressing the four TCB manual trip buttons. These will also fail to open the TCBs, requiring the opening of 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 discus 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							
RP04A-RP04D	Failure of all four Manual Trip Buttons			N/A			0
RP27B	Failure of ALL RPS trip functions			N/A			0
ES01A, ES01B	AFAS Failure, both Facilities			N/A			0
C04L-B11B	F-13A Trip Alarm			E-2		ON	2
RP10A	Ch. "A" PZR Pressure fails low			E-3	100%		3
RX04A	Ch. "X" PZR Level Cont. fails low			E-4	0%		4
FW01	Main Condenser Vacuum Loss			E-5	0.5"		5
FW01	Main Condenser Vacuum Loss			E-6	0.3"		6
RC11A	"A" RCP Seizes and tirps			E-7			7
FW33	Rapid loss of Condenser Vacuum			E-30	100%		8
FW36A FW36B	Rupture Aux Feedwater, both headers			E-9	100%		9
REMOTE FUNCTIONS							
TPR02	"A" TBCCW Pump discharge valve			E-10	CLOSED		1
TPR02	"A" TBCCW Pump discharge valve			E-11	OPEN		1

OVERRIDES							
03A1A5 S2	Trip the "A" CEDM Cooling Fan, F-13A						2

SIMULATOR SCENARIO #2

Facility: Millstone Unit 2 Scenario No.: 2 Op-Test No.: ES16LI2

Examiners: _____ Operators: _____ SRO

_____ _____ ATC

_____ _____ BOP

Initial Conditions: 90% Power IC-140, No Equipment OOS, Ch-Y PZR Level in service, Fac. 2 CRAC 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-6; Manually establish the minimum design Safety Injection System flow.
2. SGTR-5: Isolate the affected SG.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	R, N (ATC/S) (BOP/S)	Raise Reactor Power to 100%.
2	RP19C	I, TS (ATC/S)	'C' RPS Lower NI Fails low.
3	CW02D	C (BOP/S)	"D" Traveling Screen D/P high, requires securing "D" Circ. Pump.
4	RM01P CH08D	I, TS (ATC/S)	CRAC Radiation Monitor, RM-9799B, fails high and "B" CRAC Filter Fan, F-32B, Trips (TS).
5	SG01A	C, TS (BOP/S)	SGTL in #1 SG (TS).
6	N/A	R (All)	Down power due to SGTL.
7	SG02B	M (All)	SG Tube Rupture. Manual plant trip.
8	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

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 2304C 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 Control Room Air Conditioning (CRAC) Radiation Monitor will fail high, causing the ventilation system to shift into recirculation mode. Five seconds after starting, the "B" Filter Fan, F32B, will trip due to a broken belt. Per ARP 2590A-159, the crew should verify proper operation of the CRAC system and note the loss of the filter fan. This will require the crew to secure Facility 2 CRAC and ensure Facility 1 CRAC is operating as required per ARP 2590A-159. The US will enter TSAS 3.7.6.1a for an inoperable train of CRAC, TSAS 3.3.3.1 for the failed rad monitor, and call Maintenance/Work Planning for the needed equipment repairs.

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.

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			E-2	0%	0%	2
CW02D	"D" Traveling Screen D/P		180 sec	E-3	65%	65%	3
RM01P	RM-9799A CNTRL RM Radmon			E-4	100%	100%	4
CH08D	"B" CRAC Filter Fan, F32B, trip	5 sec		E-4	N/A	N/A	4
SG01A	#1 S/G tube leak		120 sec	E-5	50%	50%	5
SG02B	#1 S/G tube rupture		60 sec	E-7	15%	15%	7
ES03J	"C" HPSI start fail on SIAS			E-30	N/A	N/A	8
SI05A	"A" HPSI pump degradation		60 sec	E-30	100%	100%	8
REMOTE FUNCTIONS							
CWR06B	"B" Screen Wash Pump Start			E-10		START	3
CWR07A	"A" Screens to Fast			E-10		FAST	3
CWR07B	"B" Screens to Fast			E-10		FAST	3
CWR07C	"C" Screens to Fast			E-10		FAST	3
CWR07D	"D" Screens to Fast			E-10		FAST	3
CWR07D	"D" Screens to Stop			E-11		STOP	3
OVERRIDES							

Op-Test No.: ES16LI2 Scenario No.: 2 Event No.: 1 Event Description: Raise Power to 100%		
Time	**Position**	**Applicant's Actions or Behavior**

Examiner Note: The crew has been instructed to brief the up power prior to taking the watch. The The following steps are from OP 2204 Load Changes. OP 2204 Load Changes procedure is marked up with "N/A" and Unit Supervisor signatures for applicable steps.		
		Up power in accordance with OP 2204 and Reactivity Plan. Method: dilution and CEAs Rate: 15%/hour • Crew will dilute to the charging pump suction and raise power to ~100%. • Turbine load will be increased to maintain RCS Tavg on program.
Examiner Note: When reactor power is 5% higher than initial power or at the lead examiner's direction, proceed to Event #2, Trip of "C" Channel of NI power instrument.		

SIMULATOR SCENARIO #3

Facility: Millstone Unit 2 Scenario No.: 3 Op-Test No.: ES16LI3

Examiners: _____ Operators: _____ SRO
_____ _____ ATC
_____ _____ BOP

Initial Conditions: 100% Power IC-141

Turnover: 100% Power, steady state, Nothing out of service. 24E is aligned to 24C.

Critical Tasks:
1. LOCA-13 Trip two RCPs with SIAS actuation and a LOCA in progress.
2. LOCA-12 (TCOA) Trip ALL RCPs within 5 minutes of NPSH limits not being met.
3. 2260 2536 TCOA (ESDE-6); Isolate Aux Feed Water to the affected SG within 30 minutes following an MSI actuation.
4. LOCA-2; Start the TDAFP.

Event No.	Malf. No.	Event Type*	Event Description
1	RP13D	TS (S)	"D" Ch. SG #1 Level (LI113D) fails to 0%
2	C03-A18B	C (ATC/S)	"A" RCP Anti Rev Rot Flow Low
3	RC20A	C,TS (ATC/S)	"A" RCP Seal Cooler Leak of 5-8 gpm
4	N/A	R (ALL)	Plant shutdown due to RCS leak
5	RC20A (1005)	M (ALL)	"A" RCP Seal Cooler Rupture resulting in an Inter-System SB-LOCA of 550 gpm
6	MS02B	C (ALL)	ESD outside CTMT (4.75E06 lbm/hr), upstream of #2 MSIV on the trip. 30 second time delay following the Reactor Trip
7	FW30A FW20B	C (BOP/S)	"A" AFW Pump degraded performance and "B" AFW pump trips. Start the TDAFW pump.

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, nothing out of service.

Event 1: The crew takes the shift, then at the discretion of the Examiner malfunction for Ch. "D" SG #1 Level (LI-113D) failure to 0% is triggered. Crew will refer to applicable ARP(s), bypass the affected inputs on Channel "D" of RPS and log into the applicable instrumentation 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 5-8 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 outside of CTMT, upstream of #2 S/G MSIV (Non-Isolable) 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 unaffected S/G ADV. The U.S. will diagnose 2 events and enter EOP 2540 and implement the Resource Assessment Trees.

Event 7: Five minutes after the plant trip, the "A" Motor driven Aux Feedwater Pump performance will degrade and the "B" Motor driven Aux Feedwater pump will trip, requiring the BOP to start the Turbine driven Aux Feedwater Pump, if not previously already started.

The US should transition to the Functional Recovery Procedure, EOP 2540, and the Crew will begin addressing the CTMT Isolation Safety Function.

The crew is required to isolate the RCS leak into RBCCW 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							
RP13D	SG #1 Ch. "D" Level failure			E-1	0%	0%	1
C03-A18B	"A" RCP Anti Rev Rot Flow Low			E-2	ON	ON	2
RC20A	"A" RCP Seal Cooler Leak of 8 gpm		2 min	E-3	8 gpm	8 gpm	3
RC20A (1005)	"A" RCP Seal Cooler Rupture of 550 gpm			E-5	550 gpm	550 gpm	5
MS02B	ESD outside CTMT, upstream of #2 MSIV		30 Sec.	E-30	4.75E06	4.75E06	6
FW30A	"A" AFW pump degraded performance.	5 min.		E-30	100%	100%	7
FW20B	"B" AFW pump trip.	5 min.		E-30	N/A	N/A	7
FW20A	"A" AFW pump trip.			E-8	N/A	N/A	8
C03-A18B	"A" RCP Anti Rev Rot Flow Low			E-9	NORMAL	NORMAL	2
REMOTE FUNCTIONS							
CCR35	RBCCW pump "A" Rad Mon isolation			E-10	CLOSE	CLOSE	10
CCR35	RBCCW pump "A" Rad Mon isolation			E-11	OPEN	OPEN	11
CCR36	RBCCW pump "B" Rad Mon isolation			E-12	CLOSE	CLOSE	12
CCR36	RBCCW pump "B" Rad Mon isolation			E-13	OPEN	OPEN	13
CCR37	RBCCW pump "C" Rad Mon isolation			E-14	CLOSE	CLOSE	14
CCR37	RBCCW pump "C" Rad Mon isolation			E-15	OPEN	OPEN	15
OVERRIDES							

SIMULATOR SCENARIO #4

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, "A" & "C" TBCCW pumps operating, "B" Charging Pump aligned to Facility 2 (22F), "A" & "C" charging pumps running, "C" charging pump in Lead. **Ensure one Heater Drain Pump is in service.**

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	N/A	R, N (ATC/S) (BOP/S)	Raise power to 60%.
2	CV04A	C (ATC/S) TS (S)	"A" Charging Pump trip on motor overload.
3	WD03	TS S	CTMT Sump Level Detector Failure.
4	C06-D01A 05A1A2S23 TPHS-6282A_3	C BOP/S	"A" TBCCW Pump trip (start "B" TBCCW pump).
5	RX12C	I BOP/S	#2 S/G "Main" Level Control Channel failure.
6	ED16A	C All (TS/S)	Loss of Vital Instrument Bus, VA-10 (TS).
7	ED03A-ED03D	M All	Loss Of Offsite Power (LOOP), plant trip.
8	MS01A	C (BOP/S)	ESD in CTMT on #1 S/G.

9	ES03L	C (ATC/S)	ESAS Failure of Facility 2 CTMT Spray Actuation.

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%. When power has been raised sufficiently, or at the discretion of the Examiners, trigger Event 2.

Event 2: The "A" charging pump will trip on indication of a motor overload. This will require the crew to lower letdown flow to match charging flow and enter the applicable TS for an inoperable Fac. 1 charging pump. The crew should swap the "B" charging pump to Facility 1 and possibly realign charging pump controls based on the loss of the 1st backup pump. Once the crew has completed the applicable actions for the "A" charging pump trip, or at the discretion of the Examiners, Event 3 is triggered.

Event 3: 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 4: The "A" 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 5: 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 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.

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. During the performance of EOP 2525, the "A" Main Steam Header will rupture in CTMT (Event 8).

Event 8: The "A" Main Steam Header will rupture in CTMT requires 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, the loss of VA-10 will prevent Facility 1 of ESAS from automatically restoring power to Facility 1 (if the crew attempts to restore Facility 1 power manually, a fault on the "A" EDG breaker, A312, will prevent it from closing and re-energizing 24C).

Event 9: On CSAS, Facility 2 CS will fail to actuate, requiring the "B" CS pump to be manually started and 2-CS-4B to be manually opened. The loss of VA-10 pre-trip will prevent the re-energizing of all Facility 1 equipment on the LOOP, requiring use of Facility 2 CS 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 "B" 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							
CV04A	"A" Charging Pump trip			E-2	N/A	Active	2
C02-B12	"A" Charging Pump Trip Alarm			E-2	N/A	ON	2
WD03	CTMT Normal Sump Level Failure			E-3	100%	100%	3
C06-D01A	TBCCW PP OVERLOAD/TRIP (C-06/7, DA-1)			E-4	N/A	ON	4
RX12C	#2 SG Main Level Failure		1 min	E-5	50%	50%	5
ED16A	Loss of VA-10			E-6	N/A	Active	6
ED03A	Loss of 348 Line			E-7	N/A	Active	7
ED03B	Loss of 310 Line			E-7	N/A	Active	7
ED03C	Loss of 371 Line			E-7	N/A	Active	7
ED03D	Loss of 383 Line			E-7	N/A	Active	7
MS01A	"A" Main Stm. Hdr. Rupture in CTMT		5 min	E-30	4.75	4.75	30
ES03L	ESAS failure to actuate Fac. 2 CS			E-30	N/A	Active	30
EG08A	DG 12U Output Brkr Failure			E-30	N/A	Active	30
REMOTE FUNCTIONS							
IAR10	MP3 IA To/From MP2			E-10	OPEN	OPEN	10
IAR28	Unit 3 SA to SA Valve SAS-6			E-10	OPEN	OPEN	10
CVR11	Swap "B" Charging Pump to 22E			E-11	N/A	22E	11
OVERRIDES							
05A1A2 S23	"A" TBCCW Handswitch in "STOP"			E-4	STOP (1st one)	STOP (1st one)	5
TPHS-6282A_3	"A" TBCCW "Amber" light lit			E-4	A	A	5