

Facility: Millstone 3		Date of Exam: September 23rd, 2015															
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	A 2	G*	Total	
1. Emergency & Abnormal Plant Evolutions	1	5	2	2				4	3				2	18	1	5	6
	2	1	2	2	N/A			2	1	N/A			1	9	1	3	4
	Tier Totals	6	4	4				6	4				3	27	2	8	10
2. Plant Systems	1	2	3	3	2	3	2	1	2	3	5	2	28	3	2	5	
	2	1	0	0	2	0	1	1	2	0	0	3	10	1	2	3	
	Tier Totals	3	3	3	4	3	3	2	4	3	5	5	38	4	4	8	
3. Generic Knowledge and Abilities Categories		1		2		3		4		10		1	2	3	4	7	
		4		3		1		2				1	3	1	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). (One Tier 3 Radiation Control KA is allowed if the K/A is replaced by a K/A from another Tier 3 Category).

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

3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D 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 as 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 a category other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.

9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10CFR55.43.

G* Generic K/As

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 - Stabilization - Recovery / 1				5			Operate / monitor Nuclear Instrumentation on a reactor trip	4.0/4.1	1
000008 Pressurizer Vapor Space Accident / 3		2					Interrelations between vapor space break and sensors and detectors	2.7/2.7	2
000009 Small Break LOCA / 3	2						Operational implications of the use of steam tables on a small break LOCA	3.5/4.2	3
000011 Large Break LOCA / 3					7		Determine or interpret equipment necessary for critical pump water seals during LOCA	3.2/3.4	4
000015/17 RCP Malfunctions / 4	4						Operational Implications of thermodynamic relationship between RCS loops and SGs	2.9/3.1	5
000022 Loss of Rx Coolant Makeup / 2						2.4.49	Ability to perform without reference actions that require immediate operation	4.6/4.4	6
000025 Loss of RHR System / 4					5		Determine or interpret limitations on LPI flow and temperature rates of change	3.1/3.5	7
000027 Pressurizer Pressure Control Malfunction / 3						2.4.1	Knowledge of EOP entry conditions and immediate action steps	4.6/4.8	8
000029 ATWS / 1				15			Operate / monitor AFW system	4.1/3.9	9
000038 Steam Gen. Tube Rupture / 3				30			Operate / monitor safety injection and containment isolation systems on SGTR	4.0/3.8	10
000056 Loss of Off-site Power / 6	1						Operational implications of the principle of cooling by natural convection	3.7/4.2	11
000057 Loss of Vital AC Elec. Inst. Bus / 6					6		Determine or interpret AC instrument bus alarms for the inverter and alternate source	3.2/3.7	12
000062 Loss of Nuclear Service Water / 4				6			Operate / monitor control of flow rates to components cooled by the SWS	2.9/2.9	13
000065 Loss of Instrument Air / 8			3				Reasons for: Knowing effects on plant operation of isolating equipment from air	2.9/3.4	14
W/E04 LOCA Outside Containment / 3	3						Operational implications of annunciators, indicating signals, and remedial actions	3.5/3.9	15
W/E11 Loss of Emergency Coolant Recirc. / 4	1						Operational implications of components, capacity, & function of emergency systems	3.7/4.0	16
W/E05 Loss of Secondary Heat Sink / 4			2				Reasons for normal, abnormal and emergency operating procedures	3.7/4.1	17
000077 Generator Voltage and Electric Grid Disturbances / 6		1					Interrclations between Generator Voltage and Grid Disturbances and motors	3.1/3.2	18
K/A Category Totals:	5	2	2	4	3	2	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	#
000003 Dropped Control Rod / 1			6				Reasons for reset of demand position counter to zero	2.7/3.0	19
000032 Loss of Source Range NI / 7				1			Operate / monitor manual restoration of power	3.1/3.4	20
000061 ARM System Alarms / 7	1						Operational Implications of detector limitations	2.5/2.9	21
000076 High Reactor Coolant Activity / 9			5				Reasons for corrective actions as a result of high RCS fission-product activity level	2.9/3.6	22
W/E02 SI Termination / 3		2					Interrelations between SI Termination and heat removal systems and relation to proper operation of the facility	3.5/3.9	23
W/E13 Steam Generator Over-pressure / 4					1		Determine or interpret facility conditions and selection of appropriate procedures	2.9/3.4	24
W/E03 Post LOCA Cooldown Depress. / 4		1					Interrelations between control and safety systems, instruments, signals, interlocks, failure modes, auto/manual features	3.6/4.0	25
W/E09 Natural Circ. / 4				3			Operate / monitor for desired operating results during natural circulation operations	3.5/3.8	26
W/E08 RCS Overcooling – PTS / 4						2.4.4	Ability to recognize abnormal indications for system operating parameters that are entry level conditions for EOPs and AOPs	4.5/4.7	27
K/A Category Point Totals:	1	2	2	2	1	1	Group Point Total:		9

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 1 (RO)										Form ES-401-2		
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	10											Physical connections / cause-effect relationship between RCPs and RCS	3.0/3.2	28
003 Reactor Coolant Pump										1		Manually operate / monitor seal injection in the control room	3.3/3.2	29
004 Chemical and Volume Control										1		Manually operate / monitor boron and control rod reactivity effects in the control room	3.8/3.9	30
005 Residual Heat Removal			1									Effect of a loss of malfunction of RHR on the RCS	3.9/4.0	31
006 Emergency Core Cooling						10						Effect of loss or malfunction of valves will have on ECCS	2.6/2.8	32
007 Pressurizer Relief/Quench Tank					2							Operational implications of the method of forming a steam bubble in the Pzr	3.1/3.4	33
008 Component Cooling Water		2										Knowledge of bus power supplies to the CCW pump, including backup	3.0/3.2	34
008 Component Cooling Water				9								Design features / interlocks for the standby CCW pumps	2.7/2.9	35
010 Pressurizer Pressure Control					2							Operational implications of constant enthalpy expansion through a valve	2.6/3.0	36
012 Reactor Protection		1										Knowledge of bus power supplies to RPS channels, components, and interconnections	3.3/3.7	37
012 Reactor Protection						4						Effect of loss or malfunction of bypass-block circuits on RPS	3.3/3.6	38
013 Engineered Safety Features Actuation								2				Predict impact / mitigate excess steam demand	4.3/4.5	39
022 Containment Cooling											2.4.11	Knowledge of abnormal condition procedures	4.0/4.2	40
026 Containment Spray			2									Effect of a loss of malfunction of CSS will have on recirc spray system	4.2/4.3	41
039 Main and Reheat Steam									2			Monitor automatic operation of isolation of the MRSS	3.1/3.5	42

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 1 (RO) Continued										Form ES-401-2		
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	#
059 Main Feedwater				5								Design features / interlocks which control speed of MFW pump turbine	2.5/2.8	43
059 Main Feedwater							7					Predict / monitor parameters associated with operating controls for feed pump speed	2.5/2.6	44
061 Auxiliary/ Emergency Feedwater					2							Operational implications of decay heat sources and magnitude	3.2/3.6	45
062 AC Electrical Distribution										1		Manually operate / monitor all breakers (including switchyard) in the control room	3.3/3.1	46
062 AC Electrical Distribution								3				Predict impact / mitigate improper sequencing when transferring to or from an inverter	2.9/3.4	47
063 DC Electrical Distribution									1			Monitor automatic operation of meters, annunciators, and indicating lights	2.7/3.1	48
064 Emergency Diesel Generator									4			Monitor automatic operation of: number of starts available with an air compressor	3.1/3.5	49
073 Process Radiation Monitoring			1									Effect of a loss of malfunction of PRMS on radioactive effluent releases	3.6/4.2	50
076 Service Water		1										Knowledge of bus power supplies to service water	2.7/2.7	51
076 Service Water										2		Manually operate / monitor SWS valves in the control room	2.6/2.6	52
078 Instrument Air											2.4.8	Knowledge of how AOPs are used in conjunction with EOPs	3.8/4.5	53
078 Instrument Air	4											Physical connections / cause-effect relationship between IAS and cooling water to the compressor	2.6/2.9	54
103 Containment										3		Manually operate / monitor ESF slave relays in the control room	2.7/2.7	55
K/A Category Point Totals:	2	3	3	2	3	2	1	2	3	5	2	Group Point Total:		28

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 2 (RO)										Form ES-401-2		
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	#
016 Non-nuclear Instrumentation											2.4.21	Parameters and logic used to assess the status of safety functions, such as core cooling, heat removal, integrity	4.0/4.6	56
017 In-Core Temperature Monitor						1						Effect of loss or malfunction of ITM sensors and detectors	2.7/3.0	57
027 Containment Iodine Removal								1				Predict impact / mitigate high temperature in the filter system	3.0/3.3	58
029 Containment Purge				2								Design features / interlocks which provides for negative pressure in containment	2.9/3.1	59
035 Steam Generator	13											Physical connections / cause-effect relationship between SGS and condensate system	2.7/2.8	60
071 Waste Gas Disposal								2				Predict impact / mitigate use of waste gas release monitors, radiation, gas flow rate, and totalizer	3.3/3.6	61
072 Area Radiation Monitoring							1					Predict / monitor parameters associated with operating ARM controls including radiation levels	3.4/3.6	62
075 Circulating Water				1								Design features / interlocks which provide for heat sink	2.5/2.8	63
079 Station Air											2.1.20	Ability to interpret and execute procedure steps	4.6/4.6	64
086 Fire Protection											2.4.30	Events related to system operation that must be reported to internal organizations, or external agencies	2.7/4.1	65
K/A Category Point Totals:	1	0	0	2	0	1	1	2	0	0	3	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	#
000011 Large Break LOCA / 3						2.4.4	Recognize abnormal indications that are entry level conditions that are entry level for EOPs and AOPs	4.7	76
000015/17 RCP Malfunctions / 4						2.4.20	Knowledge of operational implications of EOP warnings, cautions, and notes	4.3	77
000029 ATWS / 1					1		Determine or interpret reactor nuclear instrumentation	4.7	78
000056 Loss of Off-site Power / 6						2.4.1	Knowledge of EOP entry conditions and immediate action steps	4.8	79
000057 Loss of Vital AC Elec. Inst. Bus / 6						2.4.20	Knowledge of operational implications of EOP warnings, cautions, and notes	4.3	80
W/E05 Loss of Secondary Heat Sink / 4						2.4.45	Ability to prioritize and interpret the significance of each annunciator or alarm	4.3	81
K/A Category Totals:					1	5	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	#
000061 ARM System Alarms / 7						2.1.25	Ability to interpret reference materials such as graphs, curves, tables, etc.	4.2	82
000076 High Reactor Coolant Activity / 9						2.1.7	Ability to evaluate plant performance and make operational judgments	4.7	83
Site Priority: AOP 3571 Instrument Failure Response					1		Selection of or adherence to appropriate procedures	NA	84
Site Priority: AOP3578 Inadvertent CIA						2.4.9	Knowledge of low power/shutdown implications in accident mitigation	4.2	85
K/A Category Point Totals:					1	3	Group Point Total:		4

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 1 (SRO)										Form ES-401-2		
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	#
004 Chemical and Volume Control											2.4.18	Knowledge of specific bases for EOPs	4.0	86
005 Residual Heat Removal								4				Predict impact and mitigate RHR valve malfunction	2.9	87
006 Emergency Core Cooling											2.1.7	Ability to evaluate plant performance and make operational judgments	4.7	88
007 Pressurizer Relief/Quench Tank								2				Predict impact and mitigate abnormal pressure in the PRT	3.2	89
073 Process Radiation Monitoring								1				Predict impact and mitigate erratic or failed power supply	2.9	90
K/A Category Point Totals:								3			2	Group Point Total:		5

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 2 (SRO)										Form ES-401-2		
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								17				Predict impact and mitigate rod misalignment alarm	3.8	91
016 Non-nuclear Instrumentation											2.4.45	Prioritize and interpret the significance of each annunciator or alarm	4.3	92
035 Steam Generator											2.2.25	Knowledge of the bases in Technical Specifications for LCOs and safety limits	4.2	93
								1			2	Group Point Total:		3

Facility: Millstone Unit 3			Date of Exam: Sept 23, 2015			
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.28	Knowledge of purpose and function of major system components and controls	4.1	66	4.1	
	2.1.30	Ability to locate and operate components, including local controls	4.4	67	4.0	
	2.1.32	Ability to explain and apply system limits and precautions	3.8	68	4.0	
	2.1.42	Knowledge of new and spent fuel movement procedures	2.5	69	3.4	
	2.1.45	Ability to identify and interpret diverse indications to validate the response of another indication			4.3	94
	Subtotal			4		1
2. Equipment Control	2.2.2	Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels	4.6	70	4.1	
	2.2.12	Knowledge of surveillance procedures	3.7	71	4.1	
	2.2.37	Ability to determine operability and/or availability of safety related equipment	3.6	72	4.6	
	2.2.17	Knowledge of the process for managing maintenance activates during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator			3.8	95
	2.2.20	Knowledge of the process for managing troubleshooting activities			3.8	96
	2.2.38	Knowledge of conditions and limits in the facility license			4.5	97
Subtotal			3		3	
3. Radiation	2.3.5	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	73	2.9	
	2.3.13	Knowledge of radiological safety procedures pertaining to licensed operator duties, such as rad monitor alarms, Cmtt entry requirements, fuel handling responsibilities, access to locked high rad areas, etc.			3.8	98
	Subtotal			1		1
4. Emergency Procedures/ Plan	2.4.13	Knowledge of crew roles and responsibilities during EOP usage	4.0	74	4.6	
	2.4.19	Knowledge of EOP layout, symbols, and icons	3.4	75	4.1	
	2.4.1	Knowledge of EOP entry conditions and immediate action steps			4.8	99
	2.4.26	Knowledge of facility protection requirements, including fire brigade and portable firefighting equipment usage			3.6	100
	Subtotal			2		2
Tier 3 Point Total				10		7

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	APE.015/017.K1.1	Oversample of natural circulation, with APE.056.K1.01 and W/E09.A1.03
1/2	APE.003.AK3.03	NA MP3. No automatic turbine runback to balance primary and secondary power
1/2	APE.076.AK2.01	NA MP3. No failed fuel Radiation Monitor. MP3 relies on manual sampling
2/1	003.A4.07	NA MP3. No RCP Seal Bypass path
2/1	004.A4.20	NA MP3. MP3 uses manual valves to align the de-borating demineralizer
2/1	008.K4.07	Oversample of CCW pump power supply, with 008.K2.02
2/1	010.K5.01	Oversample of steam table use, with EPE.009.K1.2
2/1	012.A1.01	NA MP3. Operators do not monitor or adjust RPS trip setpoints
2/1	064.A3.08	NA MP3. No automatic transfer to auto position after manual EDG stop
2/1	073.K5.01	Oversample of Rad Monitors, with APE.061.K1.01, 073.K3.01, 071.A2.02, 072.A1.01, SRO 073.A2.01
2/1	078.GEN.2.1.19	Ability to use PPC to evaluate system status; better tested on operating exam. Information available for instrument air on the PPC is fairly generic. Candidates will be routinely demonstrating PPC use during the operating exam.
2/1	078.GEN.2.2.37	Determine operability of safety related equipment. Instrument air is not safety related
2/1	078.GEN.2.2.39	≤ 1 hour Tech Spec LCOs. NA for instrument air
2/1	078.GEN.2.4.18	Basis of EOPs. EOPs assume no IAS available. No significant EOP bases step related to Instrument Air.
2/2	071.A2.07	NA MP3. No actions required with Gaseous Waste System on loss of Met Tower
2/2	079.GEN.2.2.37	Determine operability of safety related equipment. Station air is not safety related
3/4	GEN.2.4.28	Security procedures are not an RO job function
SRO 1/1	EPE.011.GEN.2.2.39	≤ 1 hour Tech Spec LCOs is RO level knowledge
SRO 1/2	APE.061.GEN. 2.2.39	≤ 1 hour Tech Spec LCOs is RO level knowledge
SRO 1/2	Plant Priority Inadvertent CIA GEN.2.4.21	Over-sample of Critical Safety Function Status Trees
SRO 2/2	001.A2.2	Effect of loss of power to reactor trip breakers is RO level knowledge
SRO 2/2	001.A2.10	Effect of loss of power to Rod Drive MG Sets is RO level knowledge

Facility: <u>Millstone Unit 3</u>		Date of examination: <u>9/14/15</u>
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: <u>2K15</u>

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations RO A.1.1	D, S	Perform AC electrical source inoperability surveillance requirements. K/A 2.1.31 (Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.) K/A Rating: 4.6 / 4.3
Conduct of Operations RO A.1.2	M, R	Determine the required boration time and final control rod height for a rapid downpower. K/A 2.1.20 (Ability to interpret and execute procedure steps.) K/A Rating: 4.6 / 4.6
Equipment Control RO A.2	P, D, R	Recommend a clearance boundary for 3CCI*P1A. K/A 2.2.13 (Knowledge of tagging and clearance procedures.) K/A Rating: 4.1 / 4.3
Radiation Control RO A.3	D, R	Make preparations required to remove a radiation monitor from service. K/A 2.3.5 (Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.) K/A Rating: 2.9 / 2.9
Emergency Plan		

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

* Type Codes & 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 3</u>		Date of examination: <u>9/14/15</u>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>		Operating Test Number: <u>2K15</u>
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations SRO A1.1	D, R	Loss of containment closure. K/A 2.1.36 (Knowledge of procedures and limitations involved in core alterations.) K/A Rating: 3.0 / 4.1
Conduct of Operations SRO A1.2	P, M, R	Review and approve reactivity calculation. K/A 2.1.37 (Knowledge of procedures, guidelines, or limitations associated with reactivity management.) K/A Rating: 4.3 / 4.6
Equipment Control SRO A.2	D, R	Notifications and reportability associated with a safety limit violation. K/A 2.2.22 (Knowledge of limiting conditions for operations and safety limits.) K/A Rating: 4.0 / 4.7
Radiation Control SRO A.3	M, R	Review and approve a radioactive liquid waste discharge permit. K/A 2.3.6 (Ability to approve release permits.) K/A Rating: 2.0 / 3.8
Emergency Plan SRO A.4	D, R	Emergency plan classification and protective action recommendation for a general emergency. K/A 2.4.41 (Knowledge of the emergency action level thresholds and classifications.) K/A Rating: 2.9 / 4.6 K/A 2.4.44 (Knowledge of emergency plan protective action recommendations.) K/A Rating: 2.4 / 4.4
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 3</u>		Date of Examination: <u>9/14/15</u>
Exam Level: RO <input checked="" type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test No.: <u>2K15</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. Perform A Boration At Power K/A Number: 004-A4.03; K/A Rating: 2.7 / 3.2	D, S	1 – 004
b. Vent Unisolated Accumulators K/A Number: 006-A1.13; K/A Rating: 3.5 / 3.7 K/A Number: 006-A4.07; K/A Rating: 4.4 / 4.4	M, EN, A, E, S	2-006
c. Arm COPPS K/A Number: 010-K4.03; K/A Rating: 3.8 / 4.1	M, S	3 – 010
d. Aligning RHR For SDR Inventory Control K/A Number: 005-A4.01; K/A Rating: 3.6 / 3.4	P, D, L, S	4.1 – 005
e. Natural Circulation Cooldown Using GA-26 K/A Number: 039-A1.05; K/A Rating: 3.2* / 3.3	P, D, EN, A, E, S	4.2 – 039
f. Respond To An Inadvertent Containment Isolation Phase 'A' K/A Number: 103-A2.03; K/A Rating: 3.5/ 3.8	P, M, EN, A, E, S	5 – 103
g. Transferring Bus 34D To Offsite Power K/A Number: 062-A2.12; K/A Rating: 3.2 / 3.6	M, L, S	6 – 062
h. Stop Auxiliary Building Filtration (Lower Levels) K/A Number: APE 060-AA1.02; K/A Rating: 2.9 / 3.1	N, S	9 – 071
In-Plant Systems* (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. Local Actions On A Loss Of Instrument Air K/A Number: APE 065-AA1.04; K/A Rating: 3.5 / 3.4	M, A, E	8 – 078
j. Align ESF And Auxiliary Building Sump Pumps, Post LOCA K/A Number: 062-A4.04; K/A Rating: 2.6 / 2.7	D, A, E, R	6 – 062
k. Cross-Connect Service Water To East Switchgear Ventilation K/A Number: 076-K1.19; K/A Rating: 3.6 / 3.7	D, E, L	4.2 – 076
* 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 : <u>Millstone Unit 3</u>		Date of Examination: <u>9/14/15</u>
Exam Level: RO <input type="checkbox"/> SRO-I <input checked="" type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test No.: <u>2K15</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. Perform A Boration At Power K/A Number: 004-A4.03; K/A Rating: 2.7 / 3.2	D, S	1 – 004
b. Vent Unisolated Accumulators K/A Number: 006-A1.13; K/A Rating: 3.5 / 3.7 K/A Number: 006-A4.07; K/A Rating: 4.4 / 4.4	M, EN, A, E, S	2-006
c. Arm COPPS K/A Number: 010-K4.03; K/A Rating: 3.8 / 4.1	M, S	3 – 010
d. Aligning RHR For SDR Inventory Control K/A Number: 005-A4.01; K/A Rating: 3.6 / 3.4	P, D, L, S	4.1 – 005
e. Natural Circulation Cooldown Using GA-26 K/A Number: 039-A1.05; K/A Rating: 3.2* / 3.3	P, D, EN, A, E, S	4.2 – 039
f. Respond To An Inadvertent Containment Isolation Phase 'A' K/A Number: 103-A2.03; K/A Rating: 3.5/ 3.8	P, M, EN, A, E, S	5 – 103
g.		
h. Stop Auxiliary Building Filtration (Lower Levels) K/A Number: APE 060-AA1.02; K/A Rating: 2.9 / 3.1	N, S	9 – 071
In-Plant Systems* (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. Local Actions On A Loss Of Instrument Air K/A Number: APE 065-AA1.04; K/A Rating: 3.5 / 3.4	M, A, E	8 – 078
j. Align ESF And Auxiliary Building Sump Pumps, Post LOCA K/A Number: 062-A4.04; K/A Rating: 2.6 / 2.7	D, A, E, R	6 – 062
k. Cross-connect Service Water To East Switchgear Ventilation K/A Number: 076-K1.19; K/A Rating: 3.6 / 3.7	D, E, L	4.2 – 076
* 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 (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 3 Scenario No.: 2K15 NRC-01 Op-Test No.: 2K15

Examiners: _____ Operators: _____

Initial Conditions: IC-357, 74% Power, Beginning of Life

Turnover:

The last shift performed a downpower to 74% power due to intake conditions.

AOP 3569, Severe Weather, has been entered for a hurricane watch. Additionally, last shift performed OP 3301G to induce pressurizer sprays. The 'B' Stator Cooling Pump is out of service for bearing replacement. Orders are to maintain power stable as management evaluates hurricane tracking.

Event No.	Malf. No	Event Type*	Event Description
1	RX10A	I (RO) T/S (US)	Primary Pressurizer Level control channel (RCS*LT459) fails high causing level to decrease (AOP 3571). (<i>Tech Spec entry</i>)
2	—	R (RO) N (BOP) R (US)	Due to hurricane tracking, Management directs downpower to 60% @ 1% per minute (AOP 3575).
3	RX19	I (BOP)	3FWS-PT508 fails high requiring manual control of the Master Speed Controller (AOP 3571).
4	ED04C	C (RO) T/S (US)	Loss of emergency bus 34C. Isolate letdown (AOP 3581). Recover from loss of 34C (AOP 3577). (<i>Tech Spec entry</i>)
5	EG01 MS02C MS07A MS07B MS12C MS12D	M (RO) M (BOP) M (US)	A main generator trip occurs, causing a steam line break outside of containment, upstream of 'C' MSIV. On the plant trip, the 'C' & 'D' MSIV's fail open and the 'A' & 'B' low set SG safety valves fail open. All four SG's are faulted (ECA-2.1). Later in event, one S/G safety reseats (will transition to E-2).
6	FW20C FW18B	C (BOP)	No Aux Feed Pumps auto start. The Turbine Driven Aux Feed Pump can be started from MB5.
7	SIR14	C (RO)	Charging injection valve (3SIH*MV8801B) fails to open below P-19 requiring actions to open.

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

SECTION 3

EXAM OVERVIEW

Title: Four Faulted SG's New Scenario

ID Number: 2K15 NRC-01

Revision: 0/1

1. The crew takes the shift with the plant at 74% power due to intake conditions. Last shift performed a downpower and entered AOP 3569, *Severe Weather*, for a hurricane watch. Last shift also performed OP 3301G section 4.5 "Induce Pressurizer Spray to Equalize Boron Concentration". Additionally, the 'B' Stator Cooling Pump is out of service for a bearing replacement. The crew has direction to maintain power stable as Management evaluates hurricane tracking.

Event 1: The primary pressurizer level control channel (RCS*LT459) will fail high, causing the charging flow control valve to reduce flow, pressurizer level will lower. The RO will place the charging flow control valve in manual and correct charging flow. The US will enter AOP 3571, *Instrument Failure Response*. The crew will swap control channels and direct I&C to trip bistables. The US will refer to and enter Technical Specification 3.3.1 Action 6 (FU# 11). The US will review Technical Specifications 3.3.3.5 and 3.3.3.6 and Technical Requirement 7.4.1

Event 2: Based on hurricane tracking, Station management will direct a downpower to 60% at 1% per minute. The crew will enter AOP 3575, *Rapid Downpower*, and perform the downpower.

Event 3: 3FWS-PT508 "Feed Header Pressure Transmitter" will fail high requiring the BOP to take manual control of the feedwater master speed controller. Once the plant is stable the crew will enter and complete actions in AOP 3571, *Instrument Failure Response*.

Event 4: The 'A' train emergency bus, 34C, will become faulted (& unrecoverable). The RO will perform immediate actions of AOP 3581, *Immediate Actions*, to simultaneously close the letdown orifice isolation valves and the charging flow control valve. The US will enter AOP 3581, confirm immediate actions are complete, and transition to AOP 3577, *Loss of Normal and Offsite Power to a 4kv Emergency Bus*, and perform multiple, time critical actions to keep the plant on-line. The following Technical Specifications are in effect; 3.8.1.1 Action a, 3.8.2.1, 3.8.3.1. The following Technical Requirements are in effect: 7.4.1, 7.6.1.

Event 5: After the crew has stabilized the plant, a Main Generator trip will occur causing an automatic Reactor trip. A steam line break will occur outside of containment, upstream of 'C' MSIV. The 'C' & 'D' MSIV's fail open while 'A' & 'B' low set safety valves fail open. All four SG's will be faulted.

While in E-0, *Reactor Trip or Safety Injection*, the crew will have to identify and mitigate two separate failures while dealing with complications of only having the 'B' train emergency bus available:

Event 6: No Aux Feed pumps will auto start. The 'A' MDAFW pump is not available due to the prior loss of bus 34C and the 'B' MDAFW pump will trip on over current once manually started. Steam supply valves must be opened to start the Turbine Driven AFW pump. **[Critical Task B.4]** – Establish at least 530 gpm AFW flow to the SGs before transition out of E-0.

Event 7: 3SIH*MV8801B, Charging to Cold Leg Injection Valve, fails to open after the SI signal coincident with P-19 (1900 psia). The parallel valve, 3SIH*MV8801A, will be closed based on the earlier 34C bus failure. The crew will need to identify this and open 3SIH*MV8801B to provide Charging flow to the core. **[Critical Task B.6]** – Manually open valves to establish injection flow from at least one Charging/SI pump before transition out of E-0.

The crew will transition to ECA-2.1, Uncontrolled Depressurization of all Steam Generators. Once the crew establishes aux feed water flow, they will need to limit flow to 100 gpm per faulted SG. **[Critical Task B.33]** – Control AFW flow rate to not less than 100 gpm per SG in order to minimize the RCS cooldown rate before a severe (orange-path) challenge develops to the integrity CSF. The crew will have to work through complications of not having the 'A' train emergency bus and ultimately terminate safety injection. During SI termination, the 'A' SG safety valve reseats. The crew must notice this and wait on transition (per prior CAUTION) to E-2 until after SI is terminated. The scenario may end after the crew makes the proper transition to E-2.

2. The SRO candidate (US) should classify this event as an **ALERT Charlie One** based on Unisolable Steam Line Break outside CTMT (BA2).
3. Duration of Exam: 90 minutes

Facility: Millstone 3 Scenario No.: 2K15 NRC-02 Op-Test No.: 2K15

Examiners: _____ Operators: _____

Initial Conditions: IC-18, 100% Power, Middle of life

Turnover:

The plant is at 100% power and at middle of life. The "B" HVK Chiller unit is out of service for planned maintenance.

Event No.	Malf. No	Event Type*	Event Description
1	RC07A	C (RO) T/S (US)	'A' PZR PORV (3RCS*PCV455A) leak. Results in closing the PORV block valve. (Annunciator response) (<i>Tech Spec entry</i>)
2	—	R (US) R (RO) N (BOP)	ISO-NE directed 300 MWe Emergency Load Reduction. (AOP 3575, <i>Rapid Downpower</i> at 5%/min)
3	CC04B	C (RO) T/S (US)	Respond to a RPCCW leak (AOP 3561, <i>Loss of RPCCW</i>). Results in taking the 'B' train of RPCCW out of service. (<i>Tech Spec entry</i>)
4	SI06A	M (ALL)	RCS to Inter-System LOCA (outside CTMT). AOP 3555, <i>Reactor Coolant Leak</i> requires a manual Reactor Trip and Safety Injection.
5	CHLO0411 CHLO0410 CHLO0695 CHLO0694 CHLO0399 CHLO0410 ANLO1103	C (RO)	SLCRS 'A' HVR EXH FAN/SPLY DMPR (3HVR*FN12A) fails to auto start.
6	—	—	Transition to ECA-1.2, <i>LOCA Outside CTMT</i> .
7	—	—	LOCA determined to be unisolable. Transition to ECA-1.1, <i>Loss of Emergency Coolant Recirculation</i> .
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

SECTION 3

EXAM OVERVIEW

Title: LOCA Outside Containment

Bank scenario, sequence modified.

ID Number: 2K15 NRC-02

Revision: 0/1

1. The Scenario will begin with the plant at 100% power and at middle of life. The "B" HVR SLCRS unit is out of service for planned maintenance. This scenario is intended to be used 4 times in the same day, with the BOP position filled by an SRO-I or a surrogate. As such, Instrument/Component malfunctions have been omitted from the BOP side in an effort to reduce run time.

Event 1: A PZR power operated relief valve (PORV), 3RCS*PCV455A, will begin to leak. The crew will carry out the actions of the Annunciator Response Procedure (or AOP 3555, *Reactor Coolant Leak*) and block the affected PORV. The US will refer to and enter Technical Specification 3.4.4 Action a.

Event 2: ISO – NE will direct the crew to begin an Emergency Load Reduction decreasing unit electrical output by 300 MWe. The crew will use AOP 3575, *Rapid Downpower* to accomplish this down power at 5%/min.

Event 3: Once the downpower is complete and the plant stable, an unisolable leak in the "B" RPCCW train will result in the crew entering AOP 3561, *Loss of Reactor Plant Cooling*. The leak will be small enough such that surge tank make-up fill will be able to keep up with the leak rate. The crew will carry out the leak isolation steps in AOP 3561, and ultimately determine that the leak is unisolable. This will require taking the affected train (B) of RPCCW out of service. The US will refer to and enter Technical Specification 3.7.3 and Technical Requirement 7.4.1 Action A.

Event 4: After the affected train of RPCCW is taken out of service, an Inter-System LOCA will occur. The location of the rupture will be downstream of 3SIH*MV8835 and be unisolable (rupture is in the ESF building, 'A' RHR pump cubicle). The crew should carry out the actions specified in AOP 3555, *Reactor Coolant Leak*, and determine the leak rate is beyond the capacity of two charging pumps. The crew will be required to initiate a manual Reactor Trip and Safety Injection. The crew will enter E-0, *Reactor Trip Or Safety Injection*.

Event 5: SLCRS "A" HVR EXH FAN/SPLY DMPR (3HVR*FN12A) fails to auto start and must be manually started. **[Critical Task]** – Manually start at least one train of SLCRS ventilation system (3HVR*FN12A) to minimize radiation release to the public.

Event 6: The crew should proceed through E-0 to step 27 and then transition to ECA-1.2, *LOCA Outside CTMT*, in an attempt to locate and isolate the leak. The crew will not be successful in isolating the leak by closing 3SIH*MV8835.

Event 7: Once indications of the inability to isolate the leak are obtained, the crew should transition to ECA-1.1, *Loss of Emergency Coolant Recirculation*, to minimize the amount of safety injection flow to that required for the decay heat load [**Critical Task B.29**] – Reduce quench spray and ECCS flow to only 1 train running and establish minimum ECCS flow rate per attachment one prior to reaching 100,000 gallons in RWST. The session will end upon completing the minimization of ECCS injection flow.

2. The SRO candidate (US) should classify this event as a **Site Area emergency**, based on a loss of both the RCS and CTMT barriers.
3. Duration of Exam: 75 minutes

Facility: Millstone 3 Scenario No.: 2K15 NRC-04 Op-Test No.: 2K15

Examiners: _____

Operators: _____

Initial Conditions: 74% Power, Beginning of life, Equilibrium Xe.

Turnover:

The plant is at 74% power. The Turbine Driven Auxiliary Feedwater Pump has been out of service for 12 hours for governor maintenance and is expected back in 11 hours.

Event No.	Malfunction No	Event Type*	Event Description
1	RX05_4A	I (RO) T/S (US)	Narrow Range Loop 4 Thot instrument (RCS-TE441A) fails high. (AOP 3581 / 3571) (<i>Tech Spec entry</i>)
2	FW01	R (US) R (RO) N (BOP)	Condenser vacuum leak requiring load reduction. (AOP 3575 at 5%/min)
3	RX15	I (BOP)	Main Steam header pressure (MSS-PT507) fails low. (AOP 3571)
4	RX09A	I (RO) T/S (US)	Primary channel of Pressurizer Pressure (RCS*PT455) fails high. (AOP 3581 / 3571) (<i>Tech Spec entry</i>)
5	RX09A RXR05 RXR34	M (ALL)	Pressurizer Pressure (RCS*PT455) fails low, causing 2/4 Reactor Trip on OTDT.
6	TC03 TC04 TC06A/B/C/D TC07A/B/C/D RP08AB RPDI0071 RPDI0140	C (BOP)	Automatic Turbine Trip failed, turbine will not run back. Auto MSI failed, both Manual MSI pushbuttons failed, MSIVs and steam traps must be closed manually. Results in automatic Safety Injection.
7	RP07B	C (RO)	Train 'B' of auto SI failed.
8	SW01C/D SW02A/B ED11E ED12E	C (RO)	Running Service Water pumps trip on the reactor trip. Stand-by Service Water Pumps fail to auto start.
9	FW20A FW18A FW21B FW19	—	The 'A' MDAFW pump fails to start in auto or manual. The 'B' MDAFW pump discharge valve is shut with a stem/disc separation. The TDAFW pump is out of service for governor maintenance.
10	FW07A FW37	—	Crew enters FR-H.1. MDFW pump will not start; SG feedwater flow will be established from the condensate pumps.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

SECTION 3

EXAM OVERVIEW

Title: Loss of Heat Sink Modified bank scenario.

ID Number: 2K15 NRC-04

Revision: 0/1

1. The Session will begin with the plant at 74% power. The Turbine Driven Auxiliary Feedwater Pump has been out of service for 12 hours for governor maintenance and is expected back in 11 hours.

Event 1: Loop 4 Thot instrument (RCS-TE441A) will fail high causing rods to step in and Pressurizer Level setpoint to increase by 13%. The RO will perform immediate actions of AOP 3581, *Immediate Actions*, to confirm a turbine runback is not in progress and place rods in manual. The US will enter AOP 3581, confirm immediate actions are complete and transition to AOP 3571, *Instrument Failure Response*. The US will direct the RO to take manual control of Charging Flow to stabilize pressurizer level. Next the crew will defeat the failed temperature channel, restore pressurizer level to setpoint, restore $T_{AVE} - T_{REF}$ error to within 1°F, and request I&C to trip bistables. The US will refer to Technical Specification 3.3.1 and log into Action 6 (FU# 7&8). The US will refer to Technical Specification 3.3.2 and log into Action 20 (FU# 5.d) and Action 21 (FU# 9.b).

Event 2: Once actions of AOP 3571 are complete, a leak will occur at condenser vacuum breaker 3ARC-MOV20C. The crew enters AOP 3559, *Loss Of Condenser Vacuum*, which will direct a rapid load reduction of 5%/min in accordance with AOP 3575, *Rapid Downpower*. Load will be lowered at least 15% before condenser backpressure will stabilize and the crew can stop the load reduction.

Event 3: Main steam header pressure transmitter, 3MSS-PT507, fails high. Turbine driven feedwater pumps will increase speed, steam generator water levels will rise, and steam dump valves will be inoperable in Auto while in the Steam Pressure Mode. The BOP will perform immediate actions of AOP 3581 to take feedwater pump speed control to manual and make corrections before significant transients occur. The US will enter AOP 3571, *Instrument Failure Response* and direct the BOP to restore feed pump differential pressure to the normal operating band of 40-175 psid. (Setpoint \approx 110 psid @ 50% power.)

Event 4: The controlling channel of pressurizer pressure RCS*PT455 will fail high. Pressurizer spray valves will open and RCS pressure will lower. The RO will perform immediate actions of AOP 3581, *Immediate Actions*, to place the master pressure controller in manual and return the output to \geq 50% to stabilize pressure. The US will enter AOP 3581, confirm immediate actions are complete and transition to AOP 3571, *Instrument Failure Response*. The crew will defeat the failed pressure channel and restore pressurizer pressure to setpoint. The crew will be unable to trip bistables, since doing so would cause an automatic reactor trip on 2/4 channels of OTΔT. The US should recognize that Technical Specification 3.0.3 applies. The US should contact plant management for maintenance assistance and guidance. Other Technical Specifications applicable are 3.3.1 Action 6 (FU# 7, 9 & 10) and 3.3.2 Action 20 (FU# 1.d) and Action 21 (FU# 9.a).

Event 5: The faulted Pressurizer Pressure loop transitions from failed high to failed low, causing a 2/4 Reactor Trip on OTDT.

Event 6: The turbine will not trip. The BOP will attempt to run back the turbine but fail. Neither MSI pushbutton will function. The BOP must manually close the Main Steam Isolation Valves. Auto MSI is failed, manual isolation of steam line drains is required after safety injection actuation.

Event 7: A Safety Injection is expected to occur from low steamline pressure. Train 'B' of Safety Injection is failed requiring manual Safety Injection.

Event 8: Running Service Water Pumps trip on the reactor trip. Stand-by Service Water Pumps fail to auto start and must be started manually. **[Critical Task B.9]** – Manually start one service water pump per train before exiting E-0.

Event 9: The 'A' MDAFW pump fails to start, and the 'B' MDAFW pump discharge valve is shut with a stem/disc separation. As previously stated, the TDAFW pump is out of service for governor maintenance.

Event 10: The crew will proceed through E-0 to step 17 and then transition to FR-H.1. The MDAFW pump will not start. The crew will reset Safety Injection and Feedwater Isolation circuits, open the feedwater isolation trip valves and feed at least one steam generator from the condensate pumps. **[Critical Task B.43]** – Establish condensate flow into at least one SG before RCS bleed and feed is required.

The session will end with condensate flow established.

2. The SRO candidate (US) should classify this event as **ALERT Charlie One** based on RCS Barrier failure, BA1: Heat Sink Red and required feedwater flow cannot be established within 15 minutes, RCB1.
3. Duration of Exam: 90 minutes