

Facility: Millstone Unit 2		Date of Exam: 01/29/10															
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													18	2	4	6
	2				N/A					N/A			9	2	2	4	
	Tier Totals												27	4	6	10	
2. Systems Plant	1													28	1	4	5
	2													10	N/A	1	2
	Tier Totals													38	2	6	8
3. Generic Knowledge and Abilities Categories		1		2		3		4		10							
		1		2		3		4		10							
		2		2		2		1		7							

Note:

1. Ensure that at least 2 topics from every K/A category are sampled within each tier of the RO and SRO 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 2).
2. The point total for each group and tier in the proposed outline must match those 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 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, 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 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 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-40103. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions – Tier 1/Group 1 (RO/SRO)						Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1									
000008 Pressurizer Vapor Space Accident / 3									
000009 Small Break LOCA / 3							2.1.31 – Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup. Does not adequately test SRO knowledge or ability. 2.1.20 - Ability to interpret and execute procedure steps.	4.6/4.3 4.6/4.6	1
000011 Large Break LOCA / 3							EA2.06 – Ability to determine or interpret the following as they apply to a Large Break LOCA: That fan is in slow speed and dampers are in accident mode during LOCA Does not adequately test SRO knowledge or ability. EA2.10 - Ability to determine or interpret the following as they apply to a Large Break LOCA: Verification of adequate core cooling	3.7*/4.0* 4.5/4/7	2
000015/17 RCP Malfunctions / 4							2.1.7 - Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.4/4/7	3
000022 Loss of Rx Coolant Makeup / 2									
000025 Loss of RHR System / 4									
000026 Loss of Component Cooling Water / 8									
000027 Pressurizer Pressure Control System Malfunction / 3									
000029 ATWS / 1									
000038 Steam Gen. Tube Rupture / 3							2.1.30 - Ability to locate and operate components, including local controls.	4.4/4.0	4
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4									
000054 (CE/E06) Loss of Main Feedwater / 4									
000055 Station Blackout / 6									
000056 Loss of Off-site Power / 6									
000057 Loss of Vital AC Inst. Bus / 6							2.4.35 - Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.	3.8/4.0	5
000058 Loss of DC Power / 6									
000062 Loss of Nuclear Svc Water / 4									

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions – Tier 1/Group 1 (RO / SRO)						Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000065 Loss of Instrument Air / 8							AA2.06 - Ability to determine and interpret the following as they apply to the Loss of Instrument Air: When to trip reactor if instrument air pressure is de-creasing	3.6*/4.2	6
000077 Generator Voltage and Electric Grid Disturbances / 6									
K/A Category Totals:							Group Point Total:		6

ES-401		PWR Examination Outline					FORM ES-401-2		
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO / SRO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1		K/A Topic(s)	IR	#	
000001 Continuous Rod Withdrawal / 1									
000003 Dropped Control Rod / 1						AA2.04 - Ability to determine and interpret the following as they apply to the Dropped Control Rod: Rod motion stops due to dropped rod	3.4*/3.6*	7	
000005 Inoperable/Stuck Control Rod / 1									
000024 Emergency Boration / 1									
000028 Pressurizer Level Malfunction / 2									
000032 Loss of Source Range NI / 7									
000033 Loss of Intermediate Range NI / 7									
000036 (BW/A08) Fuel Handling Accident / 8									
000037 Steam Generator Tube Leak / 3									
000051 Loss of Condenser Vacuum / 4									
000059 Accidental Liquid RadWaste Rel. / 9									
000060 Accidental Gaseous Radwaste Rel. / 9						2.4.18 - Knowledge of the specific bases for EOPs.	3.3/4.0	8	
000061 ARM System Alarms / 7									
000067 Plant Fire On-site / 8									
000068 (BW/A06) Control Room Evac. / 8									
000069 (W/E14) Loss of CTMT Integrity / 5									
000074 (W/E06&E07) Inad. Core Cooling / 4						2.4.30 - Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator.	2.7/4.1	9	
000076 High Reactor Coolant Activity / 9						AA2.07 - Ability to determine and interpret the following as they apply to the High Reactor Coolant Activity: When demineralizer resin needs to be replaced. Does NOT distinguish between a competent and incompetent SRO. AA2.02 - Corrective Actions required for high fission product activity in RCS	2.4/2.7* 2.8/3.4	10	
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4									
CE/A11; W/E08 RCS Overcooling - PTS / 4									
CE/A16 Excess RCS Leakage / 2									
CE/E09 Functional Recovery									
K/A Category Point Totals:						Group Point Total:		4	

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 1 (RC / 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	K/A Topic(s)	IR	#	
003 Reactor Coolant Pump											2.1.23 - Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.3/4.4	11	
004 Chemical and Volume Control											A2.15 - Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: High or low PZR level	3.5/3.7	12	
005 Residual Heat Removal														
006 Emergency Core Cooling														
007 Pressurizer Relief/Quench Tank														
008 Component Cooling Water														
010 Pressurizer Pressure Control														
012 Reactor Protection											2.4.4 - Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.	4.5/4.7	13	
013 Engineered Safety Features Actuation														
022 Containment Cooling														
026 Containment Spray											2.4.50 - Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. <i>Does not adequately test SRO knowledge or ability for this system.</i> 2.4.9 - Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.	4.2/4.0 3.8/4.2	14	
039 Main and Reheat Steam														
059 Main Feedwater														

ES-401

PWR Examination Outline
Plant Systems - Tier 2/Group 1 (RC / 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	Q	K/A Topic(s)	IR	#
061 Auxiliary/Emergency Feedwater														
062 AC Electrical Distribution														
063 DC Electrical Distribution														
064 Emergency Diesel Generator														
073 Process Radiation Monitoring														
076 Service Water												2.2.12 - Knowledge of surveillance procedures.	3.7/4.1	15
078 Instrument Air														
103 Containment														
K/A Category Point Totals:								1			2	Group Point Total:		5

[illegible]

ES-401

PWR Examination Outline
 Plant Systems - Tier 2/Group 2 (RO / 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	A 5	K/A Topic(s)	IR	#
086 Fire Protection												A2.03 - Ability to (a) predict the impacts of the following mal- functions or operations on the Fire Protection System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Inadvertent actuation of the FPS due to circuit failure or welding	2.7/2.9	18
K/A Category Point Totals:											2	Group Point Total:		3

Facility: Millstone Unit 2			Date of Exam: 01/29/10			
Category	K/A #	Topic	RO		SRO	
			IR	#	IR	#
1. Conduct of Operations	2.1.13	Knowledge of facility requirements for controlling vital/controlled access. <i>Rejected by NRC on previous exam. Only General Employee or Security knowledge item.</i>			3.2	19
	2.1.43	Ability to use procedures to determine the effects on reactivity of plant changes, such as reactor coolant system temperature, secondary plant, fuel depletion, etc.			4.3	19
	2.1.35	Knowledge of the fuel-handling responsibilities of SROs.			3.9	20
	Subtotal					2
2. Equipment Control	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	21
	2.2.38	Knowledge of conditions and limitations in the facility license.			4.5	22
	Subtotal					2
3. Radiation Control	2.3.6	Ability to approve release permits.			3.8	23
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.			3.8	24
	Subtotal					2
4. Emergency Procedures and Plan	2.4.45	Ability to prioritize and interpret the significance of each annunciator or alarm.			4.3	25
	Subtotal					1
Tier 3 Point Total						7

SRO Exam Questions Only (No "Parents" Or "Originals")

Question #: 1

Question ID: 9000018

☐ RO

☒ SRO

☐ Student Handout?

☐ Lower Order?

I-SRO Ques. # 1

Rev. 1

☒ Selected for Exam

Origin: New

☐ Past NRC Exam?

The plant automatically tripped on High Pressurizer Pressure due to an inadvertent closure of the Main Turbine Control Valves.

During the performance of EOP 2525, Standard Post Trip Actions, the crew reported that Bus 24D is deenergized due to a fault and that Power Operated Relief Valve (PORV), RC-404, is stuck open. All other equipment operated as designed. Upon entry into EOP 2532, Loss of Coolant Accident, the following conditions exist:

- Containment pressure is 4.5 psia and slowly rising.
- Reactor vessel is 43% and slowly going down
- CET temperatures are 568°F and stable
- RCS pressure is 1210 psia and stable
- Pressurizer level is 100%.
- RWST level is 96% and slowly going down.
- Steam generator levels are both 41% and going up slowly.

Which of the following actions must the Unit Supervisor/Shift Manager perform to preserve a Safety Function?

-
- ☐ **A** Direct the Technical Support Center to develop a plan to restore RWST level.
- ☐ **B** Direct the Balance of Plant Operator to align 24E to receive power from Unit 3.
- ☐ **C** Direct the Reactor Operator to place the SI/CS Pump Miniflow switches in "OPERATE".
- ☒ **D** Direct the crew to commence a controlled cooldown and depressurization.

Justification

D IS CORRECT; With RCS pressure stable at 1310 psia and the PORV still open, RCS inventory is being lost faster than Charging can restore it. The steps for the cooldown and subsequent depressurization must be pulled forward (performed out of sequence) to allow RCS pressure to be reduced below HPSI shut off head to allow adequate Safety Injection flow.

A is incorrect; Although RWST level is lowering, there is NO need to develop a plan to restore RWST level at this time (perform step out of sequence).

Plausible because step 8 of EOP 2532 directs the US or SM to have the TSC develop a plan for restoring level in the RWST if the LOCA is determined to be outside of Containment. Examinee may not remember that this step is required ONLY if the LOCA is outside of Containment.

B is incorrect; Although the loss of 24D makes the "C" HPSI pump unavailable, the one available HPSI pump should be enough to mitigate the event, provided an RCS cooldown and depressurization is accomplished.

Plausible the examinee may believe that starting a second HPSI pump is necessary to recover vessel level because the given conditions indicate that SI flow is presently inadequate (vessel level going down).

C is incorrect; The SI/CS Pump Miniflow switches are not placed in "OPERATE" until RWST level is $\leq 20\%$.

Plausible because the examinee may feel that a Sump Recirc Actuation Signal is imminent; therefore, it would be appropriate to perform this step out of sequence.

References

EOP 2532, "LOCA" and OP 2260, "EOP Users Guide"

Comments and Question Modification History

NRC (comments on original question) - Distracter "B" does not relate to a Safety Function; Replace. Distracter "A" would be acceptable if an RWST level were added to the stem.

RLC - In the stem: changed CET temp. from 578°F to 568°F, changed RCS pressure from 1310 psia to 1210 psia, and added "RWST level is 96% and slowly going down.". Also, changed choice "B" from realigning Cond. Air Removal to aligning 24E to Unit 3. [12/30/09] Bruce F. - D-3/C, No comment

NRC K/A System/E/A System 009 Small Break LOCA

Generic K/A Selected

NRC K/A Generic System 2.1 Conduct of Operations

SRO Exam Questions Only (No "Parents" Or "Originals")

Question #: 1

Question ID: 9000018

☐ RO

☒ SRO

☐ Student Handout?

☐ Lower Order?

I-SRO Ques. # 1

Rev. 1

☒ Selected for Exam

Origin: New

☐ Past NRC Exam?

Number 2.1.20

RO 4.6

SRO 4.6

CFR Link (CFR: 41.10 / 43.5 / 45.12)

Ability to interpret and execute procedure steps.

Millstone Unit 2 Loss of Coolant Accident

EOP 2532

Revision 029

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INSTRUCTIONS

CONTINGENCY ACTIONS

NOTE

1. RCS cooldown should be initiated within one hour after the event to conserve condensate inventory and comply with the Long Term Cooling Analysis.
2. RCS cooldown rate greater than 40°F/hr should be maintained until the steam dump/bypass valves or atmospheric dump valves are full open.
3. The starting point for the RCS cooldown should be the T_C or CET temperatures where RCS has stabilized.
4. T_C should be used for monitoring RCS cooldown if in forced or natural circulation. CETs should be used for all other cases.

NOTE

Technical Specification cooldown rates should be observed during the cooldown. The cooldown rates are as follows:

1. RCS T_C greater than 220°F the cooldown rate is 100°F/hr.
2. RCS T_C less than or equal to 220°F the cooldown rate is 50°F/hr.

Perform Controlled Cooldown

*17. INITIATE a controlled cooldown using the steam dumps to establish shutdown cooling entry conditions.

17.1 INITIATE a controlled cooldown using the ADVs to establish shutdown cooling entry conditions.

STOP

THINK

ACT

REVIEW