Examination Outline Cross-reference:	Level	RO	SRO
Question # 1	Tier #	1	1
K/A Statement: Reactor Trip – Stabilization-Recovery:	Group #	1	1
Operate / monitor: Nuclear Instrumentation	K/A #	EPE.007.EA1.05	
Proposed Question:	Importance Rating	4.0	4.1

The plant is initially operating at 100% power when the following sequence of events occurs:

1. The reactor trips.
2. The crew enters ES-0.1, *Reactor Trip Response*.
3. The RO is directed to periodically monitor Intermediate Range power, specifically to ensure the Source Range NIS automatically energize at the appropriate time.
4. The RO reports IRNIs currently indicate 5 x 10^{-9} Amps and decreasing as expected.

How long from this point should the RO expect to observe the SRNIs energizing?

a) 3 minutes

b) 6 minutes

c) 9 minutes

d) 12 minutes

Proposed Answer: B

Explanation (Optional): After the initial prompt drop in reactor power, the Start-Up-Rate stabilizes at -1/3 decade per minute, based on the decay rate of the longest-lived delayed neutron precursors. The SRNIs automatically energize as power drops below P-6, which is set at 5 x10^{-11} Amps. Current power is 2 decades above this, and at -1/3 decades per minute, it takes 3 minutes to lower power by one decade, so SRs will reenergize in 6 minutes ("B" correct, "A", "C", and "D" wrong). "A", "C", and "D" are plausible, since they are bounded by 3 minutes, which is obtained if the reset is assumed to be 5x10^{-10} Amps, and ES-0.1 directs the crew to manually reenergize SRNIs if more than 12 minutes has elapsed since the reactor tripped.

Technical Reference(s): ES-0.1 (Rev 26-2), step 10; WOG Bkgd Doc (Rev 2) FR-S.2 Description (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05228 Describe the operation of the Nuclear Instrumentation System under the following plant operating conditions… Reactor Shutdown… (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.1, 41.6, 41.7, and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO	
Question # 2	Tier #	1	1	
K/A Statement: Pressurizer Vapor Space Accident:	Group #	1	1	
Interrelations between: sensors and detectors	K/A #	APE.008.AK2.02		
Proposed Question:	Importance Rating	2.7	2.7	

Initial Conditions:

- The plant is in MODE 3 at normal operating temperature and pressure.
- The Reactor Trip Breakers are OPEN.
- Charging flow control valve 3CHS*FCV121 is in MANUAL, maintaining 28% PZR level.

The reference (upper) leg tap for Pressurizer level transmitter 3RCS*LT460 breaks off of the pressurizer, and RCS pressure starts decreasing.

Assuming no operator action is taken, what will be the responses of PZR level instruments 3RCS*LI459 and LI460 to this event?

	LT-459 PZR Level Indication	LT-460 PZR Level Indication
a)	Fairly stable	Offscale high
b)	Fairly stable	Offscale low
c)	Decreasing rapidly	Offscale high
d)	Decreasing rapidly	Offscale low

Proposed Answer: A

Explanation (Optional): On a vapor space break, RCS pressure will drop with significantly less inventory loss than with a liquid break in another RCS location. Also, the drop in RCS pressure increases DP across the Charging Flow Control Valve, causing charging flow to increase, which tends to compensate for the loss of RCS inventory out the PORV. This results in a fairly stable Pzr level ("C" and "D" wrong). A reference leg break will decrease pressure sensed by the reference side of LT-460, which appears as a high level ("A" correct, "B" wrong). Pressure will continue to drop with a fairly stable Pzr level until saturation pressure is reached for the RCS hot legs, forming a two-phase mixture that will force flow up the surge line and into the pressurizer. This will cause actual pressurizer level to increase until the PZR is full. "C" and "D" are plausible, since a LOCA is in progress. "B" is plausible, since level indication would decrease on a variable leg break.

Technical Reference(s): P&ID 102C (Rev 24-0)
Functional Drawing Sheet 11 (Rev H)
WOG Executive Volume (Rev 2), SI Termination, Page 7
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05342 Given a failure, partial or complete, of the Pressurizer Pressure and Level Control System, determine the effects on the system and on interrelated systems. (As available)

Question Source: Bank #78798
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.5 and 41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 3	Tier #	1	1
K/A Statement: Small Break LOCA:	Group #	1	1
Operational implications of: the use of steam tables	K/A #	EPE.009.EK1.02	
Proposed Question:	Importance Rating	3.5	4.1

The crew is performing the actions of ES-1.2, *Post LOCA Cooldown And Depressurization*, and current conditions are as follows:

- Normal charging has been established.
- Core Exit Thermocouples indicate 530°F.
- RCS pressure is 1500 psia.
- The crew is at ES-1.2, step 19, "Depressurize RCS to Minimize Subcooling".

Complete the following statement concerning the depressurization.

The crew will depressurize the RCS to a target pressure of ____(1)_____psia, and the basis for this depressurization is to____(2)_____.

	(1)	(2)
a)	1250 psia	Prevent overfilling the Pressurizer.
b)	1250 psia	Reduce RCS break flow.
c)	1050 psia	Prevent overfilling the Pressurizer.
d)	1050 psia	Reduce RCS break flow.

Proposed Answer: B

Explanation (Optional): ES-1.2 directs the crew to reduce subcooling to less than 42°F, which is reached when RCS pressure is less than about 1270 psia ("C" and "D" plausible). A knowledge item listed in the background document is that if subcooling decreases below the point where SI reinitiation is required (32°F), the crew is to stop the depressurization. "C" and "D" are wrong, since subcooling for 1050 psia is about 20°F. The Background document states that subcooling is minimized to reduce break flow ("B" correct, "A" wrong). It also states that charging flow can be used during the depressurization to maintain pressurizer level ("A" plausible).

Technical Reference(s): ES-1.2 (Rev 19-0), Step 19, and Foldout Page; WOG Bkgd Doc (Rev 2) for ES-1.2, step 20; Steam Tables (Attach if not previously provided)

Proposed references to be provided to applicants during examination: **Steam Tables**

Learning Objective: MC-05530 Discuss the basis of major procedure steps and/or sequence of steps in EOP 35 ES-1.2. (As available)

Question Source: New

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.5, 41.10, and 41.14

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 4	Tier #	1	1
K/A Statement: Large Break LOCA:	Group #	1	1
Determine or interpret: equipment necessary	K/A #	EPE.011.EA2.07	
for critical pump water seals	Importance Rating	3.2	3.4

Proposed Question:

With the plant initially at 100% power, the following sequence of events occurs:

1. An RCS LOCA occurs.
2. RCS pressure rapidly equalizes with Containment pressure.

Thirty minutes after the reactor trip, what is providing RHR Pump Seal cooling?

a) RWST water.

b) Primary Grade Water.

c) Reactor Plant Component Cooling Water.

d) The RHR Pump seal water-to-air heat exchanger.

Proposed Answer: A

Explanation (Optional): The RHR Pump seal package is normally cooled by the RPCCW System ("C" plausible), which is required for seal cooling when the RHR Pumps are taking a suction on the RCS in the cooldown mode. On a large break LOCA, the SIS signal automatically starts the RHR Pumps, which are aligned to take a suction from the RWST, which is kept at about 45°F. The Cold RWST water keeps the RHR Pump Seal package cool ("A" correct). On a large break LOCA, a CDA Signal is generated, which trips the RPCCW Pumps, removing RPCCW cooling to the seals ("C" wrong). Thirty minutes after the LOCA, RWST Lo-Lo level has not yet been reached, so the RHR Pump is still drawing water from the RWST, and RPCCW has not been restored per ES-1.3, Transfer to Cold Leg Recirculation. "D" is wrong, but plausible, since the Containment Recirculation (RSS) Pumps, and not the RHR Pumps, include an external seal cooling package which includes a seal water-to-air heat exchanger. "B" is wrong, but plausible, since makeup water for RSS Pump seal water (which is air cooled) is supplied by Primary Grade Water, and Primary Grade Water is supplied to numerous systems inside the Aux and ESF Buildings.

Technical Reference(s):	OP 3310A (Rev 17-8), Precaution 3.11	(Attach if not previously provided)
	OP 3353.MB2C (Rev 00-0), 2-9, Note prior to step 1	
	E-0 (Rev 29-0), step 11.c	
	FSAR (Rev 24-3) Page 6.3-18	
	P&ID 112A (Rev 50-0)	
	P&ID 121A (Rev 32-0)	

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05458 Describe the operation of the residual heat removal system under the following normal, abnormal, or emergency operating conditions. (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.8 and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 5	Tier #	1	1
K/A Statement: RCP Malfunctions:	Group #	1	1
Operational Implications of: thermodynamic	K/A #	APE.015/17.AK1.04	
relationship between RCS loops and SGs	Importance Rating	2.9	3.1

Proposed Question:

Initial Conditions:

- The plant is at 24% power.
- The "A" TDMFP is feeding the SGs through the Feed Reg Bypass Valves.
- The Main Turbine is on line.
- The Condenser Steam Dump Valves are closed.

The following sequence of events occurs:

1. The "C" RCP trips.
2. The crew enters AOP 3554 *RCP Trip or Stopping A RCP At Power*.
3. The plant does not trip on the initial transient.
4. The crew stabilizes the plant, and restores all SG levels to 50%.

What is the current position of the "C" Feed Reg Bypass Valve compared to its position prior to the RCP trip, and why?

a) Further open due to increased steam pressure in the "C" SG.

b) Further open due to RCS water temperature being supplied to the "C" SG increasing above T-hot of the other SGs.

c) Further closed due to RCS water temperature being supplied to the "C" SG decreasing to approximately T-cold.

d) Further closed due to increased steam pressure in the "A", "B", and "D" SGs.

Proposed Answer: C

Explanation (Optional): When the "C" RCP stops, the running pumps will create a DP across the core that will reverse flow through the idle "C" loop. The idle loop's "Tave" will drop to Tcold of the steaming loops ("B" wrong). The affected steam generator steaming rate will decrease due to less energy being added to it, since Q = UA (T_{AVE} -- T_{STM}) ("C" correct, "A" wrong). Less steaming from the idle loop's SG results in increased steam flow from the other 3 SGs (since main turbine control valves remain in the same position, drawing approximately the same total amount of steam), lowering pressures in the "A", "B", and "D" SGs ("D" wrong). "A", "B", and "D" are plausible, since AOP 3554 has the crew manually adjust feed rate to the affected SG, and RCS temperature to the affected SG and pressure in all four SGs are affected.

Technical Reference(s): AOP 3554 (Rev 09-0), step 7; AOP 3554 Basis Doc (Rev 09-0), step 7 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04893 Describe the major parameter changes associated with decreased RCS flow rate. (As available)

Question Source: Bank #78905

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.3, 41.5, 41.10, and 41.14

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 6	Tier #	1	1
K/A Statement: Loss of Rx Coolant Makeup:	Group #	1	1
Ability to perform without reference actions	K/A #	APE.022.GEN.2.4.49	
that require immediate operation	Importance Rating	4.6	4.4

Proposed Question:

An event involving Charging and Letdown occurs, resulting in the following sequence of events:

1. The crew enters AOP 3581, *Immediate Operator Actions*, Attachment F, "Charging and Letdown Events."
2. The RO attempts to simultaneously close the Letdown Orifice Isolation Valves (3CHS*AV8149A, B, and/or C) and the Charging Flow Control Valve (3CHS*FCV121).
3. None of the valves close.

Per AOP 3581, Attachment F, which valves are required to be closed by the RO to isolate Charging and Letdown?

a) The Letdown Isolation Valves (3RCS*LCV459 and LCV460), and the Charging Isolation Valves (3CHS*MV8105 and MV8106).

b) The Letdown Isolation Valves (3RCS*LCV459 and LCV460), and the Charging to RCS Loop Isolation Valves (3CHS*AV8146 and AV8147).

c) The Containment Letdown Isolation Valves (3CHS*CV8152 and CV8160), and the Charging Isolation Valves (3CHS*MV8105 and MV8106).

d) The Containment Letdown Isolation Valves (3CHS*CV8152 and CV8160), and the Charging to RCS Loop Isolation Valves (3CHS*AV8146 and AV8147).

Proposed Answer: C

Explanation (Optional): The crew is required to simultaneously close the Letdown Orifice Isolation Valves 3CHS*AV8149A, B, and/or C, and the Charging Flow Control Valve 3CHS*FCV121. These valves would not close. The RNO closes the Containment Letdown Isolation Valves (3CHS*CV8152 and CV8160) ("A" and "B" wrong), and the Charging Isolation Valves (3CHS*MV8105 and MV8106) ("C" correct, "D" wrong). "A", "B", and "D" are plausible, since these valves will also isolate Charging and Letdown.

Technical Reference(s): AOP 3581 (Rev 1-0), Att. F, step 1 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07759 Given a plant condition requiring the use of AOP 3581, identify the immediate operator actions. (As available)

Question Source: New

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.3 and 41.10

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 7	Tier #	1	1
K/A Statement: Loss of RHR System:	Group #	1	1
Determine or interpret: limitations on LPI flow	K/A #	APE.025.AA2.05	
and temperature rates of change	Importance Rating	3.1	3.5

Proposed Question:

Initial conditions:

- RCS temperature is 100°F.
- RCS pressure is 160 psia.
- The Pressurizer is solid.
- No RCPs are running.
- A "B" Train electrical outage is in progress.
- All SGs have been drained with their secondary sides open for inspections.
- Vessel Head cables are disconnected, so CETCs are NOT available.

The following sequence of events occurs:

1. An "A" RHR Pump Suction Valve from the RCS inadvertently starts stroking closed.
2. The RO promptly stops the "A" RHR Pump.
3. The crew enters EOP 3505, *Loss of Shutdown Cooling and/or RCS Inventor*y.
4. The SM informs the crew that an EAL Classification is required if RCS heats up by 10°F.
5. Per EOP 3505, Attachment A, the crew is preparing to initiate RCS Feed and Bleed cooling.
6. The RO reports RCS pressure is 200 psia and increasing.

Complete the following statement:

The preferred source for feeding the RCS is the "A"___(1)____Pump; and the method the crew is required to use to determine if a 10°F temperature rise occurs is____(2)_____.

a) (1) CHS
   (2) reaching the time calculated for a 10°F rise on the Shutdown Safety Assessment Checklist

b) (1) CHS
   (2) observing an actual 10°F rise on the RCS Wide Range Tcold instruments

c) (1) RHR
   (2) reaching the time calculated for a 10°F rise on the Shutdown Safety Assessment Checklist

d) (1) RHR
   (2) observing an actual 10°F rise on the RCS Wide Range Tcold instruments

Proposed Answer: A

Explanation (Optional): "C" and "D" are wrong, since RHR Pump shutoff head is about 200 psid, and CHS Pump runout flow occurs at around 500 psid. So, the RHR Pump is close to shutoff head conditions, with limited ability to inject water. "C" and "D" are plausible, since at runout pressure, the RHR Pump is capable of providing about 5000 gpm of flow, and if used, EOP 3505 will realign the suction path to the RWST. "A" is correct, and "B" wrong, since on loss of forced flow through the vessel with no SGs available for natural circulation flow, the crew is required to use the time calculated on the Shutdown Safety Assessment Checklist, due to RCS temperature indications being inaccurate indications of core conditions. "B" is plausible, since during normal shutdown conditions, RCS temperature instruments are accurate, and would be used to determine RCS temperature rise.

Technical Reference(s):	EOP 3505 (Rev 13-1), Note prior to step 6 EOP 3505 (Rev 13-1), Att. A, step 13 FSAR (Rev 20-3), Figures 6.3-3 and 6.3-4	(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective:	MC-07512 Given a set of plant conditions, properly apply the notes and cautions of EOP 3505.	(As available)

Question Source:	New
Question Cognitive Level:	Comprehension or Analysis
10 CFR Part 55 Content:	55.41.5, 41.8, and 41.10
Comments:	

Examination Outline Cross-reference:	Level	RO	SRO
Question # 8	Tier #	1	1
K/A Statement: Pzr Pressure Control Malfunction:	Group #	1	1
Knowledge of EOP entry conditions and immediate action steps	K/A #	APE.027.GEN.2.4.1	
	Importance Rating	4.6	4.8

Proposed Question:

With the plant initially at 100% power, the following sequence of events occurs:

1. The RO reports the following:
   - RCS pressure is 2240 psia and decreasing.
   - Pzr Spray Valve 3RCS*PCV455C indicates OPEN.
2. The crew enters AOP 3581, *Immediate Operator Actions.*

What is the first action the RO is required to take to attempt to close the spray valve; and if the crew is NOT successful in closing the spray valve, what are all of the immediate actions required after tripping the reactor prior to entering E-0, *Reactor Trip or Safety Injection*?

a) Manually CLOSE 3RCS*PCV455C. Verify all Pressurizer Heaters energized, and trip the Main Turbine.

b) Manually CLOSE 3RCS*PCV455C. Initiate Safety Injection, and stop RCPs 1 and 2.

c) Place the Master Pressure Controller in MANUAL and adjust it to $\geq$50% output. Verify all Pressurizer Heaters energized, and trip the Main Turbine.

d) Place the Master Pressure Controller in MANUAL and adjust it to $\geq$50% output. Initiate Safety Injection, and stop RCPs 1 and 2.

Proposed Answer: D

Explanation (Optional): The crew will place the Master Pressure Controller in MANUAL and adjust it to 50% output. If the spray valves do not close, then the crew will manually close the spray valves ("A" and "B" wrong, but plausible). If unsuccessful, the crew will trip the reactor, initiate Safety Injection, and stop RCPs 1 and 2 ("D" correct and "C" wrong). "C" is plausible, since tripping the turbine is an immediate action in several procedures, and energizing Pzr Heaters would slow down the pressure decrease.

Technical Reference(s): AOP 3581 (Rev 01-0), Attachment E (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07759 Given a plant condition requiring the use of AOP 3581, IDENTIFY the immediate operator actions. (As available)

Question Source: Bank #73194

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.7 and 41.10

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 9	Tier #	1	1
K/A Statement: ATWS:	Group #	1	1
Operate / monitor: AFW System	K/A #	EPE.029.EA1.15	
Proposed Question:	Importance Rating	4.1	3.9

With the plant operating at 100% power, both TDMFPs trip. The following sequence of events occurs:

1. The MDMFP fails to start.
2. All 4 SG LO-LO level setpoints are reached, but the reactor does not trip.
3. The operators are NOT successful at tripping the reactor.
4. The operators are NOT successful at deenergizing load centers 32B and 32N.
5. Reactor Power is currently 25% and coming down slowly.

Complete the following statement:

The BOP is required to maintain a minimum AFW flow of greater than__(1)___ until narrow range level in__(2)___SG(s) is/are greater than 8%.

	(1)	(2)
a)	530 gpm	at least one
b)	1150 gpm	at least one
c)	530 gpm	all
d)	1150 gpm	all

Proposed Answer: B

Explanation (Optional): For the loss of feed ATWS, a turbine trip and full AFW flow are required to ensure peak RCS pressure remains below the ASME emergency pressure limit. With reactor power above 5%, the flow requirement is greater than 1150 gpm ("A" and "C" wrong), until level in one steam generator is greater than 8% ("B" correct, "D" wrong). "A" and "C" are plausible, since 530 gpm is the minimum normally required on a reactor trip to provide heat sink. "D" is plausible, since more SGs would be better at removing excess heat, and restoring all SGs to greater than 8% is a goal in the EOP network to obtain symmetrical cooling of the RCS.

Technical Reference(s): FR- S.1 (Rev 19-2), Step 11 RNO; WOG Bkgd Doc (Rev 2) for FR-S.1, step 11 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04625 (RO, SRO, STA) Describe the major action categories within EOP 35 FR-S.1. (As available)

Question Source: Bank #71087

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.10

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 10	Tier #	1	1
K/A Statement: Steam Gen. Tube Rupture:	Group #	1	1
Operate / monitor: safety injection and	K/A #	EPE.038.EA1.30	
containment isolation systems	Importance Rating	4.0	3.8

Proposed Question:

A SGTR has occurred, and current conditions are as follows:

- The crew has entered E-3, *Steam Generator Tube Rupture*.
- The crew is depressurizing the RCS to less than ruptured SG pressure.
- RCS pressure has just dropped below 2000 psia.

Which signal is required to be blocked/reset by the crew at this point in E-3?

a) Low Steam Line pressure SI is required to be blocked.

b) Low Pressurizer pressure SI is required to be blocked.

c) Containment Isolation Phase A is required to be reset.

d) Feedwater Isolation is required to be reset.

Proposed Answer: A

Explanation (Optional): Blocking low steam pressure SI performs two functions. The first is to block low steam pressure SI, and the second is to remove the low steam pressure MSI and replace it with a high rate MSI. "A" is correct based on the need to prevent MSI when SGs are depressurized to cooldown the RCS to RHR conditions later in the E-3 series procedures. If the crew fails to do this, MSI will actuate during the cooldown, complicating the cooldown. There is no need to block SI signals, since SIS has already actuated, and a subsequent auto SIS actuation is already prevented by P-4 ("B" wrong, "C" and "D" plausible). "B" is plausible, since on a plant cooldown without SIS, low pressurizer pressure SIS would be required to be blocked. "C" is wrong, but plausible, since CIA was received when SIS actuated, but is reset independent of RCS pressure during the cooldown in E-3 to allow restoring instrument air, stop RHR pumps, and re-energize MCC 32-3T. "D" is wrong, since AFW is being used to feed SGs, but plausible, since several places in the EOP network reset the FWI signal.

Technical Reference(s): E-3 (Rev 24-1), note prior to step 6, and step 9 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04371 Describe the major action categories within EOP 35 E-3. (As available)

Question Source: Bank #79324

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.7 and 41.10

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 11	Tier #	1	1
K/A Statement: Loss of Off-site Power:	Group #	1	1
Operational implications of: the principle of cooling by natural convection	K/A #	APE.056.AK1.01	
	Importance Rating	3.7	4.2

Proposed Question:

The plant is initially at 100% power when the following sequence of events occurs:

1. Offsite power is lost, and will not be restored for an extended period of time.
2. The crew enters ES-0.2, *Natural Circulation Cooldown*.

Complete the following statement:

Per ES-0.2, the cooldown rate will be limited to a maximum of less than_____(1)_____ and in order to minimize complications of being on natural circulation cooling, the crew will_____(2)_____.

	(1)	(2)
a)	50°F/hour	close the MSIVs
b)	75°F/hour	close the MSIVs
c)	50°F/hour	verify two CRDM Fans are running
d)	75°F/hour	verify two CRDM Fans are running

Proposed Answer: C

Explanation (Optional): "C" is correct, since the basis of running two CRDM fans is to ensure as much heat as possible is being removed from the vessel head, combined with maintaining an extra subcooling margin and a restricted cooldown rate of less than 50°F/hour ("D" wrong), prevents possible void formation in the upper head (Based on analysis after the 1980 St. Lucie event). "A" and "B" are wrong, but plausible, since this action is taken due to loss of secondary plant cooling on a loss of offsite power. "D" is plausible, since this is the normal cooldown rate allowed with forced circulation.

Technical Reference(s):
- ES-0.2 (Rev 19-1), steps 4 and 5
- WOG Bkgd doc (Rev 2) for ES-0.2, steps 5 and 6
- ES-0.1 (Rev 26-2), step 3.m
- ES-0.1 Step Dev Doc (Rev 26-2), step 3, Justification 2

(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05944 Discuss the basis of major procedure steps and/or sequence of steps in EOP 35 ES-0.2, Natural Circulation Cooldown. (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.5 and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 12	Tier #	1	1
K/A Statement: Loss of Vital AC Elec. Inst. Bus:	Group #	1	1
Determine or interpret: AC instrument bus alarms	K/A #	APE.057.AA2.06	
for the inverter and alternate source	Importance Rating	3.2	3.7

Proposed Question:

The "Inverter 1 Trouble" annunciator is received on Main Board 8.

A PEO is dispatched, and reports the following local indications at Inverter 1:

- The "Out of Sync" light is ON
- The "Bypass Source Supplying Load" light is ON
- The "Inverter Supplying Load" light is OFF
- The "AC Output" Voltmeter reads 120 VAC.
- The "Manual Bypass Switch" is in NORMAL

What is the source of power to VIAC-1?

a) DC Bus 1, which is being powered by its Charger.

b) DC Bus 1, which is being powered by Battery 1.

c) MCC 32-2R, through the Static Switch and then through the Manual Bypass Switch.

d) MCC 32-2R, bypassing the Static Switch, directly through the Manual Bypass Switch.

Proposed Answer: C

Explanation (Optional): The local alarm lights indicate the alternate source is supplying the VIAC. The "alternate source" indicated by these lights is MCC 32-2R: the normal MCC is 32-2T ("A" and "B" wrong). "A" and "B" are plausible, since DC Bus power is not the normal supply, and it is a backup if the inverter AC input is lost. The normal position of the manual bypass switch aligns the VIAC to receive input from the static switch ("D" wrong), which selects 32-2R on a loss of inverter output, indicated by the out of sync light ("C" correct). "D" is plausible, since one path available from 32-2R is directly through the manual bypass switch, but this must be manually aligned locally.

Technical Reference(s): EE-1BA (Rev 31-0) (Attach if not previously provided)
OP 3345B (Rev 11-2), Sections 1.2, 2.1, and 4.4

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05009 Describe the Operation of 120 VAC Distribution System Controls and Interlocks A. Static Transfer Switch Operation B. Bypass Line Regulator C. Manual Bypass Switch D. Inverter Indication and Control (As available)

Question Source: Modified Bank #64444
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.7

Comments: Original bank question 6444 is on the following page. Considered modified since question asks for the source of power to VIAC 4 versus 1, and asks for power source, not status of the inverter.

Original bank question 64444

The "Inverter 4 Trouble" alarm has annunciated in the Control Room. Local inspection of the VIAC-4 Inverter provides the following indications:

- Out of Sync Light is ON
- Bypass Source Supplying Load Light is ON
- Inverter Supplying Load Light is OFF
- "AC Output Voltmeter" reads 120 volts.
- The Manual Switch is in NORMAL

Given these indications, which of the following correctly describes the status of VIAC-4?

a) VIAC-4 is energized from the Inverter.

b) VIAC-4 is energized from the alternate AC source through the Static Switch.

c) VIAC-4 is energized from DC battery bus 4 through the Inverter.

d) VIAC-4 is de-energized because the Inverter AC output breaker is tripped.

Correct answer is B

Examination Outline Cross-reference:	Level	RO	SRO
Question # 13	Tier #	1	1
K/A Statement: Loss of Nuclear Service Water:	Group #	1	1
Operate / monitor: control of flow rates to	K/A #	APE.062.AA1.06	
components	Importance Rating	2.9	2.9

Proposed Question:

Initial Conditions:

- The plant is in MODE 5.
- An "A" Electrical Train Outage is in progress.
- The "B" Service Water Pump is running.

The following sequence of events occurs:

1. The RPCCW HX SW FLOW HI/LO annunciator is received on MB1C.
2. A PEO is dispatched, and reports a SWP pipe break just downstream of the "B" Train Service Water to RPCCW Supply Valve 3SWP*MOV50B.
3. The "B" Service Water Pump trips.
4. The RO isolates the break by closing 3SWP*MOV50B.
5. The crew is preparing to start the "D" SWP Pump.

With 3SWP*MOV50B isolated, what Service Water System load(s) is/are required to be aligned to provide SWP minimum flow requirements, **and** prevent exceeding maximum SWP flow limits?

a) The "C" RPCCW Heat Exchanger.

b) One (1) TPCCW Heat Exchanger.

c) The "C" RPCCW Heat Exchanger and one (1) TPCCW Heat Exchanger.

d) Two (2) TPCCW Heat Exchangers.

Proposed Answer: D

Explanation (Optional): "D" is correct, since two TPCCW Heat Exchangers provide flow between the minimum and maximum requirements, and TPCCW has not been isolated. The minimum flow requirement for one SWP train is two TPCCW HX's ("B" wrong), or one RPCCW HX. "B" is plausible, since TPCCW provides a flowpath for SWP with 3SWP*MOV50B closed, and there is a concern with excessive flow as well as minimum flow. The maximum flow allowed is one RPCCW HX and one TPCCW HX. "A" and "C" are wrong because closing 3SWP*MOV50B isolates the "B" AND the "C" RPCCW HX. "A" and "C" are plausible, since these HX alignments would be between the minimum and maximum flow limits, and detailed knowledge of the Service Water to RPCCW piping is required to determine isolating SWP to the "B" HX also isolates Service Water to the "C" HX.

Technical Reference(s): OP 3326 (Rev 24-8), Precautions 3.9 and 3.10; P&ID 133A (Rev 44-0), 133B (Rev 89-0); P&ID 133C (Rev 35-0), 133D (Rev 46-0) (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05716 Describe the major administrative or procedural precautions… placed on the operation of the Service Water System, and the basis for each. (As available)

Question Source: Bank #86733

Question History: Millstone 3 2011 NRC Exam

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.8 and 41.10

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 14	Tier #	1	1
K/A Statement: Loss of Instrument Air:	Group #	1	1
Reasons for: Knowing effects on plant operation	K/A #	APE.065.AK3.03	
of isolating equipment from air	Importance Rating	2.9	3.4

Proposed Question:

With the plant at 100% power, the instrument air line to 3CHS*CV8152 (Letdown Outer Containment Isolation Valve) falls off of the valve operator.

What is the status of Letdown?

a) Letdown is being routed to the PDTT.

b) Letdown is being routed to the CDTT.

c) Letdown is being routed to the PRT.

d) The Letdown path is completely isolated.

Proposed Answer: C

Explanation (Optional): "C" is correct, and "A", "B", and "D" wrong, since 3CHS*CV8152 fails closed, blocking the normal letdown path, causing the letdown line relief valve (3CHS-RV8117) to lift at its setpoint of 600 psig, directing letdown flow to the PRT ("B" wrong). "A" and "B" are plausible, since the PDTT and CDTT receive numerous gaseous liquid inputs depending on whether the source is inside or outside of Containment, and the letdown line passes through the Containment boundary. "D" is plausible, since this would be the case if air had been isolated to the Letdown Inner Containment Isolation Valve.

Technical Reference(s): P&ID 104A (Rev 54-0) (Attach if not previously provided)
P&ID 102F (Rev 17-0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04203 For the below listed plant events, partial or complete, describe the effects on the Chemical and Volume Control System and its interrelated systems: (As available)
A. Loss of Instrument Air
B. Loss Of Power
C. Safety Injection Actuation
D. Containment Isolation Signal Phase A

Question Source: Bank #72704
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.3 and 41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 15	Tier #	1	1
K/A Statement: LOCA Outside Containment:	Group #	1	1
Operational implications of: annunciators,	K/A #	W/E04.EK1.03	
indicating signals, and remedial actions	Importance Rating	3.5	3.9

Proposed Question:

With the plant at 100% power, the following sequence of events occurs:

1. A LOCA outside Containment occurs, resulting in a reactor trip and safety injection.
2. Over the next 10 minutes, RCS pressure increases to 2350 psia, and the PZR PORVs start cycling.
3. The crew is responding using ECA-1.2, *LOCA Outside Containment*.
4. While attempting to isolate the break, the final valve the crew is preparing to close is RHR Pump B Cold Leg Injection Valve 3SIL*MV8809B.
5. Just prior to closing 3SIL*MV8809B, the RO reports the following primary plant parameters:
   - Pzr level is 65% and slowly increasing.
   - RCS Cold Leg temperatures are 545°F and slowly decreasing.
6. After 3SIL*MV8809B closes, the RO reports that the PORVs are cycling at a significantly faster rate based on indication on the Plant Process Computer.

Complete the following statements:

The LOCA outside Containment is____(1)_____from the RCS. Per ECA-1.2, a reliable, diverse indication of LOCA status is the_____(2)_____trend.

	(1)	(2)
a)	isolated	Pressurizer level
b)	still active	Pressurizer level
c)	isolated	RCS cold leg temperature
d)	still active	RCS cold leg temperature

Proposed Answer: A

Explanation (Optional): Pzr pressure is cycling at 2350 psia independent of break isolation, since letdown is isolated, and seal injection is still entering the RCS. The increased PORV cycle rate indicates the mass addition rate to the RCS has increased, meaning the break has been isolated ("B" and "D" wrong). "B" and "D" are plausible, since Pzr level was increasing with pressure at the PORV setpoint prior to leak isolation. The NOTE prior to step 1 must be applied with pressure cycling on the PORVs, since the procedurally directed use of pressure increasing to determine leak status will not work. Other means of verifying break isolation should be checked such as Pzr level increase ("A" correct), reports from the field, decrease in area radiation, or an increase in PORV cycling frequency ("C" wrong). "C" is plausible, since RCS temperature trend is given in the stem, and temperature trend is affected by ECCS injection rate, but for small breaks, the effect is minor.

Technical Reference(s): ECA-1.2 (Rev 8-0), note prior to step 1; ECA-1.2 (Rev 8-0), steps 4 and 5 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03878 Discuss conditions which require transition to other procedures from EOP 35 ECA-1.2. (As available)

Question Source: Bank #85236

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 16	Tier #	1	1
K/A Statement: Loss of Emergency Coolant Recirc:	Group #	1	1
Operational implications of: components, capacity,	K/A #	W/E11.EK1.01	
& function of emergency systems	Importance Rating	3.7	4.0

Proposed Question:

With the plant initially at 100% power, a large break LOCA occurs, resulting in the following sequence of events:

1. RWST Lo-Lo level is received.
2. All four RSS Pumps fail to start, automatically or manually.
3. The crew enters EOP 35 ECA-1.1, *Loss of Containment Recirculation*.
4. The Technical Support Center reports that emergency coolant recirculation capability has been restored via the "A" RSS Pump.
5. The crew transitions to ES-1.3, *Transfer to Cold Leg Recirculation*.

Which ECCS Pumps will be supplied by the "A" RSS Pump per ES-1.3?

a) Both Trains of CHS pumps and both trains of SIH Pumps.

b) The "A" Train CHS pump and "A" Train SIH Pump only.

c) The "A" and "B" Train CHS Pumps only.

d) The "A" and "B" SIH Pumps only.

Proposed Answer: A

Explanation (Optional): The note prior to step 1 of ECA-1.1 directs the crew to transition to ES-1.3 if cold leg recirc capability is restored. ES-1.3 will align the suctions of all four High Head ECCS Pumps to take a suction from the running RSS Pump ("C" and "D" wrong), since all four pump suctions will be aligned to the running RSS Pump, since its capacity allows for feeding all four pumps at once. "A" is correct, and "B" wrong, since design flow of one RSS Pump is about 4,000 gpm, and runout flow of a CHS Pump is around 550 gpm, and a SIH pump is about 650 gpm, so all four pumps will draw about 2400 gpm, which is within the design flow capacity of the RSS Pump. "B" is plausible, since this would be the case if each RSS Train was designed to supply only its associated train. "C" and "D" are plausible, since the "A" RSS Pump is aligned to the suction of the CHS Pumps, and the "B" RSS Pump is aligned to the suction of the SIH Pumps, but the crew also opens the suction cross-connect path via 3SIH*MV8807A and B, and SIH*MV8924.

Technical Reference(s):
- ECA-1.1 (Rev 17-0),Note prior to step 1
- ES-1.3 (Rev 16-0), steps 3 and 4
- P&IDs 112A (Rev 50-0), 112C (Rev 38-0)
- P&IDs 113A (Rev 32-0), 113B (Rev 42-0)

(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03871 Describe the major action categories within EOP 35 ECA-1.1. (As available)

Question Source: New

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.10

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 17	Tier #	1	1
K/A Statement: Loss of Secondary Heat Sink:	Group #	1	1
Reasons for: normal, abnormal and emergency	K/A #	W/E05.EK3.02	
operating procedures	Importance Rating	3.7	4.1

Proposed Question:

The crew has just entered FR-H.1, *Response to Loss of Secondary Heat Sink*.

Shortly after entering FR-H.1, the crew is directed to trip all Reactor Coolant Pumps.

What is the basis for tripping the RCPs during a loss of secondary heat sink?

a) Minimize RCS heat input, extending the time before bleed and feed is required.

b) Prevent reaching a Pressurized Thermal Shock condition if bleed and feed needs to be established.

c) Minimize mass loss out of the RCS in the event of a small RCS cold leg break.

d) Reserve the RCPs for use later in the event.

Proposed Answer: A

Explanation (Optional): RCPs add heat to the RCS water. This heat has to be removed by relieving steam from the Steam Generators. By tripping the RCPs, the effectiveness of the remaining water inventory in the SG's is extended, which extends the time at which operator action to initiate bleed and feed must occur ("A" correct). "B" is wrong, but plausible, since this is the basis for RCP trip criteria in E-0. "C" is wrong, but plausible, since RCPs running aggravates vessel cooldown with a faulted SG. "D" is wrong, but plausible, since this is the basis for stopping an RCP in FR-C.2 Response to Degraded Core Cooling Conditions.

Technical Reference(s): WOG Bkgd Doc (Rev 2) FR-H.1, step 4 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04535 Discuss the basis of major procedure steps and/or sequence of steps in EOP 35 FR-H.1 (As available)

Question Source: Bank #63975
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 18	Tier #	1	1
K/A Statement: Generator Voltage and Electric	Group #	1	1
Grid Disturbances: Interrelations between:	K/A #	APE.077.AK2.01	
Disturbances and motors	Importance Rating	3.1	3.2

Proposed Question:

The plant is at 100% power when the following sequence of events occurs:

1. Grid voltage starts decreasing, while frequency remains stable.
2. Voltage on all four 4160 Volt buses decreases to 3550 Volts.
3. The following two annunciators are received on Main Board 8:
   - BUS 34C UNDERVOLTAGE
   - BUS 34D UNDERVOLTAGE

Complete the following statement, assuming the low voltage persists and no operator action is taken:

The Charging Pump's_____(1)______, and the time after the initiating event that buses 34C and 34D will automatically transfer to the Emergency Diesel is_____(2)______.

	(1)	(2)
a)	flow will decrease	2 seconds
b)	motor temperature will increase	2 seconds
c)	flow will decrease	4.5 minutes
d)	motor temperature will increase	4.5 minutes

Proposed Answer: D

Explanation (Optional): As voltage decreases, the decrease in counter EMF in motors results in excessive current, which increases heat production due to I^2R losses. This increase in heat reduces motor insulation life. This condition is protected against by the following undervoltage protection: If voltage drops below 70% (2912 Volts) for 1.8 seconds, or below 95% (3952 Volts) for 4.5 minutes without SIS ("D" correct), or 7.5 seconds with an SIS, the bus tie breakers will trip, and the Emergency Diesels will automatically start and load emergency buses 34C and D. "A" and "B" are wrong, but plausible, since this would be correct if voltage were less than 70%, and the time would also be shorter if SIS had actuated. "C" is wrong, since pump flow is tied to motor speed (rpm), and motor speed is tied to bus frequency, which is stable. "C" is plausible, since an electrical disturbance is in progress.

Technical Reference(s): OP 3353.MB8A (Rev 04-0), 3-12
LSK 24-3K (Rev 11-0)
General Physics Motors Text (Rev 4), pages 23 and 26
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03337 Describe the 4kV Distribution System operation under normal, abnormal and emergency conditions… At power operations… LOP sequence of operations… MB8 alarm response (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.7 and 41.14
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 19	Tier #	1	1
K/A Statement: Dropped Control Rod:	Group #	2	2
Reasons for: reset of demand position counter to zero	K/A #	APE.003.AK3.06	
Proposed Question:	Importance Rating	2.7	3.0

While operating at 100% power, the following sequence of events occurs:

1. One Control Bank D Group 1 rod drops.
2. The crew enters AOP 3552, *Malfunction of the Rod Drive System*.
3. The crew prepares to recover the dropped rod.

Shortly before the crew starts withdrawing the dropped rod, AOP 3552, Attachment "B" directs the crew to reset the control bank D group 1 step counter to zero.

Why does the affected group step counter need to be reset to zero?

a) This ensures that the P/A converter will send the proper rod height data to the RIL circuitry.

b) This ensures that the rod is withdrawn to the proper height with a proper group step counter indication.

c) This prevents a ROD CONTROL URGENT FAILURE (MB4C 4-8) annunciator from coming in during the rod recovery.

d) This prevents a BANK D FULL ROD WITHDRAWAL (MB4C 5-8) annunciator from coming in during the rod recovery.

Proposed Answer: B

Explanation (Optional): "B" is correct since the crew will zero the group counter, disable the other rods in the bank, and withdraw the affected rod to the previously recorded group height, ensuring the rod is withdrawn to the height of the remainder of the rods in the bank. "A" is wrong since the group step counter does not input to the P/A converter. "A" is plausible, since the P/A converter will need to be restored using AOP 3552 Attachment E. "C" is wrong, but plausible, since this alarm will come in during rod recovery due to no group 2 rods moving during the rod recovery. "D" is wrong, but plausible since bank D full rod withdrawal is fed by the P/A converter, which has not been disabled.

Technical Reference(s): AOP 3552 (Rev 12-0), Att. B, steps 4.b-c and 5.f (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03902 Discuss the basis of major precautions, procedure steps and/or sequence of steps within AOP 3552. (As available)

Question Source: Bank #73494

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.6, 41.7, and 41.10

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 20	Tier #	1	1
K/A Statement: Loss of Source Range NI:	Group #	2	2
Operate / monitor: manual restoration of power	K/A #	APE.032.AA1.01	
Proposed Question:	Importance Rating	3.1	3.4

A reactor shutdown is in progress per OP 3207, *Reactor Shutdown*, when the following sequence of events occurs:

1. The RO reports the following:
   - IRNI Channel 3NMI-NI36A indicates 10^{-9} Amps with a Startup Rate of 0.0 dpm.
   - IRNI Channel 3NMI-N36B indicates at the bottom of its indicating range.
   - The SR LOSS OF DET VOLTAGE annunciator on MB4 is lit.
2. The US directs the RO to perform the following per OP 3207:
   - Manually restore power to the Source Range Detectors.
   - Select NIS recorder 3NME-NR45 to monitor the Source Ranges.

Per OP 3207, what procedural actions are required to be taken by the RO at MB4?

a) Press both 3NMI*N38A OR 3NMI*N38B "IR" pushbuttons. Then select the "S/U" display on 3NME-NR45 only.

b) Press both 3NMI*N38A OR 3NMI*N38B "IR" pushbuttons. Then select the "S/U" display on 3NME-NR45 and select Pen 1 to "S1" and Pen 2 to "S2".

c) Place both 3NMS*N33A AND 3NMS*N33B "SR" switch collars in "RESET" and press the pushbuttons. Then select the "S/U" display on 3NME-NR45 only.

d) Place both 3NMS*N33A AND 3NMS*N33B "SR" switch collars in "RESET" and press the pushbuttons. Then select the "S/U" display on 3NME-NR45 and select Pen 1 to "S1" and Pen 2 to "S2".

Proposed Answer: D

Explanation (Optional): If one IRNI stabilizes above P-6, OP 3207 directs the crew to place both NMS*N33A and NMS*N33B "SR" switch collars in "RESET" and press the pushbuttons to restore power to the Source Range NIS channels ("A" and "B" wrong). "A" and "B" are plausible, since a IRNI channel has not dropped below the P-6 setpoint, and these pushbuttons are used on a reactor startup. On 3NME-NR45, the crew will select the "S/U" display, and select Pen 1 to "S1" and Pen 2 to "S2" to place NR45 in service ("D" correct, "C" wrong). "C" is plausible, since Gammametrics recorders do not require any actions to switch from monitoring Power Ranges or Intermediate Ranges to Source Ranges. Also, for other instrument failures, selecting the alternate channel for control automatically selects that channel as the input to the recorder, and the operators are required to select the SU display as one of their actions.

Technical Reference(s): ES-0.1 (Rev 26-2), step 10 (Attach if not previously provided)
OP 3207 (Rev 13-10), steps 4.1.7 and 4.1.8

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05229 For the following conditions, determine the effects on the Nuclear Instrumentation System and on interrelated systems:
a. Source Range instrument failure below P-6…Intermediate Range instrument failure below P-10 (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.6, 41.7, and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 21	Tier #	1	1
K/A Statement: ARM System Alarms:	Group #	2	2
Operational Implications of: detector limitations	K/A #	APE.061.AK1.01	
Proposed Question:	Importance Rating	2.5	2.9

A LOCA occurs inside Containment.

Complete the following statement concerning the duration and severity of Temperature Induced Current (TIC) on the CTMT high range area radiation monitors (3RMS*RE04A/05A).

TIC results in a spuriously high radiation indication that lasts for a relatively ____(1)_____. While the effects of TIC are being experienced, radiation readings____(2)_____.

	(1)	(2)
a)	short duration of two to five minutes	ARE NOT valid, since the effect is large
b)	short duration of two to five minutes	ARE valid, since the effect is relatively small
c)	long duration of two to five hours	ARE NOT valid, since the effect is large
d)	long duration of two to five hours	ARE valid, since the effect is relatively small

Proposed Answer: A

Explanation (Optional): 3RMS*RE04A and 05A are susceptible to TIC as a result of "false" current induced in the particular coaxial cable used from the radiation detector to the CTMT penetration. This false current can be significant and cause rad readings orders of magnitude higher than actual rad levels so indications are not valid ("B" and "D" wrong). TIC is a result of the temperature CHANGE in CTMT as a result of the release of a significant amount of energy (steam break or LOCA). It is not a function of static temperature, regardless of how high. Thus, it only lasts a short amount of time, usually 2 - 5 minutes ("A" correct, "C" wrong). "C" is plausible, since temperature stays elevated for a fairly long time after a LOCA inside CTMT, so this would be true if TIC were related to high temperature, rather than temperature change. "B" and "D" are plausible, since some phenomena result in small, acceptable changes in detector outputs, such as feed venturi fouling.

Technical Reference(s): SP3673.6 (Rev 04-7), Section 4.2 (Attach if not previously provided)
MP-26-EPA-REF03 (Rev 19-0) page 26

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-00165 Describe the function and location of the following Radiation Monitors… RMS-RE-04A/B… (As available)
Question Source: Bank 80868
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.11
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 22	Tier #	1	1
K/A Statement: High Reactor Coolant Activity:	Group #	2	2
Reasons for: corrective actions as a result of high	K/A #	APE.076.AK3.05	
RCS fission-product activity level	Importance Rating	2.9	3.6

Proposed Question:

With the plant in MODE 5, the following sequence of events occurs:

1. Chemistry reports high RCS activity based on samples.
2. The crew enters AOP 3553 *High RCS Activity*.
3. The RO reports that CTMT area radiation monitors are showing an increasing trend.

For these conditions, AOP 3553 *High RCS Activity* cautions the operators to consider restricting access to the ESF building due to the potential for increased radiation levels.

Why does AOP 3553 have this caution?

a) The potential exists for leakage from CTMT into SLCRS areas.

b) Increased radiation levels in CTMT will raise radiation levels in buildings adjacent to CTMT.

c) If Excess Letdown is in operation, RCS activity may be transported through the CVCS system.

d) If the RHR system is in operation, RCS activity may be transported through the RHR system.

Proposed Answer: D

Explanation (Optional): "D" is correct, and "A", "B", and "C" wrong, since the Caution prior to step 1 of the procedure cautions of ALARA considerations in the ESF if RHR is operating, since the system is transporting RCS fluid with high activity levels, resulting in increased radiation levels in the area. "A" and "B" are plausible, since CTMT area monitors have shown an increasing trend. "C" is plausible since CVCS provides a flowpath for RCS water outside of CTMT.

Technical Reference(s): AOP 3553 (Rev 06-5), Note prior to step 1 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05893 Describe the basis of major procedure steps and/or sequence of steps in AOP 3553 (As available)

Question Source: Bank#75663
Question History: Millstone 3 2001 NRC Exam
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.5 and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 23	Tier #	1	1
K/A Statement: SI Termination:	Group #	2	2
Interrelations between: heat removal systems and	K/A #	W/E02.EK2.02	
relation to proper operation of the facility	Importance Rating	3.5	3.9

Proposed Question:

A steam line break occurs on the "B" Steam Generator.

The crew enters E-1, *Loss of Reactor or Secondary Coolant*, and the following conditions exist:

- RCS pressure: 1785 psia and slowly increasing
- RCS subcooling: 110°F and slowly increasing
- Pressurizer level: 18% and slowly increasing
- Intact SG NR levels: off-scale low
- Intact SG WR levels: 60% and increasing
- Total AFW flow: 500 gpm
- CTMT pressure: 21 psia slowly increasing
- CTMT temperature: 160°F and slowly increasing

What parameter, if any, is required to be increased to allow the crew to transition to ES-1.1, *SI Termination*?

a) None

b) AFW flow

c) Pressurizer level

d) RCS pressure

Proposed Answer: B

Explanation (Optional): SI Termination requires adequate subcooling, SG narrow range level in at least one SG >8% or AFW flow >530 gpm ("B" correct, "A" wrong), Pressurizer level >16% ("C" wrong), and RCS pressure stable or increasing ("D" wrong). "A" is plausible, since 3 of the four parameters are met. "C" and "D" are plausible, since both of these parameters are checked for SI termination, and both are lower than expected for a reactor trip.

Technical Reference(s): E-1 (Rev 26-0), step 6 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05523 Identify plant conditions that require entry into EOP 35 ES-1.1. (As available)

Question Source: Bank#72406
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 24	Tier #	1	1
K/A Statement: Steam Generator Over-pressure:	Group #	2	2
Determine or interpret: facility conditions and	K/A #	W/E13.EK2.01	
selection of appropriate procedures	Importance Rating	2.9	3.4

Proposed Question:

Initial Conditions:

- The crew is preparing to transition out of E-0, *Reactor Trip or Safety Injection*.
- Manual Status Tree monitoring is in effect.

The BOP reports the following parameters related to the CSF Status Trees:

- Highest SG pressure: 1230 psig
- Highest SG NR level: 75%
- Reactor Vessel Plenum level: 32%
- Pressurizer level: 80%
- CTMT temperature: 120°F

Which yellow path status tree condition exists?

a) SG overpressure

b) SG high level

c) Vessel Plenum low level

d) Pressurizer high level

Proposed Answer: A

Explanation (Optional): The parameter and logic used to assess Yellow paths on the Heat Sink status tree include the following: Yellow on SG overpressure is ANY SG >1220 psig ("A" correct). Yellow on SG high level is ANY SG NR >80% ("B" wrong, but plausible). Yellow on vessel plenum level is less than 19% ("C" wrong, but plausible). Yellow on High Pressurizer level is 89% ("D" wrong, but plausible).

Technical Reference(s): EOP35 F-0.3 (Rev 05-1) Heat Sink Status Tree
EOP 35 F-0.2 (Rev 05-0) Core Cooling Status Tree
EOP35 F-0.6 (Rev 03-0) Inventory Status Tree
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05955 Identify plant conditions that require entry into EOP 35 FR-H.2. (As available)

Question Source: Modified Bank #89266

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.10

Comments: Original bank question 89266 is on the next page. Considered modified since other yellow path conditions have been added, and distractors changed to include them.

Original Bank #89266

Initial Conditions:

- The crew is preparing to transition out of E-0, *Reactor Trip or Safety Injection*.
- Manual Status Tree monitoring is in effect.

The BOP reports the following parameters for the HEAT SINK Status Tree.

- Total AFW Flow: 450 gpm
- "A" SG pressure: 1230 psig
- "B" SG pressure: 1125 psig
- "C" SG pressure: 1125 psig
- "D" SG pressure: 1100 psig
- "A" SG NR level: 75%
- "B" SG NR level: 20%
- "C" SG NR level: 25%
- "D" SG NR level: 10%
- CTMT temperature: 120°F

What is the status of the HEAT SINK Status Tree, and why?

e) RED, due to inadequate heat sink

f) YELLOW, due to SG overpressure

g) YELLOW, due to SG high level

h) YELLOW, due to SG low level

Correct answer: B

Examination Outline Cross-reference:	Level	RO	SRO
Question # 25	Tier #	1	1
K/A Statement: Post LOCA Cooldown Depress: Inter-relations between: control and safety systems, instruments, signals, interlocks, failure modes, auto/manual features	Group #	2	2
	K/A #	W/E03.EK2.01	
	Importance Rating	3.6	4.0

Proposed Question:

The plant has tripped due to small LOCA, and the following sequence of events occurs:

1. The crew prepares to place RHR in service in the cooldown mode per ES-1.2, *Post LOCA Cooldown and Depressurization*.
2. Per OP 3310A, Residual Heat Removal System, the RO places the switch for RHR Loop Suction Isolation Valve 3RHS*MV8701**A** to OPEN, but the valve remains closed.

Complete the following statement:

3RHS*MV8701A will NOT open if ________________________.

a) RHR to Charging/SI Valve 3SIL*MV8804A is CLOSED

b) RSS to RHR Cross-connect Valve 3RSS*MV8837A is CLOSED

c) RHR Cold Leg Injection Valve 3SIL*MV8809A is OPEN

d) RHR RWST Suction Isolation Valve 3SIL*MV8812A is OPEN

Proposed Answer: D

Explanation (Optional): The interlocks required to OPEN 3RHS*MV8701A are 3SIL*MV8812A CLOSED ("D" correct), RHR to Charging/SI Valve 3SIL*MV8804A CLOSED ("A" wrong), and RSS to RHR Cross-connect Valves 3RSS*MV8837A and B CLOSED ("B" wrong). "C" is wrong since 3SIL*MV8809A is not interlocked with 3RHS*MV8701A. "A" and "B" are plausible since these valves are interlocked with 3RHS*MV8701A. "C" is plausible, since this valve is out of its expected position, and is operated as part of this evolution.

Technical Reference(s): ES-1.2 (Rev 19.0), step 29 (Attach if not previously provided)
OP 3310A (Rev 17-8), section 4.5
LSK 27-7D (Rev 16-0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05455 Describe operation of the following residual heat removal (RHR) system equipment controls and interlocks… Loop suction valves… (As available)

Question Source: Modified Bank #78815
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.7 and 41.10

Comments: Original bank question 78815 is on the next page. Considered modified since the stem has been changed by placing the crew in a new procedure ES-1.2 versus ECA-1.2), meaning different expected valve positions may exist, and distractor "C" is a new valve.

Original Bank question #78815

The plant has tripped due to a LOCA outside Containment, and the following sequence of events occurs:

1. The crew commences verifying proper valve alignment in the ESF Building per ECA-1.2, *LOCA Outside Containment*.
2. The RO reports that RHR Loop Suction Isolation Valve 3RHS*MV8701B is OPEN.
3. The STA reports all other ECCS valves are in their proper lineup.
4. The US directs the RO to close 3RHS*MV8701B.
5. The RO improperly places the switch for 3RHS*MV8701**A** to OPEN, but the valve remains closed.

Which interlock prevented RHR Loop Suction Isolation Valve 3RHS*MV8701A from opening?

a) RHR to Charging/SI Valve 3SIL*MV8804A is CLOSED.

b) RSS to RHR Cross-connect Valve 3RSS*MV8837A is CLOSED.

c) RHR Loop Suction Isolation Valve 3RHS*MV8701B is OPEN.

d) RHR RWST Suction Isolation Valve 3SIL*MV8812A is OPEN.

Correct Answer: D

Examination Outline Cross-reference:	Level	RO	SRO
Question # 26	Tier #	1	1
K/A Statement: Natural Circ:	Group #	2	2
Operate / monitor: for desired operating results	K/A #	W/E09.EA1.03	
Proposed Question:	Importance Rating	3.5	3.8

The plant is initially at 100% power when the following sequence of events occurs:

1. Offsite power is lost.
2. The crew transitions to ES-0.2, *Natural Circulation Cooldown*.
3. The STA is verifying adequate natural circulation cooling is occurring in the RCS.

Current Conditions:

- RCS Pressure: 2250 psia and stable.
- RCS T-hot: 580°F and going down slowly.
- Core Exit TCs: 585°F going down slowly.
- RCS-T-cold: 561°F and stable.
- SG Pressures: 1125 psig and stable.

Complete the following statements:

Adequate natural circulation __(1)__ exist. Heat removal is being maintained by the __(2)__.

	(1)	(2)
a)	DOES	SG Code Safety Valves
b)	DOES NOT	SG Code Safety Valves
c)	DOES	Atmospheric Relief Valves
d)	DOES NOT	Atmospheric Relief Valves.

Proposed Answer: C

Explanation (Optional): "A" is wrong, since the atmospheric relief valves are available after an LOP since the crew restores Instrument Air pressure in ES-0.1, and ES-0.1 has been completed prior to entry into ES-0.2. "A" is plausible, since the Atmospheric Relief Valves are air-operated valves, and air is lost on an LOP. Also, the atmospheric relief valves would have been lost if an MSI had actuated, and the crew closes the MSIVs in ES-0.1 on an LOP. "C" is correct, and "B" and "D" wrong, since Tcold is approximately equal to Tsat for SG pressures, and SG Pressure, CETCs, and Thot are stable or decreasing with adequate subcooling. "B" and "D" are plausible, since if any of these conditions were not met, natural circulation would not be adequate.

Technical Reference(s): ES-0.1 (Rev 26-2), steps 3 and 9 (Attach if not previously provided)
P&ID 123B (Rev 26-0)
Steam Tables

Proposed references to be provided to applicants during examination: **Steam Tables**

Learning Objective: MC-05511 Describe the major action categories within EOP 35 ES-0.1. (As available)

Question Source: Bank #72294

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7, 41.10, and 41.14

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 27	Tier #	1	1
K/A Statement: RCS Overcooling – PTS: Ability to recognize abnormal indications for system operating parameters that are entry level conditions for EOPs and AOPs	Group #	2	2
	K/A #	W/E08.GEN.2.4.4	
	Importance Rating	4.5	4.7

Proposed Question:

With the plant initially at 100% power, the following sequence of events occurs:

1. The reactor trips and Safety Injection actuates.
2. At 13:00, the STA commences manual status tree monitoring.
3. At 14:00, the STA checks the integrity status tree.

RCS parameters have trended as follows over the previous hour:

	13:00	14:00
• RCS Pressure:	1100 psia	2350 psia
• RCS Cold Leg Temperatures:		
• RCS Loop A:	380ºF	300ºF
• RCS Loop B:	380ºF	210ºF
• RCS Loop C:	380ºF	290ºF
• RCS Loop D:	380ºF	270ºF

What is the color of the "Integrity" Status Tree?

a) Green

b) Yellow

c) Orange

d) Red

Proposed Answer: D

Explanation (Optional): The status tree will indicate green unless a > 100°F/Hr cooldown occurs in any cold leg (actual cooldown is 110°F/hr on Loop D) and temperature is > 290°F ("A" is plausible, since several loops have cooled down less than 100°F, and have temperatures above 290°F). The status tree turns yellow if >100°F/hr occurs, and temperature drops to between 290°F and 260°F ("B" wrong, but plausible). The status tree turns orange if >100°F/hr occurs, and temperature drops below 260°F but to the right of the "Limit A" curve on the status tree ("C" is wrong, since temperature is to the left of the limit A curve, but plausible, since orange would be correct if the RCS was depressurized). "D" is correct, since greater than 100°F/ hour cooldown has occurred, and RCS temperature is to the right of the "limit A" curve.

Technical Reference(s): EOP 35 F.04 (Rev 07-0), Integrity Status Tree (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04551 Identify plant conditions that require entry into EOP 35 FR-P.1. (As available)

Question Source: Modified Bank #78749

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.10

Comments: Original Bank #78749 is on the next page. This question is considered modified since the RCS repressurizes in the new version, changing the correct answer from Orange to Red.

Original Bank Question #78749

With the plant initially at 100% power, the following sequence of events occurs:

1. The reactor trips and one safety valve on each SG lifts and fails to close.
2. At 1300, the STA commences manual status tree monitoring.
3. The crew enters ECA-2.1 *Uncontrolled Depressurization of All Steam Generators*.
4. The crew throttles AFW flow back to 100 GPM to each Steam Generator.
5. At 14:00, the STA checks the integrity status tree.

RCS parameters have trended as follows over the previous hour:

	13:00	14:00
• RCS Pressure:	600 psia	2000 psia
• RCS Cold Leg Temperatures:		
• RCS Loop A:	380ºF	300ºF
• RCS Loop B:	380ºF	290ºF
• RCS Loop C:	380ºF	310ºF
• RCS Loop D:	380ºF	270ºF

What is the color of the "Integrity" Status Tree?

a) Green

b) Yellow

c) Orange

d) Red

Correct Answer: C

Examination Outline Cross-reference:	Level	RO	SRO
Question # 28	Tier #	2	2
K/A Statement: Reactor Coolant Pump:	Group #	1	1
Physical connections / cause-effect relationship	K/A #	003.K1.10	
between: RCPs and RCS	Importance Rating	3.0	3.2

Proposed Question:

A plant cooldown is in progress per OP 3208, *Plant Cooldown*.

Why is the crew required to isolate the RCP seal leakoff lines prior to reducing RCS pressure below 125 psia?

a) Seal leakoff flow may decrease to the point where the number 1 seal may not be effective, so the number 2 seal is placed in service.

b) Backflow from the VCT through the seal leakoff line may occur, which could flush contaminants into the seals.

c) Seal injection flow may increase to the point where controlled leakage Technical Specification limit may be exceeded.

d) Seal leakoff flow may increase to the point where they are greater than the RCP number 1 seal design operating range.

Proposed Answer: B

Explanation (Optional): Normally, filtered RCP Seal Injection is supplied from the running Charging Pump to the RCP, with a portion of the seal injection water flowing down past the RCP thermal barrier into the RCS, and a portion flowing up through the RCP #1 Seal, with seal leakoff flowing to the VCT. The VCT is pressurized with a hydrogen blanket, and is on the Auxiliary Building 43 foot level. As RCS pressure is reduced, a larger portion of the seal injection water flows down into the RCS. When RCS pressure is reduced to below 125 psia, enough seal injection flow may flow down into the RCS, resulting in backflow through the seal leakoff line from the VCT into the RCP Seal Package. The seal leakoff line does not contain a filter, so VCT contaminants may be introduced into the seals, potentially damaging the RCP seals ("B" correct, "A", "C", and "D" wrong). "A", "C", and "D" are plausible, since they each involve RCS pressure reduction impacting RCP seal flow. "A" is plausible, since AOP 3554 isolates number 1 seal leakoff on failed #1 seal to place the number 2 seal in service. "C" is plausible, since there is a controlled leakage limit in Tech Specs but is does not apply in MODE 5 (RO level knowledge). "D" is plausible, since operators maintain RCP seal leakoff design requirements per OP 3301D.

Technical Reference(s): OP 3208 (Rev 22-9), Step 4.4.15.c and d (Attach if not previously provided)
OP 3301D (Rev 14-3), Precaution 3.3

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05427 Describe the following RCP fluid flow paths: A. Reactor Coolant Flow. B. Seal Flow… (As available)

Question Source: Bank #73189
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.3
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 29	Tier #	2	2
K/A Statement: Reactor Coolant Pump:	Group #	1	1
Manually operate / monitor: seal injection	K/A #	003.A4.01	
in the control room	Importance Rating	3.3	3.2

Proposed Question:

A plant cooldown to MODE 5 is in progress per OP 3208, *Plant Cooldown*.

The RO has been directed to maintain Seal Injection to each RCP between 8 and 13 gpm during the cooldown.

Complete the following statement:

Per OP 3208, the preferred method of adjusting seal injection flow is by throttling the___(1)____, and this action___(2)____be carried out from the Main Boards

	(1)	(2)
a)	Common Charging Header To Seal Injection Valve	CAN
b)	Common Charging Header To Seal Injection Valve	CANNOT
c)	Individual RCP Seal Supply Throttle Valves	CAN
d)	Individual RCP Seal Supply Throttle Valves	CANNOT

Proposed Answer: D

Explanation (Optional): As the plant is depressurized, seal injection flow tends to increase, since the Charging Pumps are centrifugal pumps, and a portion of the seal injection flow is routed to the RCS. The seal injection path can be throttled to all four RCPs via the common Charging Header to Seal Injection Valve 3CHS-HCV182 from Main Board 3 ("A", "B", and "C" plausible), or by throttling the individual RCP Sealy Supply Throttle Valves locally in the Auxiliary Building ("C" wrong). "D" is correct, since OP 3208 directs the crew to throttle seal injection flow to individual RCPs ("A" and "B" wrong) as necessary during the RCS depressurization to obtain 3CHS-HCV182 full open and RCP seal injection flows between 8 gpm and 13 gpm. This is preferred since excessive throttling of 3CHS-HCV182 may lead to failure of the seal injection filter O-rings when the valve is subsequently re-opened.

Technical Reference(s): OP 3208 (Rev 22-9), steps 3.2.5, 3.2.6, 4.2.4 and 4.4.9
OP 3301D (Rev 14-3), Section 4.9, including Caution prior to 4.9.1
P&IDs 103A (Rev 26-0) and 104A (Rev 54-0)
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-00148 Describe the purpose and operation of the controls and interlocks associated with the operation of the Reactor Coolant Pumps. (As available)

Question Source: New
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.3, 41.5, and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 30	Tier #	2	2
K/A Statement: Chemical and Volume Control:	Group #	1	1
Manually operate / monitor: boron and control rod	K/A #	004.A4.01	
reactivity effects in the control room	Importance Rating	3.8	3.9

Proposed Question:

The plant is initially at 100% power with conditions as follows:

- I&C is performing troubleshooting on Rod Control.
- Rod Control is in Manual, and it is desired NOT to move control rods during the troubleshooting.

The following sequence of events occurs:

1. The Main Turbine starts to automatically runback.
2. The Condenser Steam Dump Valves ARM.
3. The runback stops.
4. The BOP operator reports the following parameters:
   - Tave is 2°F above program.
   - Steam Dump Demand indicates 30% on MB5.

Complete the following statement concerning the boration required to close the steam dump valves, and monitoring requirements per OP-AA-300, *Reactivity Management* during the reactivity maneuver:

The crew will need to add about ___(1)____gallons of boron; and one parameter that is specifically required to be monitored as a "critical parameter" is_____(2)______.

	(1)	(2)
a)	70	Axial Flux Distribution
b)	70	Main Generator electric output (MWe)
c)	360	Axial Flux Distribution
d)	360	Main Generator electric output (MWe)

Proposed Answer: C

Explanation (Optional): Steam Dump capacity is 40% power, so 30% demand is equivalent to 40% power x .30 = 12% power. The boric acid addition thumbrule is about 30 gal/% power, so 12% x 30 gallons/% = 360 gallons required ("A" and "B" wrong). "A" and "B" are plausible, since one thumbrule for rods is 6 steps per % power, and 6 x 12 is 72 steps. "C" is correct, and "D" wrong, since the specified critical parameters are RCS temperature, Reactor power, AFD, RIL, and Turbine Power (Tref) ("D" plausible).

Technical Reference(s): RE Curve and Data Book (Cycle 17 MOL), Thumbrule Sheet
OP-AA-300 (Rev 18-0), step 5.3.14
OP 3316A (Rev 15-0), Section 1.2
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MG-00860 Perform reactivity balance calculations involving moderator temperature, fuel temperature, and power coefficients. (As available)

Question Source: New

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.1, 41.5, 41.6, 41.7, and 41.10

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 31	Tier #	2	2
K/A Statement: Residual Heat Removal:	Group #	1	1
Effect of a loss of malfunction on: the RCS	K/A #	005.K3.01	
Proposed Question:	Importance Rating	3.9	4.0

The plant is in MODE 5, and the following initial conditions exist:

- Train B RHR is in service in COOLDOWN mode.
- RHR Heat Exchanger Outlet Valve, 3RHS*HCV607 is 30% OPEN.
- RHR Total Flow Controller 3RHS-FC619 setpoint is set to maintain total flow at 3,200 gpm.

3RHS-FC619 malfunctions, with its setpoint drifting up to 3,800 gpm

Complete the following statement concerning the effect on the RHR system and on RCS temperature.

3RHS*HCV607_______(1)_______, and RCS temperature_______(2)_______.

	(1)	(2)
a)	remains AS IS	DECREASES
b)	remains AS IS	INCREASES
c)	strokes OPEN	DECREASES
d)	strokes OPEN	INCREASES

Proposed Answer: B

Explanation (Optional): Total flow controller 3RHS-FC619 is demanding increased total flow through and around the heat exchanger ("C" and "D" plausible) by positioning only bypass valve 3RHS*FCV619 ("C" and "D" wrong). Bypass valve 3RHS*FCV619 strokes open, lowering pressure at the inlet of the RHR Heat Exchanger, decreasing flow through the heat exchanger, even though total flow has increased ("A" plausible). Decreased flow through the heat exchanger causes RCS temperature to increase ("B" correct, "A" wrong).

Technical Reference(s): P&ID 112A (Rev 50-0) (Attach if not previously provided)
OP 3208 (Rev 22-9), Section 4.3.22

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05459 Given a failure, partial or complete, of the Residual Heat Removal System, determine the effects on the system and on interrelated systems. (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.3 and 41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 32	Tier #	2	2
K/A Statement: Emergency Core Cooling:	Group #	1	1
Effect of loss or malfunction of: valves	K/A #	006.K6.10	
Proposed Question:	Importance Rating	2.6	2.8

With the plant initially at 100% power, the following sequence of events occurs:

1. Safety Injection actuates.
2. The following two valves fail to automatically reposition on the Safety Injection Signal:
   - RWST TO CHG Valve 3CHS*LCV112E does NOT open.
   - VCT TO CHG Valve 3CHS*LCV112C does NOT close.

Assuming no operator action has been taken, how do the malfunctioning valves affect the suction to the Charging Pumps?

a) The "A" and "B" Charging Pump suctions are aligned to both the RWST and the VCT.

b) The "A" and "B" Charging Pump suctions remain aligned to the VCT. The RWST suction path is isolated.

c) The "A" and "B" Charging Pump suctions are aligned to the RWST. The VCT suction path is isolated.

d) The "A" Charging Pump suction is aligned to the RWST. The "B" Pump suction is aligned to the VCT.

Proposed Answer: C

Explanation (Optional): The Charging Pumps provide High Head Safety Injection to the RCS. On an SIS, the pumps automatically start and their suctions automatically realign to the RWST. The two RWST Suction Valves (3CHS*LCV112D and 112E) receive open signals on a SIS, and the two VCT Suction Valves (3CHS*LCV112B and 112C) receive close signals on a SIS. There is a Train-specific interlock requiring LCV112D to be open prior to LCV112B closing, and LCV112E to be open prior to LCV112 C closing. With LCV112E failing to open, and LCV112C failing to close, the end lineup is RWST Suction Valve 112D open with RWST Suction Valve 112E closed; and VCT Suction Valve 112B closed with VCT Suction Valve 112C open. RWST Suction Valves LCV112D and 112E are in parallel, so both pumps receive suction from the RWST with only one of these valves open ("B" and "D" wrong). VCT Suction Valves LCV112B and 112C are in series, so both pump suctions are isolated from the VCT with only one of these valves closed ("C" correct, "A" wrong). "A", "B", and "D" are plausible, since one valve in each path is open, and one valve in each path is closed.

Technical Reference(s): P&ID 104D (Rev 30-0) (Attach if not previously provided)
Proposed references to be provided to applicants during examination: None
Learning Objective: MC-06289 Given a failure (partial or complete) of the Emergency Core Cooling System, determine the effects on the system and on interrelated systems. (As available)
Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.7, 41.8, and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 33	Tier #	2	2
K/A Statement: Pressurizer Relief/Quench Tank:	Group #	1	1
Design features/interlocks which provide for	K/A #	007.K4.01	
Quench Tank cooling	Importance Rating	2.6	2.9

Proposed Question:

How does Pressurizer Relief Tank (PRT) Drains Outlet Valve 3DGS-AV8031 respond to a changing PRT level, and why?

a) Automatically closes on PRT high level to prevent water discharge into the Gaseous Waste System vent header.

b) Automatically opens on PRT high level to prevent overfilling the PRT, keeping water out of the Pressurizer Safety Valve discharge piping.

c) Automatically closes on PRT low level, to prevent lowering PRT level below the minimum level required to quench and cool influent from the Pressurizer.

d) Automatically opens on PRT low level to allow lowering level below normal band to allow cooling of the PRT after an extended discharge from the Pressurizer to the PRT.

Proposed Answer: C

Explanation (Optional): Considered a KA match since the interlocks associated with the drain valve ensure adequate cooling water exists for a discharge to the PRT, and manual features that allow for draining and filling the PRT to allow manually cooling the tank. 3RCS-AV8031, PRT Drains Outlet Valve functions to prevent lowering PRT level below the minimum (56%) required for the performance of its design basis function of quenching and cooling influent from the Pzr PORVs and Safety Valves. Interlocks prevent opening the valve until PRT level is raised to 82% ("A" wrong), and will cause the valve to automatically close when PRT level lowers to 62% ("B" and "D" wrong). The Operator must take manual action to open the valve when level increases to 82%, and to override the level interlocks if it is desired to drain the PRT below 62% ("C" correct).

Technical Reference(s):
FSAR Section 5.4.11.1, page 5.4-45 (Rev 27.2)
P&ID 102F (Rev 17-0)
P&ID 107A (Rev 27-0)
LSK-32-3A (Rev 7-0)
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05345 Describe the function and location of the following Pressurizer Relief Tank System components… Pressurizer Relief Tank Outlet Valve DGS-AV8031… (As available)

Question Source: Bank #64923

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.3 and 41.7

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 34	Tier #	2	2
K/A Statement: Component Cooling Water:	Group #	1	1
Knowledge of bus power supplies to:	K/A #	008.K2.02	
the CCW pump, including backup	Importance Rating	3.0	3.2

Proposed Question:

The plant is at 100% power, with the "C" RPCCW pump breaker in its normal standby alignment, when the following sequence of events occurs:

1. The "A" RPCCW Pump trips.
2. The crew enters AOP 3561, *Loss of Reactor Plant Component Cooling Water*.
3. As part of the recovery actions, a PEO is dispatched to align the "C" RPCCW pump and heat exchanger to the "A" train.

What local action, if any, needs to be taken at the switchgear?

a) Nothing needs to be done at the switchgear. The "C" RPCCW pump breaker is normally aligned to the "A" train and is already racked up in cubicle 34C10-2.

b) The "C" RPCCW Pump "B" train breaker needs to be racked down, and the "C" RPCCW Pump "A" Train breaker needs to be racked up, since both Trains' breakers are normally installed in their "C" pump breaker cubicles.

c) The "A" RPCCW Pump breaker needs to be racked down from breaker cubicle (34C9-2), and racked up into the "C" RPCCW Pump breaker cubicle (34C10-2).

d) The "C" RPCCW Pump breaker needs to be racked down from its "B" train cubicle (34D9-2), and racked up into its "A" train cubicle (34C10-2).

Proposed Answer: D

Explanation (Optional): The "C" swing pump has one breaker ("C" wrong) that can be racked up in either train ("B" wrong). Normally, the breaker is racked up into the 'B' train cubicle ("A" wrong), so the crew needs to move the breaker to the "A" train cubicle ("D" correct). "A", "B", and "C" are plausible, since two breaker cubicles exist, and the CHS swing pump does not have its own dedicated breaker. It utilizes the associated train's CHS Pump Breaker.

Technical Reference(s): AOP 3561 (Rev 15-0), Att. A, step 6. (Attach if not previously provided)
OP 3330A (Rev 18-9), sections 1.2 and 4.9

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04154 Describe the operation of the Reactor Plant Component Cooling System under the following normal, abnormal, or emergency conditions: A. Normal, at power operations B. Shifting Pumps and Heat Exchangers… (As available)

Question Source: Bank #71204
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 35	Tier #	2	2
K/A Statement: Component Cooling Water:	Group #	1	1
Design features / interlocks for:	K/A #	008.K4.09	
the standby CCW pumps	Importance Rating	2.7	2.9

Proposed Question:

The plant is initially at 100% power in a normal plant alignment.

RCS pressure rapidly drops to 1880 psia.

How, if at all, does the Charging Pump Cooling System (CCE) respond to the event?

a) Both CCE Pumps were already running at the start of the event. The suction and discharge cross-connects CLOSE, to provide train separation.

b) Both CCE Pumps were already running at the start of the event. The suction and discharge cross-connects remain OPEN, ensuring cooling can be provided to both trains from a single CCE Pump.

c) The Standby CCE Pump auto-starts. The suction and discharge cross-connects CLOSE, to provide train separation.

d) The Standby CCE Pump auto-starts. The suction and discharge cross-connects remain OPEN, ensuring cooling can be provided to both trains from a single CCE Pump.

Proposed Answer: C

Explanation (Optional): The normal lineup for the Charging Pump Cooling (CCE) Pumps is one pump running and the other pump in standby, with the suction and discharge cross-connect valves open. The standby CCE Pump auto-starts on a SIS, LOP, or Low Discharge Header Pressure signal. SIS has actuated, since RCS pressure has dropped below the setpoint of 1892 psia, and the SIS signal will start the standby CCE pump, and the suction and discharge cross-connect valves receive train related close signals, resulting in both pumps running with the trains separate into individual flowpaths ("C" correct, "D" wrong). "A" and "B" are plausible, since The Safety Injection Pump Cooling (CCI) System consists of two physically independent cooling loops with a cooling pump for each SIH pump. Also, at 100% power, two RPCCW Pumps and two TPCCW Pumps are normally running. "D" is plausible, since the standby pump auto starts, and some ECCS alignments allow for a single pump to supply both trains during a SIS, specifically, the RHR Pump and SIH Pump discharges remain cross-tied to allow one pump to supply both trains in the event of a failure of one pump to start.

Technical Reference(s): P&ID 105A (Rev 23-0) (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-00155 Describe the operation of the controls and interlocks associated with the following Charging Pump Cooling System components… Charging Pump Cooling Pumps… Charging Pump Cooling System Cross-connect Valves (As available)

Question Source: Bank #65121

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7 and 41.8

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 36	Tier #	2	2
K/A Statement: Pressurizer Pressure Control:	Group #	1	1
Operational implications of: constant enthalpy	K/A #	010.K5.02	
expansion through a valve	Importance Rating	2.6	3.0

Proposed Question:

An earthquake occurs, resulting in the following failures:

- The "C" Steam Generator is faulted.
- The "A" PZR Safety Valve sticks slightly open.

The following plant conditions currently exist:

- RCS pressure is stable at 1600 psia.
- Core Exit Thermocouple temperature is 341°F.
- The PRT pressure is 30 psia.

What should tail pipe temperature currently be indicating for the Pressurizer Safety Valve?

a) 212°F

b) 250°F

c) 341°F

d) 400°F

Proposed Answer: B

Explanation (Optional): This question is based on the lessons learned from the Three Mile Island Event. Steam passing through a valve is a constant enthalpy process. Pressure downstream of the safety valve is at PRT pressure (30 psia). From the Mollier diagram, a constant enthalpy process from 1600 psia to 30 psia leads to saturated steam at 30 psia, and from the steam tables, saturation temperature for 30 psia is 250°F ("B" correct, "A", "C", and "D" wrong). "A" is plausible, since this is the saturation temperature of water at atmospheric temperatures, but PRT pressure is elevated. "C" is plausible, since this is the temperature of the CETCs, which is the temperature of the water being transported into the RCS Hot Legs. "D" is plausible, since this is the upper end of the meter scale on MB4, which is below saturation temperature for current RCS pressure, which is the temperature of the water/steam in the Pressurizer.

Technical Reference(s): Steam Tables (Attach if not previously provided)

Proposed references to be provided to applicants during examination: **Steam Tables**

Learning Objective: MC-04914 OUTLINE the unique characteristics of a Pressurizer Vapor Space LOCA. (As available)

Question Source: Modified Bank #68331
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.14
Comments:
Original Bank Question #68331 is included on the following page. Question is considered modified since RCS pressure, RCS temperature, and PRT temperature have been changed. Also, distractors "C" and "D" have been changed.

Original Bank Question #68331

The following plant conditions exist:

- The "A" PZR Safety Valve has been stuck slightly open for the past 10 minutes.
- RCS pressure is stable at 2000 psia with all pressurizer heaters energized.
- Core Exit Thermocouple temperature is 617°F
- The PRT pressure is 50 psia.

What temperature should the tail pipe temperature indication for pressurizer safety valve "A" read?

a) 212°F

b) 281°F

c) 617°F

d) 636°F

Correct answer = B

Examination Outline Cross-reference:	Level	RO	SRO
Question # 37	Tier #	2	2
K/A Statement: Reactor Protection: Knowledge of bus power supplies to: RPS channels, components, and interconnections	Group #	1	1
	K/A #	012.K2.01	
	Importance Rating	3.3	3.7

Proposed Question:

With the plant at 100% power, VIAC 2 loses power.

What are two effects the loss of VIAC 2 has on the Reactor Protection (RPS) System?

a) All Protection Set 2 Reactor Trip bistables fail to their tripped condition.
Associated instruments fail, potentially requiring manual control of some controllers.

b) All Protection Set 2 Reactor Trip bistables fail to their tripped condition.
All RPS Train B slave relays revert to their backup power supply.

c) The Protection Set 2 power supply automatically reverts to its backup 48 Volt Power Supply.
Associated instruments fail, potentially requiring manual control of some controllers.

d) The Protection Set 2 power supply automatically reverts to its backup 48 Volt Power Supply.
All RPS Train B slave relays revert to their backup power supply.

Proposed Answer: A

Explanation (Optional): Each of the two Trains of RPS contains 4 Protection Sets, with each powered by its own VIAC. Each of the two Trains of RPS receives power from the two train-related VIACs. Train "B" receives power from VIAC 2 and VIAC 4. They each provide redundant power to a 48V power supply, and to a 15V power supply. Since VIAC 4 is still providing power, "B" Train RPS is still energized. VIAC 2 also provides the only source of power for Train "B" RPS slave relays. So, on loss of VIAC 2, Protection Set 2 loses power in both trains of RPS, and the Train "B" RPS slave relays lose power ("B" and "D" wrong). When Protection Set 2 loses power, it sends a "trip" signal from each associated bistable to the RPS logic cabinet ("C" wrong). VIAC 2 also supplies power to the channel 2 instruments, creating faulty inputs to controllers selected to channel 2 (A" correct). "C" and "D" are plausible, since there are two internal 48-volt power supplies in each RPS protection set. "C" is plausible, since the Master Relays have backup power.

Technical Reference(s): AOP 3564 (Rev 10-0) Entry Conditions (Attach if not previously provided)
SSPS Power Distribution Training RPS Figure 5 (Rev 04-0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05497 Describe the operation of the RPS under the following… Loss of Power… (As available)

Question Source: Bank #80881
Question History: Millstone 3 2007 NRC Exam
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 38	Tier #	2	2
K/A Statement: Reactor Protection:	Group #	1	1
Effect of loss or malfunction of bypass-block circuits on RPS	K/A #	012.K6.04	
	Importance Rating	3.3	3.6

Proposed Question:

The plant is in MODE 5 with initial conditions as follows:

- Only the "B" RCP running.
- The Pressurizer is solid.

Turbine First Stage Pressure Transmitter 3MSS-PT505 fails high.

Which "First Out" annunciator will illuminate on MB4 due to this failure?

a) STEAM LINE PRESSURE LO ISOL SI

b) PRESSURIZER WATER LEVEL HI

c) TURBINE TRIPPED

d) ONE LOOP RCS FLOW LO

Proposed Answer: B

Explanation (Optional): Turbine first stage (impulse) pressure failing high will provide input to the RPS trip-block permissive circuitry that the Turbine is on line. Initially, Permissive P-13 is receiving the required 2/2 detectors indicating the turbine is off line. When PT505 fails high, P-13 will change state. P-13 inputs to P-7, and since P-7 requires 2 / 2 inputs from P-10 (Reactor at power) and P-13 (Turbine at power) to determine the plant is not at power, the state of P-7 changes. P-7 blocks the following trips with the plant off line: Low Pzr Pressure, Low RCP Shaft Speed, Low RCS flow (two or more loops), and High Pzr Level ("B" correct). "A" is wrong, but plausible, since this is affected by P-11, which is based on RCS pressure. "C" is wrong, but plausible, since this is affected by P-9, which is based on low NIS power. "D" is wrong, but plausible, since this is based on P-8, which is based on NIS power. "A", "C", and "D" are plausible, since all of these trips are normally disabled in MODE5, but enabled at 100% power.

Technical Reference(s): Functional Sheet 4 (Rev G) (Attach if not previously provided)
Functional Sheet 5 (Rev K)
Functional Sheet 6 (Rev J)
Functional Sheet 7 (Rev M)
Functional Sheet 16 (Rev L)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05493 Describe the operation of the following RPS controls and interlocks…
ESF Actuation Signals… P-7… P-8… P-9…P-10… P-11… P-13… (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 39	Tier #	2	2
K/A Statement: Engineered Safety Features	Group #	1	1
Actuation: Predict impact / mitigate:	K/A #	013.A2.02	
excess steam demand	Importance Rating	4.3	4.5

Proposed Question:

A steam break occurs on the "A" SG, resulting in the following sequence of events:

1. The crew enters E-1, *Loss of Reactor or Secondary Coolant*.
2. The crew reaches E-1, step 9, "Check RCS and SG Pressures."
3. Since the "A" SG pressure is still decreasing, the crew is directed to return to E-1, step 1.

Per the WOG Background Document, why is it important that the operators do NOT proceed past E-1, Step 9 with the "A" SG depressurizing?

a) The crew would be directed to transition to ES-1.2, *Post LOCA Cooldown and Depressurization*, where unnecessarily restrictive SI Termination Criteria would be encountered.

b) E-1 provides no guidance for faulted steam generator isolation past this point.

c) The RCS cooldown rate must be under operator control in order for subsequent E-1 steps to be effectively implemented.

d) The crew would be directed to transition to ES-1.3, *Transfer to Cold Leg Recirculation*, and aligning for cold leg recirculation is not desired for a steam line break.

Proposed Answer: A

Explanation (Optional): E-1 is designed to handle a loss of reactor or secondary coolant. The proper mitigation strategy for a faulted SG is to exit E-1 at step 6, transitioning to ES-1.1, where the crew will be directed to terminate SIS in a fairly rapid fashion, since ECCS is injecting into an intact RCS, resulting in a solid Pressurizer and water relief through the Pzr PORVs unless SIS is promptly terminated. However, if a LOCA exists, the crew will proceed ahead in E-1 and transition to either ES-1.2 for a small break, where the operators will be directed to cooldown the plant ("C" wrong, but plausible) or ES-1.3 for a large break ("D" wrong, but plausible). "A" is correct, since, per the background document, "If the operator proceeds past Step 10 in E-1 with a depressurizing SG, he could be directed to ES-1.2, *Post LOCA Cooldown And Depressurization*, and encounter more restrictive SI termination criteria than necessary." "B" is wrong, but plausible, since the steps in E-1 past step 9 assume a LOCA, not a fault, but the E-1 foldout page contains guidance for a faulted SG, and the foldout page is in effect throughout the procedure.

Technical Reference(s): WOG Bkgd Doc (Rev 2) for E-1, step 9 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04362 Discuss the basis of major procedure steps and/or sequence of steps in EOP 35 E-1 (As available)

Question Source: Bank #70254

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.10

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 40	Tier #	2	2
K/A Statement: Containment Cooling:	Group #	1	1
Knowledge of: abnormal condition procedures	K/A #	022.GEN.2.4.11	
Proposed Question:	Importance Rating	4.0	4.2

With the plant initially at 100% power, the following sequence of events occurs:

1. The following two annunciators illuminate on MB2:
   - CONTAINMENT ISOLATION PHASE A
   - GP 2 ESF STATUS CMPNT OFF NORMAL
2. The RO reports SIS has NOT actuated.
3. The crew enters AOP 3578, *Response to Inadvertent Containment Isolation Phase A*.
4. The crew successfully resets CIA.
5. The crew is currently performing AOP 3578, step 7, "Restore RPCCW System to Normal."

Per AOP 3578, step 7, what are two verifications the crew WILL be required to perform at MB1 and/or VP1 that are NOT expected to require manual action as part of the restoration?

a) Verify the CDS Chillers automatically restart, and verify the "C" CAR Fan is running.

b) Verify the CDS Chillers automatically restart, and verify the CDS to Ctmt Air Recirc Valves are open.

c) Verify the "C" CAR Fan is running, and verify the RPCCW to Ctmt Air Recirc Valves are closed

d) Verify the RPCCW to Ctmt Air Recirc Valves are closed, and verify the CDS to Ctmt Air Recirc Valves are open.

Proposed Answer: A

Explanation (Optional): AOP 3578 directs the crew to recover from the CIA by referring to OP 3330C, which has the crew CLOSE the RPCCW to Ctmt Air Recirc Valves ("C" and "D" wrong, but plausible), OPEN the CDS CTMT CTVs, and OPEN the CDS to CAR Valves ("B" wrong, but plausible). "A" is correct; since step 7 verifies the CDS Chillers restart automatically, and verifies the "C" CAR Fan is running, without directing any action to be taken other than the verification (unless a problem is discovered, per the RNO column).

Technical Reference(s):	AOP 3578 (Rev 03-0), step 7 OP 3330C (Rev 10-3), steps 4.2.2 and 4.2.7	(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective:	MC-04154 Describe the operation of the Reactor Plant Component Cooling System under the following… Sequenced Safeguards Signal actuation.	(As available)

Question Source: New
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.4, 41.7, and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 41	Tier #	2	2
K/A Statement: Containment Spray:	Group #	1	1
Effect of a loss of malfunction will have on:	K/A #	026.K3.02	
recirc spray system	Importance Rating	4.2	4.3

Proposed Question:

The plant has been operating at 100% power when a large break LOCA occurs.

T=0: The Reactor trips and Safety Injection actuates.
T+6 minutes: CDA actuates.
T+6 minutes: Both Quench Spray pumps FAIL to automatically or manually start.
T+16 minutes: The crew transitions to EOP 35 FR-Z.1, *Response to High Containment Pressure*.
T+17 minutes: A PEO is dispatched to the ESF building to realign RSS pump "C", using FR-Z.1, Attachment "B".

FR-Z.1, Attachment "B" will align the "C" RSS pump to take a suction on the ___(1)___ and discharge to the___(2)___.

	(1)	(2)
a)	CTMT Sump	RSS CTMT Spray Ring
b)	CTMT Sump	QSS CTMT Spray Ring
c)	RWST	RSS CTMT Spray Ring
d)	RWST	QSS CTMT Spray Ring

Proposed Answer: C

Explanation (Optional): With no Quench Spray Pump running, steam is not being condensed as effectively in CTMT, and RWST water is not being sprayed into CTMT. So CTMT sump level may be inadequate for taking a suction on the CTMT sump. Attachment B of FR-Z.1 will align the selected RSS pump to take a suction on the RWST ("A" and "B" wrong) and discharge through its CTMT spray ring ("C" correct, "D" wrong), effectively converting the selected RSS pump into a QSS pump. "A" and "B" are plausible, since the RSS System is designed to take a suction on the CTMT Sump during an accident, and the RCS inventory has been discharged to CTMT. "D" is plausible, since backup alignments are being made, and the QSS spray ring is not in use by QSS during this event, and there are 2 RSS and 2 QSS Spray Rings.

Technical Reference(s): FR-Z.1 (Rev 17-0), Att. B (Attach if not previously provided)
P&ID 112C (Rev 38-0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04667 DESCRIBE the Major Action Categories within EOP 35 FR-Z.1 (As available)

Question Source: Bank #73487
Question History: Millstone 3 2000 NRC Exam
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.3 and 41.8
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 42	Tier #	2	2
K/A Statement: Main and Reheat Steam:	Group #	1	1
Monitor automatic operation of: isolation of the MRSS	K/A #	039.A3.02	
Proposed Question:	Importance Rating	3.1	3.5

Current conditions:

- RCS temperature is 557°F.
- Pressurizer pressure is 2250 psia.

Which of the following valves, if initially open, would remain open upon receipt of a Main Steam Isolation (MSI) signal?

a) The Atmospheric Relief Valves

b) The Atmospheric Relief Isolation Valves

c) The Main Steamline Upstream Drain Valves

d) The TDAFW Steam Supply Upstream Drain Valves

Proposed Answer: B

Explanation (Optional): On an MSI, the following valves close:
- The MSIVs
- The MSIV Bypass Valves
- The Atmospheric Relief Valves ("A" wrong)
- The MSS Upstream Drains ("C" wrong)
- The TDAFW Pp Steam Supply Upstream Drains ("D" wrong)

"B" is correct, since the Atmospheric Relief Isolation Valves do not automatically close on an MSI. "A", "C", and "D" are plausible, since all four groups of valves are part of the Main Steam (MSS) System, all four groups of valves are capable of discharging steam from the MSS System, and none of the choices directly isolate the Main Steam Lines (MSIVs and MSIV Bypass Valves).

Technical Reference(s):	P&ID 123B (Rev 26-0)	(Attach if not Previously provided)
	P&ID 123D (Rev 14-0)	
	P&ID 123E (Rev 25-0)	
	P&ID 145A (Rev 44-0)	

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05005 Describe the operation of the Main Steam System under the following normal, abnormal, and emergency conditions… Receipt of a Main Steam Isolation Actuation Signal… (As available)

Question Source: Bank #69243
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.4 and 41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 43	Tier #	2	2
K/A Statement: Main Feedwater:	Group #	1	1
Design features / interlocks which: control	K/A #	059.K4.05	
speed of MFW pump turbine	Importance Rating	2.5	2.8

Proposed Question:

Which one of the following parameters provides an input to the TDMFW Pump speed control circuit?

a) Total feed flow

b) Total steam flow

c) SG Narrow Range level

d) Program SG Narrow Range level

Proposed Answer: B

Explanation (Optional):

Inputs to Pump Speed are ("A", "C", and "D" wrong):
- Total Steam Flow ("B" correct)
- Steam Header Pressure
- Feed pump discharge pressure
- Program Feed-Steam DP

"A", "B", and "D" are plausible, since each of these parameters inputs to the SGWLC circuit

Technical Reference(s): Functional Sheet 13 (Rev K) (Attach if not previously provided)
P&ID 123F (Rev 08-0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04660 DESCRIBE the operation of the following… Steam Generator Water Level Control Systems Controls & Interlocks… Turbine Driven Main Feed Pump Master Speed Controller … (As available)

Question Source: Bank #69634
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 44	Tier #	2	2
K/A Statement: Main Feedwater:	Group #	1	1
Predict / monitor parameters associated with:	K/A #	059.A1.07	
operating controls for feed pump speed	Importance Rating	2.5	2.6

Proposed Question:

A downpower is in progress, and current conditions are as follows:

- The plant is at 50% power.
- The hydraulic jack switches (MB5) for both Turbine Driven Main Feed Pumps (TDMFPs) are in their normal "OFF" (solenoid de-energized) position.

The operator attempts to control "A" TDMFP speed using the Manual Speed Control (pistol grip) switch.

How will "A" TDMFP speed respond?

a) Speed can be controlled only at speeds below the EAP speed setting.

b) Speed can be controlled only if the EAP is at its high-speed stop (HSS).

c) Speed can be controlled only if the hydraulic jack is placed in ON.

d) Speed can be controlled over the entire operating range.

Proposed Answer: A

Explanation (Optional): The EAP Controller and the Manual Speed Changer are both in effect, with feed pump speed being maintained by whichever controller set for the lower speed. In order for the NUS EAP controller to fully control its pilot valve, the manual speed changer is required to be positioned at its High Speed Stop. If the manual speed changer is not at the HSS, the control with the NUS is limited at the high end at which the manual speed changer is set ("A" correct, "B" and "C" wrong). The manual speed changer controller is normally utilized during the turbine startup and shutdown operations ("D" plausible). During normal turbine operation, the speed changer motor is normally maintained at its High Speed Stop so that the NUS will be able to control turbine speed ("B" plausible). Energizing the hydraulic jack solenoid valve forces the NUS controller to its high speed stop and allows full speed control to be performed by the Manual Speed Controller ("D" wrong, "C" plausible).

Technical Reference(s): OP 3353.MB5C (Rev 05-0), 4-6 (Attach if not previously provided)
OP 3321 (Rev. 20-0), step 4.3.38

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07219 Describe the operation of the following Main Feedwater Systems Controls & Interlocks… Turbine Driven Main Feed Pump Manual Speed Controllers (TFC-M1A/B) Turbine Driven Feed Pump Speed Controllers (FWS-SK46A/B) Turbine Driven Main Feed Pump Hydraulic Jack (As available)

Question Source: Bank #69632

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 45	Tier #	2	2
K/A Statement: Auxiliary/ Emergency Feedwater:	Group #	1	1
Operational implications of: decay heat sources	K/A #	061.K5.02	
and magnitude	Importance Rating	3.2	3.6

Proposed Question:

Initial conditions:

- The reactor has been operating at 100% power for several months.
- The TDAFW Pump is tagged out for maintenance.

The following sequence of events occurs:

1. A reactor trip occurs.
2. The BOP reports the AFW status as follows:
   - The "A" MDAFW Pump is feeding 250 gpm each to the "A" and "D" SGs.
   - The "B" MDAFW Pump is discharging only to the "B" SG, at 250 gpm.
3. The crew enters ES-0.1, *Reactor Trip Response*.
4. Twenty minutes after the trip, the BOP is maintaining RCS Tcold stable with 530 gpm total AFW flow.
5. A PEO reports a mild rubbing sound coming from the "A" MDAFW pump.

Assuming that the "B" MDAFW pump can feed 250 gpm to the "B" SG only, what is the earliest time period post-trip within which the crew can stop the "A" MDAFW pump and still remove all decay heat with the "B" MDAFW Pump?

a) ½ to 1 hour

b) 4 to 8 hours

c) 1 to 2 days

d) 4 to 8 days

Proposed Answer: B

Explanation (Optional): Per GFS thumbrules, decay heat one second after a trip is 6% power, one minute after a reactor trip is 3%, and after one hour it is 1.5%, and after one day it is 0.75%. Consequently after one day the existing decay heat is approximately one quarter of its value following the trip. The BOP is able to maintain Tcold stable after 20 minutes with 530 gpm AFW flow. AFW is designed to remove 5% decay heat, and is normally capable of delivering 1200 gpm total flow, which means about 240 gpm is needed per % power (In the case above, after 20 minutes decay heat would be roughly 2%, and 530 gpm is removing this heat). So, 250 gpm is capable of removing roughly 1% decay heat. Per the thumbrule, decay heat would be 1% after approximately 4 hours ("B" correct, "A", "C", and "D" wrong). "A", "C", and "D" are plausible, since decay heat removal is required for the long-term after a trip, and decreases in a logarithmic fashion.

Technical Reference(s): ECA-1.1 (Rev 17-0), Att. A (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04637 DESCRIBE the major administrative & procedural precautions & limitations placed on the operation of the Auxiliary Feedwater System, & the basis for each. (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.1, 41.5, 41.8, and 41.14
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 46	Tier #	2	2
K/A Statement: AC Electrical Distribution:	Group #	1	1
Manually operate / monitor all breakers	K/A #	062.A4.01	
(including switchyard) in the control room	Importance Rating	3.3	3.1

Proposed Question:

Complete the following statement concerning remote monitoring and closing capability for the 345KV Switchyard breakers:

The Millstone 3 Control Room has the capability to ______(1)_______the breakers, and CONVEX has the capability to______(2)_______ the breakers.

	(1)	(2)
a)	only monitor	close and monitor
b)	only monitor	only monitor
c)	close and monitor	close and monitor
d)	close and monitor	only monitor

Proposed Answer: A

Explanation (Optional): None of the breakers can be closed from the Millstone 3 Control Room ("C" and "D" wrong). All of the breakers can be closed from CONVEX ("A" correct, "B" wrong). "C" and "D" are plausible, since Millstone 2 can control the two breakers associated with their unit's Main Generator, and Millstone 3 has indication of breaker position for all of the breakers at MB8. "B" is plausible, since the switchyard breakers can be operated locally.

Technical Reference(s): FSAR (Rev 28), page 8.1-3 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03314 - Describe the operation of 345 kv distribution system controls and interlocks… Breaker and mod control… (As available)

Question Source: Bank #68082
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.5
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 47	Tier #	2	2
K/A Statement: AC Electrical Distribution:	Group #	1	1
Predict impact / mitigate improper sequencing	K/A #	062.A2.03	
when transferring to or from an inverter	Importance Rating	2.9	3.4

Proposed Question:

The plant is at 100% power, and initial conditions are as follows:

- VIAC 2 is on the alternate source via the Static Switch.
- Inverter 2 is being returned to service.
- A PEO has been dispatched to energize Inverter 2 and then transfer VIAC 2 from the Alternate AC Source to the Inverter per OP 3345B, *120 Volt Vital Instrument AC*.

The following sequence of events occurs:

1. Due to a placekeeping error, the PEO inadvertently skips the step to close the Inverter 2 AC Input Breaker.
2. The PEO completes the transfer by selecting "Inverter to Load" on the Static Switch without noticing the skipped step.

VIAC 2 is currently___________________________.

a) de-energized

b) energized from DC Bus 2

c) energized from MCC 32-2U

d) energized from MCC 32-2W

Proposed Answer: B

Explanation (Optional): VIAC 2 is initially receiving power from the alternate source via the Static Switch, which is located at the output of Inverter 2. The PEO is transferring power back to the normal source -- Inverter 2. Part of this alignment is to energize Inverter 2 from the DC Source -- DC Bus 2, and the AC Source -- MCC 32-2U. If the procedure were carried out correctly, Inverter 2 would rectify the 480VAC to 140VDC, and invert this to 120VAC, which would supply VIAC 2 via the Static Switch. The backup source of Inverter power would be DC Bus 2, which supplies Inverter 2 downstream of the rectifier via a blocking diode, at a lower voltage (135VDC) than the output of the rectifier. The alternate source (which is supplied from MCC 32-2W via a step-down transformer) is also available after the swap ("D" plausible). The procedure step the PEO skipped would have placed MCC 32-2U in service, supplying the rectifier ("C" plausible). So, the PEO's actions energized the Inverter from DC Bus 2, and then failed to supply the rectifier from MCC 32-2U ("A" plausible). The PEO then selected "Inverter to Load", which transferred VIAC 2 from alternate source to the Inverter, which is being powered from DC Bus 2 ("B" correct, "A" and "C", and "D" wrong).

Technical Reference(s): OP 3345B (Rev 11-2), Sections 4.9 and 4-12 (Attach if not previously provided)
EE-1BA (Rev 31-0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05009 Describe the Operation of 120 VAC Distribution System Controls and Interlocks A. Static Transfer Switch Operation B. Bypass Line Regulator C. Manual Bypass Switch D. Inverter Indication and Control (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.7 and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 48	Tier #	2	2
K/A Statement: DC Electrical Distribution:	Group #	1	1
Monitor automatic operation of: meters,	K/A #	063.A3.01	
annunciators, and indicating lights	Importance Rating	2.7	3.1

Proposed Question:

With the plant initially at 100% power, the following sequence of events occurs:

1. Offsite Power is lost.
2. Both EDGs automatically start and load as expected.
3. The BOP Operator is monitoring 125 DC Bus voltages on MB8.

Assuming the batteries' outputs are 125VDC, what approximate voltage will the BOP Operator observe on DC buses 2 and 6?

a) DC Bus 2: 140 VDC
   DC Bus 6: 135 VDC

b) DC Bus 2: 140 VDC
   DC Bus 6: 125 VDC

c) DC Bus 2: 135 VDC
   DC Bus 6: 135 VDC

d) DC Bus 2: 135 VDC
   DC Bus 6: 125 VDC

Proposed Answer: D

Explanation (Optional): 140 Volts is the normal output of the rectifiers that feed the inverters from 480VAC. 135VDC is the approximate output of a battery charger, and 125V is the approximate output of the battery ("A", "B", and "C" plausible). On a loss of power, all non-emergency 480 Volt busses deenergize, and MCC 32-3T automatically strips, since it feeds non-emergency loads, even though powered from emergency Load Center 32T ("A" and "C" plausible). Inverter 2 still has its rectifier input from 32-2U, so its voltage is 140 volts ("A" and "B" plausible), but there is a blocking diode in the line to the inverter from the 125 VDC bus. DC Bus 2 is fed from a charger from MCC 32-2U which still has power, so its voltage is 135 Volts ("A" and "B" wrong). DC Bus 6 has lost both of its chargers, which are supplied from MCC 32-3T, so Battery 6 automatically starts to discharge, supplying DC bus 6 with 125 VDC ("D" correct, "C" wrong).

Technical Reference(s): EE-1BA (Rev 31-0) and EE-1U (Rev 19-0); FSAR (Rev 27-2) Page 8.3-3; OP 3345C (Rev 16-10), Prerequisite 2.1.2 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03308 Describe the 125 VDC distribution system operation under normal, abnormal, and emergency … Loss of off-site power (As available)

Question Source: New

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7 and 41.8

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 49	Tier #	2	2
K/A Statement: Emergency Diesel Generator:	Group #	1	1
Monitor automatic operation of: number of starts	K/A #	064.A3.04	
available with an air compressor	Importance Rating	3.1	3.5

Proposed Question:

Initial Conditions:

- The plant is at 100% power.
- "A" EDG Starting Air Receiver (3EGA*TK2A) Outlet Valve 3EGA-V16 has been inadvertently closed.

The following sequence of events occurs:

1. Offsite power is lost.
2. Both EDGs start and restore power to 34C and 34D.
3. The "A" EDG trips shortly after the successful starting.
4. The crew attempts to re-start the "A" EDG.

Assume all electrical interlocks are met. Based on starting air capacity under present conditions, how will the "A" EDG respond to this start attempt with 3EGA-V16 still shut?

a) The "A" EDG will NOT start.

b) The "A" EDG will only start if "A" EDG starting air compressor 3EGA-C1A has power.

c) The "A" EDG will only start if "A" EDG Start Air Cross-Connect Valve 3EGA*V20 is open.

d) The "A" EDG will start with the remaining air receiver as a source of starting air.

Proposed Answer: D

Explanation (Optional): Each EDG is provided with a dedicated air starting system consisting of two full capacity subsystems. Each subsystem includes a motor-driven air compressor, an air dryer, an air receiver, an air start solenoid, an air start valve, an air distributor and a complete instrumentation and control system to provide pressurized air to one bank of seven cylinders. Each subsystem is capable of starting the engine five times from an initial receiver pressure of 425 psig without recharging the receiver ("D" correct, "A", "B", and "C" wrong). The air start system (both subsystems operating in parallel) is able to crank the diesel engine to the manufacturer's recommended rpm and enables the generator to reach voltage and frequency and begin load sequencing within 11 seconds. "A" is plausible, since one air receiver tank is isolated, and the remaining air receiver has undergone one start of the EDG already. "B" is plausible, since this compressor recharges the available air receiver. "C" is plausible, since if the cross-tie valve were open, starting air would be sent to the EDG via both of the redundant start-air paths.

Technical Reference(s): P&ID 116B (Rev 39-0) (Attach if not previously provided)
FSAR Section 9.5.6.1 (Rev 24.1)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04395 Describe the function and location of the following Emergency Diesel Generator (and Support) system components… Air systems… (As available)

Question Source: Bank #72389

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.7 and 41.8

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 50	Tier #	2	2
K/A Statement: Process Radiation Monitoring:	Group #	1	1
Effect of a loss of malfunction on:	K/A #	073.K3.01	
radioactive effluent releases	Importance Rating	3.6	4.2

Proposed Question:

With the plant initially at 100% power, a SG Tube leak occurs.

The Turbine Building Floor Drain Sump Rad Monitor (3DAS-RE50) goes into ALARM due to high radiation.

To where will the Turbine Building Floor Drains Sump Pumps automatically divert as a result of the alarming radiation monitor?

a) The TPCCW Sump.

b) The Condensate Demin Waste Neutralizing Sump.

c) The High Level Waste Drain Tanks.

d) The Low Level Waste Drain Tanks.

Proposed Answer: A

Explanation (Optional): The Turbine Building Floor Drains Sump normally discharges to the yard drains system. "A" is correct, and "B", "C", and "D" wrong, since RE50 diverts flow to the TPCCW sump on hi rad levels, terminating the release. "B" is plausible, since Radiation Monitor 3CND-07 diverts to the Condensate Demin Waste Neutralizing Sump on high radiation. "C" and "D" are plausible, since the TPCCW sump is normally aligned to the Liquid Waste System, and can be manually aligned to either of these tanks.

Technical Reference(s): AOP 3573 (Rev 20-0), Att A, page 4 of 12 (Attach if not previously provided)
P&ID 106C (Rev 46-0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05293 Describe the operation of the following Radiation Monitors controls and interlocks… DAS-RE50 (As available)

Question Source: Bank #85261
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.11 and 41.13
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 51	Tier #	2	2
K/A Statement: Service Water:	Group #	1	1
Knowledge of bus power supplies to: service water	K/A #	076.K2.01	
Proposed Question:	Importance Rating	2.7	2.7

The plant is at 100% power, and initial conditions are as follows:

- The crew has just started the "C" Service Water Pump (3SWP*P1C) and stopped the "A" Service Water Pump on the "A" Train.
- At 4KV Bus 34C, the "Lead/Follow" switch is still selected to "A-Lead/C-Follow", since the PEO has NOT yet been dispatched to operate the switch.
- All Service Water Pumps are in "AUTO".

A Loss of off-site power occurs.

One minute later, what is the status of the "A" Train Service Water Pumps?

a) NEITHER 3SWP*P1A nor 3SWP*P1C are running.

b) 3SWP*P1A IS running, but 3SWP*P1C IS NOT running.

c) 3SWP*P1A IS NOT running, but 3SWP*P1C IS running.

d) BOTH 3SWP*P1A and 3SWP*P1C are running.

Proposed Answer: B

Explanation (Optional): When a LOP occurs, all 4KV loads are stripped except Load Centers and Charging Pumps. A manual start block is inserted, and all SWP Pumps remain off until the LOP start signal is generated at about 20 seconds into the event ("A" plausible). The sequencer then loads the bus based on the event in progress. The Lead SWP will automatically start on an SIS, CDA, or LOP ("A" and "C" wrong). The Follow SWP will automatically start when SIS, CDA, or LOP is present, only if the Lead SWP is not running after a 0.5 second time delay to allow the lead pump breaker to close first ("B" correct, "D" wrong). Any SWP Pump that has its MB1 control switch in AUTO-after-STOP (normally the "follow" Pump) will automatically start with Service Water Header Pressure Lo-Lo at 26 psig on that Train's common discharge header (3SWP*PS27A/B) in the SWP pump cubicles as long as an LOP signal is NOT present (the Lo-Lo discharge auto start feature of the pump in AUTO-after STOP is bypassed with a LOP signal present). "C" and "D" are plausible, since there is a disagreement between which pump is the lead pump and which pump is in AUTO-AFTER-START.

Technical Reference(s): LSK 24-9.4A (Rev 12-0) (Attach if not previously provided)
LSK 24-9.4J (Rev 08-0)
LSK 9-10H (Rev 13-0)
LSK 9-10J (Rev 13-0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03337 Describe the 4kV Distribution System operation under normal, abnormal and emergency conditions… LOP sequence of operations… (As available)

Question Source: Bank #76268
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 52	Tier #	2	2
K/A Statement: Service Water:	Group #	1	1
Manually operate / monitor SWS valves	K/A #	076.A4.02	
in the control room	Importance Rating	2.6	2.6

Proposed Question:

Initial conditions:

- The plant is in MODE 3.
- The crew is preparing to start the "A" Train of Service Water per OP 3326, *Service Water System*,

The RO starts the "A" SWP Pump.

Which one of the following valves will the RO be required to manually open from MB1 as part of placing the "A" SWP Train in its normal lineup?

a) "A" Service Water Pump Discharge Valve 3SWP*MOV102A

b) "A" Service Water Pump Strainer Backwash Valve 3SWP*MOV24A

c) "A" SWP TPCCW Header Supply Valve 3SWP*MOV71A

d) "A" SWP EDG Header Outlet Valve 3SWP*AOV39A

Proposed Answer: C

Explanation (Optional): Upon starting the "A" SWP Pump, the RO will ensure 3SWP*MOV102A and 3SWP*MOV24A have automatically opened at MB1 ("A" and "B" wrong, but plausible). The RO will then manually align Train A SWP to TPCCW by opening 3SWP*MOV71A from Main Board 1 ("C" correct). Then, the crew will vent the "A"EDG SWP supply piping by cycling a manual valve locally, but will not be directed to open 3SWP*AOV39A, since its normal standby position is closed in AUTO ("D" wrong). "D" is plausible, since this valve needs to be open when the "A" EDG is running, and can be manually operated from Main Board 1.

Technical Reference(s):	OP 3326 (Rev 24-8), steps 4.1.11, 4.1.13, and 4.1.17 OP 3326-007 (Rev 04-1), page 2 of 2	(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective:	MC-05718 Describe the operation of the Service Water System under the following normal, abnormal, and emergency conditions: A. System startup…	(As available)

Question Source: New
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.7, 41.8, and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 53	Tier #	2	2
K/A Statement: Instrument Air:	Group #	1	1
Knowledge of how AOPs are used in conjunction	K/A #	078.GEN.2.4.8	
with EOPs	Importance Rating	3.8	4.5

Proposed Question:

With the plant initially at 100% power, the following sequence of events occurs:

1. The crew enters AOP 3562, *Loss of Instrument Air* due to lowering IAS pressure.
2. IAS pressure starts decreasing at a more rapid rate, and the crew is preparing to trip the reactor.

The SM is considering how the crew will implement E-0, *Reactor Trip or Safety Injection*, ES-0.1, *Reactor Trip Response*, and AOP 3562 to mitigate the event after the reactor is tripped.

Which of the following procedure implementation strategies is the crew allowed to carry out in this situation?

a) Prior to entering E-0, the US directs the RO by reading out-loud the step of AOP 3562 that operates Pzr heaters, assisting with RCS pressure control. Later, the remaining actions of AOP 3562 are performed in parallel with ES-0.1.

b) The US hands AOP 3562 to the extra senior licensed operator, who directs the BOP by reading out loud the steps of AOP 3562 while the US directs the RO to perform the immediate actions of E-0, and then transitions to ES-0.1.

c) After exiting E-0, the US directs the RO and the BOP by reading out-loud all of AOP 3562. After the crew completes all of AOP 3562, dealing with the loss of air, the crew then enters ES-0.1.

d) After exiting E-0, the US directs the RO and the BOP by reading out-loud steps from ES-0.1 and AOP 3562 in parallel. Only the steps of AOP 3562 that are necessary to ensure success of ES-0.1 are performed, without completing all of AOP 3562.

Proposed Answer: D

Explanation (Optional): It is acceptable to perform the actions of an AOP in parallel with an ERG derived EOP ("A", "B", and "C" plausible) provided the actions of the ERG-derived procedure receives priority ("C" wrong) and the actions of the AOP are not initiated before completing all immediate actions of the ERG derived procedure ("A" and "B" wrong). It is not necessary to perform all steps in the parallel procedure. Only those steps necessary to ensure success of the ERG derived procedure need to be performed ("D" correct).

Technical Reference(s): OP 3272 (Rev 08-13), Section 1.7 (Attach if not previously provided)
Proposed references to be provided to applicants during examination: None
Learning Objective: MC-04455 Describe the usage of abnormal operating procedures while in the emergency operating procedure network. (As available)
Question Source: Bank #78929
Question History: Millstone 3 2011 NRC Exam
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 54	Tier #	2	2
K/A Statement: Instrument Air:	Group #	1	1
Physical connections / cause-effect relationship	K/A #	078.K1.04	
between: IAS and cooling water to the compressor	Importance Rating	2.6	2.9

Proposed Question:

What condition will directly generate the signal that causes the Domestic Water backup cooling supply to automatically align to the Instrument Air Compressors?

a) Low TPCCW supply header pressure.

b) High TPCCW return temperature from Instrument Air compressors.

c) All 3 Air Compressors (Instrument and Service Air) running simultaneously.

d) No TPCCW pumps running.

Proposed Answer: D

Explanation (Optional): The normal cooling water supply for the Instrument Air Compressors is from TPCCW. Backup cooling is from Domestic Water. These two sources are aligned via AOVs 191, 192, 193, and 194 A & B. These valves automatically swap to align Domestic Water Cooling (OPEN 191/194 and CLOSE 192/193) when 3CCS-P1A, B, and C are all stopped ("D" correct, "A", "B", and "C" wrong). "A" and "B are plausible, since each of these may be indicative of inadequate cooling water supply. "C" is plausible, since it is related to running equipment, and is providing higher than normal heat load.

Technical Reference(s): P&ID 134B (Rev 31-0) (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05324 Given a failure, partial or complete, of plant air systems, determine effects on the systems and interrelated systems (As available)

Question Source: Bank #66846
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.4 and 41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 55	Tier #	2	2
K/A Statement: Containment:	Group #	1	1
Manually operate / monitor: ESF slave relays	K/A #	103.A4.03	
in the control room	Importance Rating	2.7	2.7

Proposed Question:

Current Conditions:

- The crew is conducting SP 3646A.8, *Slave Relay Testing – Train A.*
- The crew is performing a pre-job brief before performing step 4.1, "Containment Isolation Phase A – S804 – Relay K624 – Continuity Check."
- The RO informs the crew that Relay K624 feeds RCP Seal Isolation Valve 3CHS*MV8112.

Complete the following statements:

3CHS*MV8112____(1)_____stroke during this test. Should an actual CIA signal be received during the test, Slave Relay K624____(2)_____respond to the actual CIA.

	(1)	(2)
a)	WILL NOT	WILL NOT
b)	WILL NOT	WILL
c)	WILL	WILL NOT
d)	WILL	WILL

Proposed Answer: A

Explanation (Optional): The test checks continuity of the slave relay, but does not actually operate the associated valve ("C" and "D" wrong). "C" and "D" are plausible, since Tech Spec Acceptance Criteria for a slave relay test requires the energization of each slave relay and verification of operability of each relay. Also, "Go" testing of slave relays actually operates components. "A" is correct, and "B" wrong, since the slave relay is blocked from responding to actual signals during continuity testing. "B" is plausible, since during some testing, such as Sequencer Test 1 testing, the equipment gets automatically removed from the Test Mode to respond upon receipt of an actual signal.

Technical Reference(s): SP 3646A.8-001 (Rev 14-0), page 2 of 2 (Attach if not previously provided)
SP 3646A.8 (Rev 24-11), Note prior to step 4.1.3

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05497 Describe the operation of the RPS under the following normal, abnormal, and emergency conditions… Slave Relay Testing… Block Testing… (As available)

Question Source: Bank #86757
Question History: Millstone 3 2011 NRC Exam
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.7 and 41.9
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 56	Tier #	2	2
K/A Statement: Non-nuclear Instrumentation: Parameters and logic used to assess the status of safety functions, such as core cooling, containment conditions, etc.	Group #	2	2
	K/A #	016.GEN.2.4.21	
	Importance Rating	4.0	4.6

Proposed Question:

A LOCA has occurred.

1. The crew has completed E-0, *Reactor Trip or Safety Injection*.
2. The crew is performing a manual Critical Safety Function (CSF) status tree check prior to transitioning to E-1, *Loss of Reactor or Secondary Coolant.*
3. The crew is currently checking the CTMT tree, and parameters are reported as follows:

- Containment pressure: 25 psia and slowly increasing.
- Containment radiation: 12 R/hr and slowly increasing.
- Containment sump level: 13 feet and slowly increasing.
- Quench Spray Pumps: Both running.

What is the color of the Containment Status Tree?

a) Green

b) Yellow

c) Orange

d) Red

Proposed Answer: B

Explanation (Optional): CTMT red path is CTMT pressure > 60 psia ("D" wrong). CTMT orange paths are from CTMT pressure of 23 psia with NO CTMT Spray Pumps running, or CTMT high sump level of 15.75 feet ("C" wrong). The CTMT yellow path is radiation above 10R/hr ("B" correct, "A" wrong). "A", "C", and "D" are plausible, since the parameters that input to each of these colors are given, and conditions are not as expected for a standard reactor trip.

Technical Reference(s): EOP 35 F-0.5 (Rev 04-0), CTMT Status Tree (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05961 Identify plant conditions that require entry into EOP 35 FR-Z.3. (As available)

Question Source: Bank 63966
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 57	Tier #	2	2
K/A Statement: In-Core Temperature Monitor:	Group #	2	2
Effect of loss or malfunction of:	K/A #	017.K6.01	
ITM sensors and detectors	Importance Rating	2.7	3.0

Proposed Question:

With the plant initially at 100% power, the following sequence of events occurs:

1. A small break LOCA occurs.
2. The crew is NOT able to start any SIH Pumps.
3. The crew is NOT able to start any CHS Pumps.
4. Plant radiation levels increase, indicating significant fuel damage is occurring.

Current ICC/RVLMS status is as follows:

- Several CETCs are flashing and read > 5000°F.
- The remaining CETCs indicate about 1400°F.
- Subcooling margin indicates 1999°F.
- RCS pressure is 1200 psia.

Complete the following statement concerning the status of the ICC/RVLMS.

The CETC data channels reading >5000°F______(1)______. The subcooling margin indication of 1999°F ______(2)______.

	(1)	(2)
a)	are providing accurate data	is indicating an out-of-range condition
b)	are providing accurate data	is providing accurate data
c)	is indicating an open condition	is indicating an out-of-range condition
d)	is indicating an open condition	is providing accurate data

Proposed Answer: C

Explanation (Optional): 5000°F indicates an open condition (likely due to damage from the event in progress). Flashing indicates the data channel selected is invalid ("A" and "B" wrong). "A" and "B" are plausible, since 5000°F is the approximate fuel temperature where fuel melt occurs, and an inadequate core cooling event is in progress. "C" is correct, and "D" wrong, since the subcooled margin display indicates a value of 1999°F when an out-of-range condition exists. "D" is plausible, since and subcooling margin display is capable of displaying superheat, and 1999°F of superheat would indicate very high CETC temperatures if it were accurate.

Technical Reference(s): OP 3201K (Rev 05-7), Precautions Section (Attach if not previously provided)
OP 3201K (Rev 05-7), Cautions prior to step 4.1.1

Proposed references to be provided to applicants during examination: **Steam Tables**

Learning Objective: MC-04831 Describe the major administrative or procedural precautions and limitations associated with the operation of the ICCM and RVLMS systems, including the basis for each. (As available)

Question Source: Bank #78784
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 58	Tier #	2	2
K/A Statement: Containment Iodine Removal:	Group #	2	2
Predict impact / mitigate: high temperature	K/A #	027.A2.01	
in the filter system	Importance Rating	3.0	3.3

Proposed Question:

The plant is in MODE 5, at the start of a refueling outage, and the following sequence of events occurs:

1. The crew starts "A" Containment Air Filtration Fan 3HVU-FN3A per OP 3313D, *Containment Air Filtration* in preparation for opening Containment for entry.
2. The crew shifts from the "A" to the "B" Containment Air Filtration Unit per OP 3313D.
3. The CTMT BLDG FLTR TEMP HI/HI-HI annunciator has just come in at VP1.

What is a potential impact of this annunciator being lit, and what action is the crew required to take per the ARP to mitigate this condition?

a) The in service HEPA Filter is losing efficiency. Stop the running CAF Fan (3HVU-FN3B) to prevent permanently damaging the in-service HEPA filter.

b) The in service HEPA Filter is losing efficiency. Open Bleed Damper 3HVU-AOD44 to place both filters in service.

c) The in service Charcoal Filter may catch fire. Stop the running CAF Fan (3HVU-FN3B) to prevent further heating of the in-service filter.

d) The standby Charcoal Filter may catch fire. Open Bleed Damper 3HVU-AOD44 to provide cooling air flow to the standby filter.

Proposed Answer: D

Explanation (Optional): Hi temperature is indicative of decay heat being generated from collected radionuclides. The concern with high temperature is excessive heat in the standby train (which is not being cooled by air flow), with the potential for a fire in the charcoal filter ("A" and "B" wrong). A" and "B" are plausible, since the filters contain both a HEPA (particulates) and a charcoal (iodine) filter, and there is concern for filter damage in the event of exposure to paint fumes or solvents. The high temperature condition is mitigated by opening the bleed damper, which cross-ties both filters to the suction of the running fan, allowing air flow to cool the standby filter ("C" wrong, "D" correct). "C" is plausible, since if temperature continues to increase to the Hi-Hi setpoint (but this alarm just came in, indicating the Hi Setpoint), the crew will be directed to place the unaffected CAF unit in service.

Technical Reference(s): OP 3313D (Rev 07-3), Precautions 3.4 and 3.8
OP 3353.VP1B (Rev 03-3). 3-2
P&ID 153A (Rev 29-0)
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04261 Describe the major administrative or procedural precautions and limitations placed on the operation of the Containment Ventilation System, and the basis for each. (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 59	Tier #	2	2
K/A Statement: Containment Purge:	Group #	2	2
Design features / interlocks which:	K/A #	029.K4.02	
provides for negative pressure in containment	Importance Rating	2.9	3.1

Proposed Question:

The plant is in MODE 5, with initial conditions as follows:

- The Containment Purge System is running in the Unfiltered Mode per OP 3313F, *Containment Purge Air*.
- The Containment Personnel Access Hatch is open.
- Outside air temperature is 60°F.

The crew is preparing to open the Containment Equipment Hatch shortly.

Per OP 3313F, how many Containment Purge Exhaust Fans will be required to be running in order to open the Containment Equipment Hatch open, and why?

a) One, to prevent excessively cooling down CTMT.

b) One, to minimize the spread of contamination from CTMT into the Auxiliary Building.

c) Two, to keep air flowing into CTMT through the Equipment Hatch.

d) Two, to maximize CTMT cooling, minimizing personnel heat stress concerns.

Proposed Answer: C

Explanation (Optional): The Containment Purge supply and exhaust paths are designed to supply approximately the same amount of air flow as is removed when an equal number of supply and exhaust fans are running. Normally, two supply and two exhaust fans are desired to be running to maximize Containment cooling ("D" plausible). "A" and "B" are wrong, since two exhaust fans are required with the Equipment Hatch open. "A" is plausible, since there is a minimum desired CTMT temperature, but hot water heating is modulated to the HVUs to maintain 70°F supply temperature to Containment. "B" is plausible, since only one train is allowed in the filtered mode (but the Purge System is running in the unfiltered mode), and with the Aux Bldg at a slightly negative pressure, contamination may spread from Containment to the Aux Building near the personnel access hatch. "C" is correct, and "D" wrong, since, by design, running two exhaust fans with the equipment hatch open will draw a negative pressure inside Containment, ensuring air flows into Containment through the equipment hatch.

Technical Reference(s): OP 3313F (Rev 10-7), Section 4.8, Notes 1 and 2; OP 3313F (Rev 10-7), Precaution 3.2; OP 3313F (Rev 10-7), Note prior to step 4.1.7 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04261 Describe the major administrative or procedural precautions and limitations placed on the operation of the Containment Ventilation System, and the basis for each. (As available)

Question Source: New

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.41.4

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 60	Tier #	2	2
K/A Statement: Steam Generator:	Group #	2	2
Physical connections / cause-effect relationship	K/A #	035.K1.13	
between: SGS and condensate system	Importance Rating	2.7	2.8

Proposed Question:

With the plant at 100% power, a PEO is performing a valve lineup on the Steam Generator blowdown system.

The PEO reports the following:

- The Blowdown Tank liquid flowpath is lined up to the Main Condenser.
- The Blowdown Tank vent flowpath is lined up to the Main Condenser.

What is the status of these two flowpaths?

a) Both the liquid and vapor paths are in their normal 100% power lineups.

b) The liquid path is in its normal 100% power lineup, but the vapor path is in its alternate lineup.

c) The liquid path is in its alternate lineup, but the vapor path is in its normal 100% power lineup.

d) Both the liquid and vapor paths are in their alternate lineups for 100% power.

Proposed Answer: B

Explanation (Optional): At 100% power, the blowdown liquid path is normally lined up to the condenser ("C" and "D" wrong, "A" plausible) , which conserves secondary plant water inventory, as compared to the alternate path, which is to the Circ Water Tunnel, and ensures the liquid is purified by the Condensate Demineralizers prior to returning to the Steam Generators. The vent path is normally lined up to the 4th point heaters ("B" correct, "A" wrong), which improves plant efficiency by recovering heat from the blowdown tank steam. The alternate path is to the Main Condenser ("C" and "D" plausible).

Technical Reference(s): OP 3203 (Rev 20-7), Steps 4.2.4 and 4.3.47 (Attach if not previously provided)
OP 3316C (Rev 16-7), Step 4.1.19

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04120 Describe the function & location of the following BDG components… Vents to 4th point heaters (3BDG-MOV21A-C)… Vent to main condenser (3BDG-MOV32)… Level control valves… To condenser (3BDG-LV25)… To circulating water tunnel (3BDG-LV36)… (As available)

Question Source: Bank #69471
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.4
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 61	Tier #	2	2
K/A Statement: Waste Gas Disposal:	Group #	2	2
Predict impact / mitigate: use of waste gas release	K/A #	071.A2.02	
monitors, radiation, gas flow rate, and totalizer	Importance Rating	3.3	3.6

Proposed Question:

Radioactive Gaseous Waste Radiation Monitor 3GWS-RE48 goes into HI ALARM.

Which component(s) receive(s) an automatic CLOSE signal directly from this HI ALARM?

a) Degasified Stream Outlet Valve 3GWS-AOV54.

b) Process Gas Receiver Discharge Pressure Control Valve 3GWS-PV49.

c) Gas Dryer Valves 3GWS-AOV69A and AOV69B.

d) Millstone Stack Isolation Dampers 3GWS*AOD78A and B.

Proposed Answer: B

Explanation (Optional): "B" is correct, and "A", "C", and "D" wrong, since the valve that auto-closes on High Radiation as sensed by 3GWS-RE48 is the process gas receiver discharge pressure control valve. "A", "C", and "D" are plausible, since each of these are actual valves/dampers in the Gaseous Waste System.

Technical Reference(s): AOP 3573 (Rev 20-0), Att A, page 5 of 13 (Attach if not previously provided)
P&ID 109B (Rev 26-0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04723 Describe the function and location of the following GWS system components… Process Gas Receiver Pressure Valve (GWS-PV49)… (As available)

Question Source: New
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.7, 41 11, and 41.13
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 62	Tier #	2	2
K/A Statement: Area Radiation Monitoring:	Group #	2	2
Predict / monitor parameters associated with:	K/A #	072.A1.01	
operating ARM controls including radiation levels	Importance Rating	3.4	3.6

Proposed Question:

With the plant at 100% power, the following sequence of events occurs:

1. Area Radiation Monitor 3RMS16-1 (VCT and Boric Acid Tank area) goes into alarm.
2. The RO reviews the narrative log and notes the following evolutions have recently been conducted:

   - A Liquid Waste Discharge was commenced.
   - The Degasifier was shutdown.
   - The Boron Evaporator was started up.
   - A Solid Waste System resin transfer was commenced.

Which of these activities was the likely cause of the alarm?

a) The Liquid Waste discharge.

b) The shutdown of the Degasifier.

c) The startup of the Boron Evaporator.

d) The resin transfer.

Proposed Answer: B

Explanation (Optional): The degasifier degasses the letdown stream prior to entry into the VCT. With the degasifier shutdown, radioactive gasses accumulate in the VCT on the Aux Building 43 foot level near Area Rad Monitor 3RMS-RE16-1, so a RMS16-1 alarm can be anticipated ("B" correct). "A" is wrong, since the liquid waste discharge piping runs through the Aux Building 4 foot level. "C" is wrong, since the Boron Evaporator receives water from the Boron Recovery Tanks, which contains water that has settled and degassed over time prior to being sent to the degasifier. "D" is wrong, since the resin transfer path from the solid waste system runs through the Auxiliary Building, 4 foot level. "A", "C", and "D" are plausible, since they involve movement of radioactive liquid through the Auxiliary Building.

Technical Reference(s): AOP 3573 (Rev 20-0), Att B, page 3 of 6 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05469 Describe the major administrative or procedural precautions and limitations placed on the operation of the Radiation Monitoring System, including the basis for each. (As available)

Question Source: Bank #76167
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.10, 41.11, and 41.12
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 63	Tier #	2	2
K/A Statement: Circulating Water:	Group #	2	2
Design features / interlocks which: provide for heat sink	K/A #	075.K4.01	
Proposed Question:	Importance Rating	2.5	2.8

The plant is initially at 100% power, when the following sequence of events occurs:

A mat of seaweed drifts into the area around the intake structure.
Main Circulating Water Pump DPs start increasing, and the BOP operator reports Screen DPs have stabilized at the following values:

- "A" Screen: 36 inches and increasing
- "B" Screen: 36 inches and increasing
- "C" Screen: 24 inches and increasing
- "D" Screen: 22 inches and increasing
- "E" Screen: 12 inches and increasing
- "F" Screen: 10 inches and increasing

Which Main Circulating Water Pump will automatically trip first, and why?

a) The "A" Pump, to protect the associated Traveling Screen from damage.

b) The "A" Pump, to ensure adequate NPSH is available for the associated Service Water Pump.

c) The "B" Pump, to protect the associated Traveling Screen from damage.

d) The "B" Pump, to ensure adequate NPSH is available for the associated Service Water Pump.

Proposed Answer: D

Explanation (Optional): The "A" and "F" Main Circulating Water Pumps trip at 42 inches H2O ("A" and "B" wrong), while all the other Main Circulating Water Pumps trip at 36 inches H2O ("A" and "B" plausible). The reason for this is that the "A" and "F" bays do not have Service Water Pumps associated with them, and screen durability becomes the limiting component ("A" and "C" plausible). Circulating Water Pumps in the affected bays trip to ensure the Service Water Pumps in the affected bays maintain adequate suction, since they provide heat sink to the reactor ("D" correct, "C" wrong).

Technical Reference(s): OP 3353.MB6B (Rev 00-1), 5-6 (Attach if not previously provided)
FSAR (Rev 26.5), Pages 10.4-20 and 21

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05729 Describe the major administrative or procedural precautions and limitations placed on the operation of the Traveling Screen Wash System, and the basis for each. (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.4 and 41.7
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 64	Tier #	2	2
K/A Statement: Station Air:	Group #	2	2
Ability to interpret and execute procedure steps	K/A #	079.GEN.2.1.20	
Proposed Question:	Importance Rating	4.6	4.6

Initial conditions:

1. Service Air is being supplied by a temporary air compressor.
2. The Service Air Compressor has just been repaired and is ready to be returned to service.

A PEO is dispatched to perform OP 3332C, *Service Air System*, Section 4.1, "Start Service Air Compressor."

While carrying out OP 3332C, Section 4.1, into what positions will the PEO place the Load Transfer Switch and the Control Switch at the Service Air Compressor?

	Load Transfer Switch	Control Switch
a)	Position "1" OR "2"	CS
b)	Position "1" OR "2"	AUTO
c)	Position "1" (NOT "2")	CS
d)	Position "1" (NOT "2")	AUTO

Proposed Answer: A

Explanation (Optional): OP 3332C has the operator place the Load Transfer Switch in "Position 1" or "Position 2" ("C" and "D" wrong, but plausible), which determines which cylinder half will load first, and either half is equally effective at compressing air. The Control Switch is placed in "CS" (Continuous Service), which means the compressor unloads as air pressure reaches its desired pressure ("A" correct, "B" wrong). "B" is plausible, since AUTO is also selectable, but this allows the compressor to automatically start and stop to maintain pressure in the desired band. This is the position of the standby Instrument Air Compressor.

Technical Reference(s): OP 3332C (Rev 10-4), steps 4.1.6 and 4.1.7 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05321 Describe the operation of the followings plant air systems components controls and interlocks… Service Air Compressor… (As available)

Question Source: New
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.4 and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 65	Tier #	2	2
K/A Statement: Fire Protection:	Group #	2	2
Events related to system operation that must be	K/A #	086.GEN.2.4.30	
reported to internal organizations, or external agencies	Importance Rating	2.7	4.1

Proposed Question:

The plant is at 100% power.

The crew is preparing to perform a Fire Protection Water Deluge Spray Nozzle Flow Test on RSST A per SP3641A.4, *Fire Protection Water System Functional Test and Deluge Spray Nozzle Operability*.

Per OP 3341A, *Fire Protection Water System*, who is the crew required to notify prior initiating water flow?

a) The Unit 2 Control Room, since fire pumps may start.

b) State DEP, since water runoff may reach the storm drains which drain to Long Island Sound.

c) The NRC, since a fire protection system will be actuated.

d) CONVEX, since there is an increased risk of losing the backup power supply to Millstone 3.

Proposed Answer: A

Explanation (Optional): "A" is correct, since the crew is required to notify Unit 2, since the Fire Water Pumps are located in their unit, and flowing water will drop system pressure, which will automatically start the fire water pumps. "B", "C", and "D" are wrong, since these notifications are not required. "B" is plausible, since events such as oil spills are reportable events. "C" is plausible, since automatic actuations of ESF Systems require NRC notification, along with numerous other Reportability requirements. "D" is plausible, since CONVEX is required to be notified of work affecting the switchyard lineup.

Technical Reference(s): OP 3341A (Rev 13-9), Precaution 3.1 (Attach if not previously provided)
SP 3641A.4 (Rev 12-11), step 2.1.2
SP 3641A.4 (Rev 12-11), step 4.45.4

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04620 Describe the major administrative or procedural precautions and limitations placed on the operation of the Water Fire Protection (FPW) system, including the basis for each. (As available)

Question Source: Bank #75797
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 66	Tier #	3	3
K/A Statement: Generic:	Group #	1	1
Knowledge of purpose and function of major system components and controls	K/A #	GEN.2.1.28	
	Importance Rating	4.1	4.1

Proposed Question:

In accordance with OP-AA-1500, *Human Performance (HU)*, what is the difference between a Concurrent Verification (CV) and a Peer Check (PC)?

a) CV is intended to help the performer avoid error for a specific action, while PC is intended to help the performer avoid errors for a sequence of actions.

b) PC is intended to help the performer avoid error for a specific action, while CV is intended to help the performer avoid errors for a sequence of actions.

c) CV requires the verifier to consider the expected response of the system to the component being manipulated, while PC focuses primarily on the performer's action.

d) PC requires the verifier to consider the expected response of the system to the component being manipulated, while CV focuses primarily on the performer's action.

Proposed Answer: C

Explanation (Optional): This question is deliberately avoiding asking the purpose of a specific plant component, due to the direction in ES-4.01, Section D.2.a, which states "Ensure that the questions selected for Tier 3 maintain on plant-wide generic knowledge, and abilities and do not become an extension of Tier 2, 'Plant Systems.'" This question is considered a KA match since this generic topic tests the admin requirement for the Verifier to understand system component and control functions in order to carry out a proper Concurrent Verification. Peer-checking (PC) is similar to concurrent verification (CV), but there are differences. Although both techniques help the performer avoid error for a specific action ("A" and "B" wrong, but plausible), CV focuses of on status control and response of the equipment, while the primary focus of PC is the performer's action ("C" correct, "D" wrong, but plausible).

Technical Reference(s): PI-AA-5000 (Rev 08-0), Att. 11, Page 1 of 4. (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-06584 Describe operating practices for plant manipulations with respect to self checks and peer checks. (As available)

Question Source: Bank #73074
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 67	Tier #	3	3
K/A Statement: Generic:	Group #	1	1
Ability to locate and operate components,	K/A #	GEN.2.1.30	
including local controls	Importance Rating	4.4	4.0

Proposed Question:

A loss of heat sink event is in progress, and the following sequence of events occurs:

1. A PEO reports the TDAFW Pump Trip Throttle Valve (3MSS*MSV5) in the tripped position.
2. The US directs the PEO to open MSV5 as soon as possible.

Using the attached figure from GA-31, *Locally Restoring AFW Flow*, complete the following statement on how the PEO is required to reset and open this valve.

Move the connecting rod toward__(1)___, rotate the handwheel on MSV5 to the__(2)___position, ensure the Latch-Up Lever re-latches with the Trip Hook, and then__(3)___the handwheel on MSV5 to/in the OPEN position.

	(1)	(2)	(3)
a)	MSV5	CLOSED	rotate
b)	MSV5	OPEN	leave
c)	The TDAFW Pump	CLOSED	rotate
d)	The TDAFW Pump	OPEN	leave

Proposed Answer: A

Explanation (Optional): "A" is correct since the connecting rod must be moved toward MSV5 to allow the trip tappet to drop fully down ("C" and "D" wrong), which is necessary to allow the trip hook to engage the latch up lever. The handwheel must be then taken to close to align the latch-up lever with the trip hook ("B" and "D" wrong). "B", "C", and "D" are plausible, since the connecting rod opposite to MSV5 points toward the TDAFW Pump, and the valve must finally be rotated to the OPEN position.

Technical Reference(s): GA-31 (Rev 00-2), Steps 2.c-h, and Figures 1 and 2 (Both figures on page 8 of 8) (Attach if not previously provided)

Proposed references to be provided to applicants during examination: **GA-31, Figures 1 and 2**

Learning Objective: MC-04635 DESCRIBE the operation of the following Auxiliary Feedwater System component controls & interlocks… Turbine Driven Auxiliary Feedwater Pump Steam Isolation Valve (MSV5)… (As available)

Question Source: Bank #63917
Question History: Millstone 3 2007 NRC Exam
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.7, 41.8, and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 68	Tier #	3	3
K/A Statement: Generic:	Group #	1	1
Ability to explain and apply system limits	K/A #	GEN.2.1.32	
and precautions	Importance Rating	3.8	4.0

Proposed Question:

The RO has been handed a section of a procedure to perform.

- The procedure is designated as "Continuous Use."
- The procedure does NOT contain placekeeping aides (e. g. blanks).

Per AD-AA-102, *Procedure Use and Adherence*, how is the RO required to address the Precautions and Limitations section of the procedure?

a) This section IS NOT required to be reviewed. These items will be addressed in the applicable procedure section, which includes the applicable Cautions and Limitations.

b) This section IS required to be reviewed, but placekeeping of this section of the procedure is NOT required.

c) This section IS required to be reviewed, and placekeeping of this section of the procedure IS required to be documented by initialing by each item.

d) This section IS required to be reviewed, and placekeeping of this section of the procedure IS documented by circling and slashing each item.

Proposed Answer: D

Explanation (Optional): Continuous Use procedures require placekeeping, and placekeeping is required for the Precautions and Limitations section of the procedure ("A" and "B" wrong). "A" is plausible, since notes and cautions that are specific to a portion of the procedure are repeated in that section of the procedure. "B" is plausible, since placekeeping is not required for several of the more general sections of the procedure (such as the Purpose and Special Tools sections), and placekeeping is not required for Information Use procedures. "D" is correct, and "C" wrong, since the circle and slash method of placekeeping is required when placekeeping aids are not provided. "C" is plausible, since initials are used when placekeeping aids are provided, and the precautions are not carried out in a step by step fashion.

Technical Reference(s): AD-AA-102 (Rev 09-0), Step 3.2.1 (Attach if not previously provided)
AD-AA-102 (Rev 09-0), Section 3.5.1

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-06790 State what must be performed prior to using only selected steps or sub-steps of a procedure. (As available)

Question Source: New
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 69	Tier #	3	3
K/A Statement: Generic:	Group #	1	1
Ability to interpret reference material, such as graphs, curves, tables, etc.	K/A #	GEN.2.1.25	
	Importance Rating	3.9	4.2

Proposed Question:

A plant cooldown is in progress per OP 3208, *Plant Cooldown*, and the following parameters exist:

- Pzr Water Temperature: 600ºF
- RCS Temperature: 510ºF
- Pzr Level as read on RCS-LI459 (Hot Cal): 58%
- Pzr Level as read on RCS-LI462 (Cold Cal): 40%

Using the attached OP 3208, Attachment 2, what is actual Pzr level?

a) 39%

b) 45%

c) 51%

d) 57%

Proposed Answer: C

Explanation (Optional): Using Attachment 2, it can be determined that actual Pzr level is approximately 51%. Other distractors are plausible since they are all close to the hot and cold cal indications

Technical Reference(s): OP 3208 (Rev 22-9), Attachment 2 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: **OP 3208, Attachment 2**

Learning Objective: MC-03444 Describe the major action categories contained within the OP 3208 procedure. (As available)

Question Source: Bank #60276
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 70	Tier #	3	3
K/A Statement: Generic: Ability to manipulate	Group #	2	2
the console controls as required to operate the facility	K/A #	GEN.2.2.2	
between shutdown and designated power levels	Importance Rating	4.6	4.1

Proposed Question:

A plant cooldown is in progress per OP 3208, *Plant Cooldown*, and initial conditions are as follows:

- RCS temperature indicates 100°F.
- Pressurizer temperature has been equalized with RCS temperature.

The US directs the RO to lower RCS pressure per OP 3208.

What action is the RO required to take to lower RCS pressure?

a) Place an additional Letdown Orifice in service.

b) Throttle open Auxiliary Spray Valve 3CHS*AV8145.

c) Throttle open RHR to Letdown Flow Control Valve 3CHS*HCV128.

d) Throttle open Letdown Pressure Control Valve 3CHS*PCV131.

Proposed Answer: D

Explanation (Optional): The plant is solid, as indicated by Pzr temperature equal to RCS temperature. "A" is wrong since all orifices were already placed in service during the plant cooldown. "A" is plausible, since increasing letdown flow would lower RCS pressure. "B" is wrong since spray does not affect pressure when solid. "B" is plausible, since spray flow is the normal way to lower RCS pressure. "D" is correct, and "C" is wrong since OP 3208 has the operator use 3CHS*PCV131 to control pressure. "C" is plausible, since this valve is in series with 3CHS*PCV131.

Technical Reference(s): OP 3208 (Rev 22-9), section 4.4, specifically step 4.4.15 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03444 Describe the major action categories contained within the OP 3208 procedure (As available)

Question Source: Bank #68581
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.3, 41.5, and 41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 71	Tier #	3	3
K/A Statement: Generic:	Group #	2	2
Knowledge of surveillance procedures	K/A #	GEN.2.2.12	
	Importance Rating	3.7	4.1

Proposed Question:

Current conditions:

- The plant is in MODE 2.
- The crew is performing a Surveillance Procedure that is specified as a "Monthly" surveillance.
- The last time the Surveillance was performed was 33 days ago.

The SURVEILLANCE REQUIREMENT tied to this procedure states "The provisions of Specification 4.0.4 are not applicable".

What does this statement mean?

a) The Surveillance completion time includes a 25% grace period, so a transition to MODE 3 is NOT required.

b) The Surveillance does NOT allow for a grace period, so the crew is required to transition to MODE 3.

c) Entry into MODE 1 IS allowed with this Surveillance NOT completed.

d) Entry into MODE 1 IS NOT allowed until this Surveillance IS completed.

Proposed Answer: C

Explanation (Optional): Surveillance Requirement 4.0.4 states that the Surveillance Requirements (within the specified time interval.) do NOT need to be performed prior to entering a mode or other specified condition ("C" correct, "A", "B", and "D" wrong). "A" and "B" are plausible, since this is related to Surveillance Requirements 4.0.2 and 4.0.3 concerning grace periods. "D" is plausible, since normally, surveillance requirements must be met prior to mode changes.

Technical Reference(s): Tech Spec Surveillance Requirements 4.0.2 through 4.0.4 (Amend 241) (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07648 Describe the relationship between Technical Specification Requirements and entry into an Operational MODE (As available)

Question Source: Bank #68361
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 72	Tier #	3	3
K/A Statement: Generic:	Group #	2	2
Ability to determine operability and/or availability	K/A #	GEN.2.2.37	
of safety related equipment	Importance Rating	3.6	4.6

Proposed Question:

With the plant at 100% power, the RO is taking rounds and observes the following parameters:

- RWST temperature is 45° F.
- RWST borated water volume is 1,200,000 gallons.
- SIL Accumulator "D" pressure is 640 psia.
- SIL Accumulator "D" borated water volume is 6200 gallons.

Which of these conditions requires entry into a Technical Specification ACTION STATEMENT?

a) RWST temperature.

b) RWST volume.

c) Accumulator pressure.

d) Accumulator volume.

Proposed Answer: D

Explanation (Optional):
"A" is wrong, since RWST temperature is between 40 and 50°F.
"B" is wrong, since RWST volume is between 1,166,000 and 1,207,000 gallons.
"C" is wrong, since accumulator pressure is between 636 and 694 psia.
"D" is correct, since accumulator volume is below the required volume of 6618 and 7030 gallons.
"A", "B", and "C" are plausible, since each of these parameters have an associated LCO.

Technical Reference(s): Tech Spec LCO 3.5.1 (Amend 258) (Attach if not previously provided)
Tech Spec LCO 3.5.4 (Amend 258)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-06288 Describe the major administrative or procedural precautions and limitations placed on the operation of the Emergency Core Cooling System, and the basis for each. (As available)

Question Source: Bank #74365
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.10 and 43.2
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 73	Tier #	3	3
K/A Statement: Generic: Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	Group #	3	3
	K/A #	GEN.2.3.5	
	Importance Rating	2.9	2.9

Proposed Question:

An event is in progress involving a radiation release, and an operator is preparing to exit the Turbine Driven Auxiliary Feedwater Pump Room.

The operator is performing a manual frisk prior to exiting the room, and the frisk results are as follows:

- The Frisker is on the "x1" scale.
- Background indicates 190 counts per second.
- Counts indicate 250 counts per second as the soles of the operator's shoes are frisked.

In accordance with the Radiation Protection Manual, is this a valid frisk? If not, why not? If yes, is the operator considered "contaminated"?

a) The frisk IS NOT valid, since the wrong scale is selected with a rad release in progress.

b) The frisk IS NOT valid, since background counts are too high.

c) The frisk IS valid, and the operator IS contaminated.

d) The frisk IS valid, and the operator IS NOT contaminated.

Proposed Answer: D

Explanation (Optional): Manual Frisking - Verify that the hand-held frisker is on the "x1" scale ("A" wrong), and the background is less than 200 cpm ("B" wrong). "A" and "B" are plausible, since the frisker has several selectable scales, and background counts are elevated. Pick up the probe and pass it slowly over the hands and feet, holding the probe one-half inch away from the surface being checked. The probe must be moved very slowly; one to two inches per second. While frisking, watch the needle on the meter face and listen for the clicks. If an increase of 100 counts per second above background is observed, the person is considered contaminated and must contact HP. "D" is correct, and "C" wrong, since counts have increased from 190 to 250 counts, which is an increase of 60 counts. "C" is plausible, since counts are elevated above background.

Technical Reference(s): Radiation Protection Manual (Rev 16-1), Section 5.2.2, page 22 of 43 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05128 Outline the steps required to perform a manual frisk (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.41.11 and 41.12
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 74	Tier #	3	3
K/A Statement: Generic:	Group #	4	4
Knowledge of crew roles and responsibilities	K/A #	GEN.2.4.13	
during EOP usage	Importance Rating	4.0	4.6

Proposed Question:

A reactor trip has occurred, and current plant conditions are as follows:

- The "A" MDAFW pump tripped, and will not re-start.
- "B" SG pressure: 450 psig and decreasing.
- "A", "C", and "D" SG pressures: 750 psig and decreasing.
- RCS Tcold: 460ºF and decreasing.
- RCS pressure: 1600 psia and decreasing.
- The crew is performing E-0, step 3 "Verify Power to AC Emergency Busses".

The BOP Operator desires to isolate AFW flow as early as allowed to minimize the RCS cooldown.

In accordance with OP 3272, *EOP Users Guide*, the earliest the BOP operator can isolate AFW flow to the "B" SG is after_________________.

a) obtaining direction from the US or SM

b) receiving procedural direction from the appropriate EOP

c) completing the BOP-side immediate actions in E-0

d) narrow range level in at least one SG is restored to >8%

Proposed Answer: C

Explanation (Optional): The BOP operator may, at any time when not required to be performing an immediate action or sequenced steps, throttle AFW flow if minimum heat sink requirements are satisfied. This includes isolating AFW flow to a faulted SG. The crew is currently performing an immediate action requiring action by the BOP operator, so the BOP must complete this step before isolating AFW ("C" correct). "A" is wrong, since the only time US/SM permission is required prior to throttling or isolating AFW is during a SGTR ("A" plausible), but the above event can be diagnosed as a faulted SG based on one SG pressure below saturation pressure for Tcold in the RCS. "B" is wrong, since isolating or throttling AFW prior to procedural guidance is a responsibility of the BOP. "B" is plausible, since EOP steps are generally performed in sequence. "D" is wrong, but plausible, since the BOP has to wait for 8% level prior to throttling AFW flow in two instances: if the SG has a ruptured tube, or if minimum heat sink requirements won't be met after throttling AFW. Even though the "A" MDAFW pump, which feeds two intact SGs, did not start, >530 gpm will exist since the TDAFW pump is also running.

Technical Reference(s): OP3272 (Rev 08-13) Att. 3, Sheets 2 and 3 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04454 State the conditions which would allow the action of either the throttling or isolation of auxiliary feed water flow to a steam generator or steam flow from a steam generator prior to being directed to perform the action by a specific step within the emergency operating procedure network. (As available)

Question Source: Bank#75640

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.41.10

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 75	Tier #	3	3
K/A Statement: Generic:	Group #	4	4
Knowledge of EOP layout, symbols, and icons	K/A #	GEN.2.4.19	
	Importance Rating	3.4	4.1

Proposed Question:

Which phrase is used in the EOP network to direct the crew to transition from one EOP to another EOP with no requirement to return to the original EOP?

a) Go To

b) Perform

c) Proceed To

d) Use

Proposed Answer: A

Explanation (Optional): Four transition phrases used in EOP Network and their meanings are as follows:
Go To - Branches to another EOP or OP with no requirement to return ("A" correct).
Proceed To - Move ahead in the same procedure ("C" wrong, but plausible).
Return To - Move back in the same procedure
Using - Branches to a non-EOP or an attachment with the requirement to return to the step in effect when completed ("D" wrong, but plausible).
Occasionally the supplemental transition phrase "Perform" is used to alert the Operator that, at the present time due to plant conditions, a particular action must be skipped. This is always provided with a conditional logic "WHEN/THEN " and specific criteria, which when satisfied, require the Operator to "Perform" the skipped action ("B" wrong, but plausible).

Technical Reference(s): OP 3272 (Rev 08-13), Att. 2, Sheet 4 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04446 Describe the use and applicability of "notes" and "cautions" contained within the emergency operating procedures network including transitions to another EOP procedure or step in the same EOP procedure (As available)

Question Source: Bank #70164
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.41.10
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 76	Tier #		1
K/A Statement: Large Break LOCA:	Group #		1
Recognize abnormal indications that are entry level conditions that are entry level for EOPs and AOPs	K/A #	EPE.011.GEN.2.4.4	
	Importance Rating		4.7

Proposed Question:

Initial conditions:

- A LOCA occurred 80 minutes ago.
- The crew has completed the actions in ES-1.3, *Transfer to Cold Leg Recirculation*.
- The crew is holding a transition brief while preparing to transition back to E-1, *Loss of Reactor or Secondary Coolant*.
- The TSC is NOT fully activated

After transitioning back to E-1, the RO reports the following:

- CETs are increasing.
- ECCS flows are at their expected values and stable.

What is the crew required to consider based on these indications?

a) Per E-1, restore the Reactor Plant Component Cooling Water (RPCCW) System to service.

b) Per E-1, vent the Vessel Head to Pressurizer Relief Tank (PRT), since head voiding may be occurring.

c) Transition to ES-1.4, *Transfer to Hot Leg Recirculation*, since in vessel debris blockage may be occurring.

d) Transition to ECA-1.1, *Loss of Emergency Coolant Recirculation*, since Recirculation Sump screen blockage may be occurring.

Proposed Answer: C

Explanation (Optional): Considered SRO since plant conditions must be assessed, and the candidate is required to realize Attachment E of ES-1.3 must be implemented, which directs the crew to monitor for in-vessel effects if the TSC is not fully activated (otherwise, the TSC will perform the monitoring). The crew looks for CETs increasing with stable ECCS flows. Normally, CETs will be stable or decreasing as decay heat decreases. Micro-fibers and chemical precipitates may pass through the Ctmt Sump screens, and collect in the reactor vessel bottom nozzles. This may block flow into the active fuel, while total ECCS flow remains stable since flow will go around the vessel downcomer and out the broken loop cold leg. Symptoms of this exist, so Attachment E directs the crew to consider early transition to Hot Leg Recirculation to flush the debris out the break by reversing flow through the core ("C" correct, "B", and "D" wrong). "B" is plausible, since E-1 series procedures monitor for hydrogen formation, which can inhibit core cooling flow if this is excessive. "D" is plausible, since sump blockage would be suspected if ECCS flow were decreasing. "A" is wrong, but plausible, since RPCCW is automatically removed from service on a CDA, and ES-1.3 has already restored it to service to support Spent Fuel Pool cooling.

Technical Reference(s): ES-1.3 (Rev 16-0), step 10.a.RNO
ES-1.3 (Rev 16-0), Att. E, step 3 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-06262 Discuss conditions which require transition to other procedures from ES-1.3 and ES-1.4 (As available)

Question Source: Bank #63930

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 77	Tier #		1
K/A Statement: RCP Malfunctions:	Group #		1
Knowledge of operational implications of:	K/A #	APE.015/17.GEN.2.4.20	
EOP warnings, cautions, and notes	Importance Rating		4.3

Proposed Question:

With the plant initially at 100% power, issues with RPCCW occur, resulting in the following sequence of events:

1. VCT temperature increases to 140°F.
2. The crew trips the reactor.
3. The crew trips all four RCPs.
4. One minute after the reactor trip, a tube ruptures on the "C" SG.
5. The crew enters E-3, *Steam Generator Tube Rupture*.
6. The BOP operator reports "C" SG NR level is 90% and increasing.
7. The crew commences a cooldown of the RCS.
8. During the RCS cooldown, a RED path is received on the INTEGRITY status tree.
9. The STA reports the low temperature condition is occurring in the ruptured loop cold leg.

What action is the crew required to take with the INTEGRITY status tree?

a) Continue in E-3, since with no RCPs running, the "C" loop Tcold indication is providing false indication of a Pressurized Thermal Shock condition.

b) Continue in E-3, since E-3 takes priority over FR-P.1 with ruptured SG narrow range level greater than 87%.

c) Transition to FR-P.1, *Response to Pressurized Thermal Shock*, stop the RCS cooldown, and terminate Safety Injection.

d) Transition to FR-P.1, *Response to Pressurized Thermal Shock*, stop the RCS cooldown, and SOAK the RCS for 1 hour.

Proposed Answer: A

Explanation (Optional): Question is considered SRO since plant conditions must be assessed to determine if a transition to Functional Restoration Procedure is appropriate with its entry conditions being met, but not applicable under given conditions. High VCT temperature requires the crew to trip all four RCPs, since this hot water is supplied directly to the RCP seals. The loss of all four RCPS has resulted in natural circulation flow cooling of the core. During the cooldown, the ruptured SG is not steamed to allow a pressure differential to develop between the ruptured SG and the remaining SGs. The cooldown will allow depressurizing the RCS to ruptured SG pressure while still maintaining subcooling in the RCS. With RCPs not running and the ruptured SG not being steamed, natural circulation flow will stop in the ruptured loop, and even reverse due to DP across the core due to flow across the core in the other three loops. Cold SI flow into the cold legs will flow into the Vessel downcomer, and through the ruptured loop cold leg, along with cold ECCS water being injected into the ruptured loop, with some flow going out the broken tube and some returning to the vessel via the hot leg. This cold ECCS water will flow over the ruptured loop's cold leg temperature instruments. This flow does not reach the point of vulnerability for the integrity status tree, which is the vessel belt line, so this loop's cold leg temperature is to be disregarded until after E-3, step 29 to prevent a false entry into the FR-P series ("C" and "D" wrong). "C" and "D" are plausible, since an orange path on Integrity normally requires entry into FR-P.1, and current conditions in FR-P.1 would require the crew to stop the cooldown, terminate Safety Injection, and SOAK the RCS. The crew needs to complete the cooldown, depressurize the RCS, and terminate SI in E-3 as quickly as practical to avoid overfilling the ruptured SG, which would result in increased radiation release. A caution at E-3, step 6 and a note at E-3, step 30 alerts the crew to this condition ("A" correct).

"B" is wrong, since FR-P.1 would take priority over E-3 if the FR-P.1 entry condition were valid. "B" is plausible, since several specific conditions exist where EOPs take priority over the FRPs, such as during swap-over to cold leg recirculation, and several conditions exist where the FRP is not to be performed: this is the case for FR-P.1 if a large break LOCA exists. Also, there is a significant concern with overfilling the ruptured SG, and 87% Narrow Range level is a setpoint that directs a transition from ECA-3.1 to ECA-3.2, if there is a LOCA present along with the ruptured SG.

Technical Reference(s):	E-3 (Rev 24-1), step 5, and Notes prior to step 6 and 30	(Attach if not previously provided)
	WOG Bkgd Doc (Rev 2) for E-3, step 6 Caution	
	AOP 3561 (Rev 15-0), Foldout Page	
	FR-P.1 (Rev 16-0), steps 7 and 23	

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-074471 Given a set of plant conditions, determine the required actions to be taken per E-3 (As available)

Question Source: Bank #78455
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.5
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 78	Tier #		1
K/A Statement: ATWS:	Group #		1
Determine or interpret: reactor nuclear instrumentation	K/A #	EPE.029.EA2.01	
Proposed Question:	Importance Rating		4.7

With the plant initially at 100% power, the following initial sequence of events occurs:

1. RPCCW cooling is lost to the "B" and "C" RCPs.
2. The crew attempts to trip the reactor, but the reactor does NOT trip.
3. The crew enters FR-S.1, *Response to Nuclear Power Generation/ATWS*.
4. The crew is NOT able to initiate immediate boration of the RCS.

The US reaches FR-S.1, step 18, "Verify Reactor Subcritical," with current conditions as follows:

- The RO reports reactor power is 60%.
- The "D" RCP "Vibration Hi" annunciator is received on MB4.
- The STA reports all other status trees are green or yellow.

What action is the US required to direct?

a) Trip the "D" RCP. Then transition to E-0, *Reactor Trip or Safety Injection*.

b) Trip the "D" RCP. Then remain in FR-S.1 as long as power is above 5%.

c) Close the secondary plant steam release paths to allow the RCS to heat up. Then transition to E-0, *Reactor Trip or Safety Injection*.

d) Close the secondary plant steam release paths to allow the RCS to heat up. Then remain in FR-S.1 as long as power is above 5%.

Proposed Answer: D

Explanation (Optional): Question is considered SRO since conditions must be assessed to determine whether RCP trip criterion apply, and also to determine whether RCS heatup is required while looping back in FR-S.1, even though the crew has reached the end of the procedure. The decision is beyond system knowledge, since this action is taken only if boration is unsuccessful and power is not less than 5% by the end of FR-S.1, at which point the crew is required to add negative reactivity to the core by allowing the RCS to heat up. The question is considered a KA match, since the decision to allow the RCS to heat up is based on an interpretation of the NIS at the end for FR-S.1. With power above 5%, the crew is also required to perform actions of other FRs which do not add positive reactivity to the core, and remain in FR-S.1 ("D" correct, "C" wrong). "C" is plausible, since the crew can transition to other FR procedures, but status trees are green or yellow, and the crew would return to E-0 if power were less than 5% with negative startup rate, and the crew has completed all significant actions of FR-S.1. Other FR procedures allow transition once all actions of the procedure have been taken. "A" and "B" are wrong, since RCPs are not to be tripped with reactor power above 5%. "A" and "B" are plausible, since the "D" RCP has had a loss of RPCCW cooling, and is experiencing high vibration, and would be tripped if power were less than 5%.

Technical Reference(s): FR-S.1 (Rev 19-2), Caution prior to step 1; FR-S.1 (Rev 19-2), Steps 18 and 21 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07455 Given a set of plant conditions, determine the required actions to be taken for FR-S.1. (As available)

Question Source: New

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 79	Tier #		1
K/A Statement: Loss of Off-site Power:	Group #		1
Knowledge of EOP entry conditions and	K/A #	APE.056.GEN.2.4.1	
immediate action steps	Importance Rating		4.8

Proposed Question:

The following sequence of events occurs:

T-0:	Offsite power is lost, resulting in a plant trip.
T+10 minutes:	ISO New England reports that power is not expected back for several hours.
T+30 minutes:	A PEO reports a significant leak in the CST.
T+35 minutes:	The STA expresses a concern about having enough combined DWST and CST inventory to reach COLD SHUTDOWN.
T+37 minutes:	The crew enters ES-0.2, *Natural Circulation Cooldown*.
T+45 minutes:	The crew is verifying adequate SHUTDOWN MARGIN exists per ES-0.2, step 2 prior to commencing the cooldown to COLD SHUTDOWN.

Based on current plant conditions, what actions can the US take/direct per ES-0.2 to reach COLD SHUTDOWN in the shortest amount of time?

a) Remain in ES-0.2, and commence the cooldown prior to completing the verification of adequate SHUTDOWN MARGIN in step 2 of ES-0.2.

b) Remain in ES-0.2, and cooldown and depressurize the RCS in discrete steps while monitoring Pzr level to ensure the cooldown rate is not excessive.

c) Complete the first 10 steps of ES-0.2, and then transition to ES-0.3, *Natural Circulation Cooldown With Steam Void in Vessel (with RVLMS)*.

d) Transition from ES-0.2, step 2, to ES-0.3, *Natural Circulation Cooldown With Steam Void in Vessel (with RVLMS)*.

Proposed Answer: C

Explanation (Optional): Question is considered SRO since it requires assessing plant conditions and requires selecting entry into an ES procedure. "A" is wrong, since ES-0.2 step 5.a logic does not allow proceeding prior to verifying adequate Shutdown Margin. "A" is plausible, since normally, the crew is allowed to proceed to the next step in an EOP when the current step has been commenced. Also, several EOPs specifically allow proceeding with a cooldown prior to verifying Shutdown Margin, but these EOPs have SIS actuated, which is adding boron to the RCS. "B" is wrong, since ES-0.2 limits cooldown rate due to concerns with void formation. "B" is plausible, since it is a misapplication of ES- 0.4 actions, which cools down the plant at the Tech Spec maximum rate, since it is designed to deal with Reactor Vessel Head void formation. "C" is correct, and "D" wrong, since is the first 10 steps of ES-0.2 are preparatory steps that are required to be completed prior to increasing the cooldown rate in ES-0.3. "D" is plausible, since the appropriate transition is to ES-0.3, and there is a sense of urgency to commence the cooldown.

Technical Reference(s): ES-0.2 (Rev 19-1), steps 1, 5, 10 (Attach if not previously provided)
ES-0.2 (Rev 19-1), Note prior to step 11
ES-0.3 (Rev 11-1), Entry Conditions

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05947 Discuss conditions which require transition to other procedures from EOP 35 ES-0.2, Natural Circulation Cooldown. (As available)

Question Source: Bank #67600

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 80	Tier #		1
K/A Statement: Loss of Vital AC Elec. Inst. Bus:	Group #		1
Knowledge of operational implications of	K/A #	APE.057.GEN.2.4.20	
EOP warnings, cautions, and notes	Importance Rating		4.3

Proposed Question:

A large break LOCA occurs, resulting in the following initial sequence of events:

1. The "B" EDG fails to start on the SIS, and cannot be started manually.
2. The "A" RSS Pump does NOT start, automatically or manually.
3. The crew enters ES-1.3, *Transfer to Cold Leg Recirculation*.
4. The crew establishes Cold Leg Recirculation using the "C" RSS pump per ES-1.3 Attachment C, "Aligning Recirculation Spray Pump C or D for Cold Leg Recirculation."
5. The crew stops the unloaded "A" EDG per E-1, *Loss of Reactor or Secondary Coolant*.

The following sequence of events occurs:

1. VIAC 1 loses power.
2. Offsite power is lost.

What actions are required to be directed by the US to restore core cooling?

a) Place "A" Train Emergency Loads except the "C" RSS Pump in Pull-to-Lock. Then close the "A" EDG output breaker. Then start the "A" CHS and "A" SIH Pumps.

b) Close the "A" EDG output breaker. Then start the "C" RSS Pump. Then start the "A" CHS and "A" SIH Pumps.

c) Place "A" Train Emergency Loads except the "C" RSS Pump in Pull-to-Lock. Then start the "A" Emergency Diesel and close the output breaker. Then start the "A" CHS and "A" SIH Pumps.

d) Start the "A" Emergency Diesel and close the output breaker. Then start the "C" RSS Pump. Then start the "A" CHS and "A" SIH Pumps.

Proposed Answer: A

Explanation (Optional): Question is considered SRO since several notes and cautions apply, and they must be assessed to determine how they are to be integrated under current plant conditions. Also, there needs to be an understanding of the abnormal procedural lineup that exists at this point after completing ES-1.3 Attachment C. ES-1.3 required the crew to reset SIS, where the crew was cautioned that "After SI reset, manual action to restart safeguards equipment may be required if offsite power is lost." They then aligned the "C" RSS Pump per Att. C, which puts the RSS pump TEST/INHIBIT switch in the INHIBIT, ensuring the pump is not stripped by the LOP, ensuring it starts as soon as power is restored to the bus, providing suction to the minimum required 1 CHS and SIH Pump. This is explained in the notes in Attachment C of ES-1.3. Then the crew completed the recirc alignment, and a note in ES-1.3 stated "If a Loss of Offsite Power occurs in the Recirculation Mode, the EDG sequencer automatically restarts cold leg recirculation components." At this point, VIAC 1 is lost, adding the following caution; "Loss of VIAC 1 or 2 deenergizes the associated EDG sequencer. If an ESF actuation takes place, the following will NOT occur automatically on the associated train: EDG start (except on LOP), Emergency bus load stripping, Load Sequencing. On the LOP with the sequencer deenergized, the associated EDG does start from a switchgear LOP signal ("C" and "D" wrong), even without the sequencer. "C" and "D" are plausible; since the EDG would not start without the sequencer on an SIS without LOP. On the LOP with the loss of VIAC, loads were not stripped, so if the EDG output breaker is closed, the EDG would immediately re-energize all loads, potentially overloading the EDG, risking an EDG trip. Placing loads in Pull-To-Lock will protect the EDG.

Attachment C of ES-1.3 has aligned the "C" RSS Pump to immediately energize on power restoration, so it will not need to be restarted ("B" wrong). Operators close the output breaker, which starts the RSS Pump. They then can start the "A" CHS and SIH Pumps ("A" correct). "B" is plausible, since if lined up per ES-1.3 without Attachment C being performed, the "C" RSS pump would be stripped on the LOP with the VIAC energized. Also, with the sequencer deenergized, and with SIS reset, loads would not sequence on (but they did not strip).

Technical Reference(s): ES-1.3 (Rev 16-0) Cautions prior to step 1
AOP 3564 (Rev 10-0), Caution prior to step 1
ES-1.3 (Rev 16-0) Note prior to step 4, and Notes prior to Attachment C, step 1
(Attach if not) previously provided

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07429 Given a set of plant conditions, determine the required actions to be taken per ES-1.3… (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.5
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 81	Tier #		1
K/A Statement: Loss of Secondary Heat Sink:	Group #		1
Ability to prioritize and interpret the significance	K/A #	W/E05.GEN.2.4.45	
of each annunciator or alarm	Importance Rating		4.3

Proposed Question:

An earthquake occurs, initially resulting in a Reactor Trip, Safety Injection, and loss of Bus 34D due to a bus differential, along with the following sequence of events:

1. During the E-0, step 16 brief, the following two annunciators are received on MB3:
   - The CHARG PP FLOW HI/LO.
   - The CHARG PP TRIP/OVERCURRENT.
2. The BOP reports the following:
   - The "D" SG has completely depressurized.
   - Only the "A" MDAFW pump is running, feeding only the "A" SG at 200 gpm.
3. The crew enters FR-H.1, *Response to Loss of Secondary Heat Sink*.

Current conditions are as follows:

- Only the "A" MDAFW pump is running, feeding only the "A" SG at 200 gpm.
- All SG NR Levels are 0%.
- SG WR Levels indicate as follows:
  - "A" SG: 63% and slowly increasing.
  - "B" SG: 43% and stable.
  - "C" SG: 46% and stable.
  - "D" SG: 0% and stable.

Per FR-H.1, what is the next action required to be taken by the crew?

a) Transition to E-0, *Reactor Trip or Safety Injection*, since a heat sink is established.

b) Transition to E-2, *Faulted Steam Generator Isolation*, since a heat sink is established.

c) Attempt to restore feed from the Main Feedwater System.

d) Stop all RCPs and initiate bleed and feed cooling of the RCS.

Proposed Answer: D

Explanation (Optional): Question is considered SRO since the applicant is required to assess plant conditions, realize conditions are not met to exit FR-H.1 with some AFW flow available, and determine that, even though normal Bleed and Feed criteria are not met, the crew must move ahead to the bleed and feed section in FR-H.1, due to concerns with the ability to "feed" the reactor. "A" and "B" are wrong, since Core Exits TCs must be stable or going down AND Wide Range Level in at least one SG must be going up with less than 530 gpm AFW flow to exit FR-H.1, but CETCs are slowly increasing. "A" is plausible, since some AFW flow exists, which directs transition back to procedure and step in effect if CETs are stable or decreasing and SG level is increasing in one SG, and the crew transitioned to FR-H.1 from E-0, step 17. "B" is plausible, since the crew normally starts monitoring status trees at the transition step from E-0, which would be to E-2, since one SG has depressurized. "D" is correct, and "C" wrong, since the loss of both CHS Pumps takes precedence over normal bleed & feed criteria, since the RCS needs to be bled to the point where the SI Pumps can inject. As the RCS heats up, raising saturation pressure, the PORVS may not be able to pass sufficient flow to reduce pressure far enough and core uncovery may occur. "C" is plausible, since if Bleed and Feed criteria were not met, this would be the appropriate strategy in FR-H.1.

Technical Reference(s): FR-H.1 (Rev 24-1), Steps 1-5, and 10-14 (Attach if not previously provided)
E-0 (Rev 29-0), steps 17 and 25

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07461 Given a set of plant conditions, determine the required actions to be taken per FR-H.1. (As available)

Question Source: Bank #69851

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 82	Tier #		1
K/A Statement: ARM System Alarms:	Group #		2
Ability to interpret reference materials	K/A #	APE.061.GEN.2.1.25	
such as graphs, curves, tables, etc.	Importance Rating		4.2

Proposed Question:

The plant is initially at 100% power when the following sequence of events occurs:

Time (Minutes)	Event
0	The RAD HI annunciator is received on MB2.
0	The RO reports Containment Area Radiation Monitors are in ALARM.
1	Safety Injection actuates.
17	The crew transitions to E-1, *Loss of Reactor or Secondary Coolant*.
18	The RO reports that subcooling is 0°F.
20	The RO reports 3RMS-RE04A/05A reading 240 R/hr.
24	HP reports a post accident survey near the north site boundary fence shows approximately 0.4 mr/hr general area doses rates.
30	The RO reports RE04A/05A reading of 650 R/hr and stable.
30	HP reports radiation levels around the north site boundary fence approximately 0.8 mr/hr and stable.
39	RWST Lo-Lo level is reached.

What is the required EAL classification for this event?

a) General Emergency - Alpha

b) General Emergency - Bravo

c) Site Area Emergency - Charlie Two

d) Alert - Charlie One

Proposed Answer: C

Explanation (Optional): Question is considered SRO since it requires the applicant to determine the Emergency Classification based on fission product barrier conditions. "C" is correct, and "A", "B", and "D" wrong since classification is SAE-C2 based on loss of 2 barriers, RCB2 and FCB3. CTMT barrier is OK per table 1 on page 3 of the EAL tables, where 800 R/hr is required to potentially lose the CTMT barrier. Also, the offsite plume is < 5x10-6 times the RE04 reading (3.25 mr/hr). "A", "B", and "D" are plausible, since these answers can be correct, depending on how many barriers are lost or potentially lost, or due to in-plant radiation or offsite releases.

Technical Reference(s): MP-26-EPI-FAP06-003 (Rev 9-0) (Attach if not previously provided)

Proposed references to be provided to applicants during examination: **EAL Tables**

Learning Objective: MC-04364 Given a plant condition requiring the use of EOP 35 E-1, classify the event in accordance with MP-26-EPI-FAP06, Classifications & PARs. (As available)

Question Source: Bank #73765
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.5 and 43.6
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 83	Tier #		1
K/A Statement: High Reactor Coolant Activity:	Group #		2
Ability to evaluate plant performance	K/A #	APE.076.GEN.2.1.7	
and make operational judgments	Importance Rating		4.7

Proposed Question:

With the plant at 100% power, the following sequence of events occurs:

1. Chemistry Department reports that, based on the latest RCS sample results, RCS activity is elevated.
2. The crew enters AOP 3553 *High Reactor Coolant System Activity*.

Current conditions are as follows:

- Purification Demineralizer Decontamination Factor: 30.
- Letdown Flow: 84 gpm.
- Letdown Filter Differential Pressure: 14 psid.
- Reactor Coolant Filter Differential Pressure: 12 psid.

In accordance with AOP 3553, which action is the crew required to take?

a) Shift the in-service Mixed Bed Purification Demineralizer.

b) Consult with a Reactor Engineer on the advisability of increasing letdown flow.

c) Remove from service, replace, and place the Letdown Filter back in service.

d) Remove from service, replace, and place the Reactor Coolant Filter back in service.

Proposed Answer: B

Explanation (Optional): Question is considered SRO since the applicant is required to assess plant conditions and apply a specific procedure section based on present plant conditions. "B" is correct, since increasing letdown flow will increase flow through the demins and filters, increasing the removal of RCS activity sources. "A" is wrong, since purification Demin DF is required to be greater than 25, and it is. "C" is wrong, since Letdown Filter DP is required to be less than 20 psid, and it is. "D" is wrong, since Reactor Coolant Filter DP is required to be less than 20 psid, and it is. "A", "C", and "D" are plausible, since each of these actions may be required in AOP 3553, depending on plant conditions.

Technical Reference(s): AOP 3553 (Rev 06-5), steps 1 through 7 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07531 Given a set of plant conditions, determine the required actions to be taken per AOP 3553. (As available)

Question Source: Bank #80909
Question History: Millstone 3 2007 NRC Exam
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.5
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 84	Tier #		1
K/A Statement: Instrument Failure Response:	Group #		2
Selection of / adherence to appropriate procedures	K/A #	AOP 3571.A2.01	
Proposed Question:	Importance Rating		Site Priority

With the plant at 100% power, the following sequence of events occurs:

1. The CONTAINMENT PRESSURE HI-1 Annunciator comes in on MB2.
2. The RO reports all CTMT pressure instruments indicate 13.7 psia.
3. The RO reports that only one CTMT PRESS HI-1 Bistable is lit on MB2.
4. The crew enters the appropriate procedures.
5. The crew is preparing to place the Train A SSPS Multiplexer Test switch in the “A+B” position to assist in distinguishing whether the failure is within SSPS or at the protection channel.
6. The extra operator reports that the red GENERAL WARNING lamp on 3RPS*RAKLOGB is lit.
7. The extra operator also reports that the Train B SSPS “Multiplexer Test” switch is in NORMAL at 3RPS*RAKLOGB.

Which procedure provides direction on distinguishing whether the failure is within SSPS or at the protection channel; and is the crew required to place the Train A SSPS Multiplexer Test switch in the “A+B” position?

a) The CONTAINMENT PRESSURE HI-1 ARP provides guidance. The crew will NOT select “A+B”, since this is only required if an associated instrument has also failed.

b) The CONTAINMENT PRESSURE HI-1 ARP provides guidance. The crew WILL select “A+B”, since if this causes the affected bistable light to start flashing, the RPS Bistable can be tripped without further troubleshooting of SSPS.

c) AOP 3571, *Instrument Failure Response* provides guidance. The crew will NOT select “A+B”, since this step will result in a reactor trip with the plant in this configuration.

d) AOP 3571, *Instrument Failure Response* provides guidance. The crew WILL select “A+B”, since if this causes the affected bistable light to start flashing, I&C will need to troubleshoot SSPS prior to tripping the RPS Bistable.

Proposed Answer: C

Explanation (Optional): Question is considered SRO since it requires the applicant to assess plant conditions and determine that entry into AOP 3571 applies without an instrument failure, and apply a step from AOP 3571 that is normally skipped. "A" and "B" are wrong, since the CTMT Pressure HI-1 ARP does not adequately address troubleshooting a single failed bistable. "A" is plausible, since ARP entry conditions are met; and no instrument has failed, making this an unusual entry into AOP 3571. "B" is plausible, since this action would be correct if the opposite train GENERAL WARNING light was not illuminated and the bistable light did not start flashing. "C" is correct, and "D" is wrong, since with a GENERAL WARNING on train B, taking this switch to "A + B" will mean both trains of SSPS are not in a normal lineup, and a reactor trip will occur. "D" is plausible, since this would be the correct answer if the opposite train GENERAL WARNING light was not illuminated.

Technical Reference(s): AOP 3571 (Rev 11-1), Att. R, step 1.d. (Attach if not previously provided)
OP 3353.MB2A, 5-3 (Rev 00-0)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07563 Given a set of plant conditions, determine the required actions to be taken per AOP 3571. (As available)

Question Source: Bank #80913

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43. 5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 85	Tier #		1
K/A Statement: Inadvertent CIA:	Group #		2
Knowledge of low power/shutdown implications	K/A #	AOP 3578.GEN.2.4.9	
in accident mitigation	Importance Rating		Site Priority

Proposed Question:

Initial Conditions:

- A plant heatup is in progress per OP 3201, *Plant Heatup*.
- RCS temperature is 215°F.
- RCS pressure is 350 psia.
- The RCS is solid.

An inadvertent CIA occurs, resulting in the following sequence of events:

1. The crew enters AOP 3578, *Response to Inadvertent Containment Isolation Phase A*.
2. Per AOP 3578, step 2, the crew is directed to monitor RCP motor temperatures.
3. Per AOP 3578, step 3, the crew is directed to refer to T/S 3.3.4, Pressurizer Relief Valves.

Based on current conditions, how many running RCPS are required to be monitored; and per Technical Specifications concerning the Pressurizer Relief Valves, what is the status of COPPS?

	Running RCPs	COPPS Status
a)	NONE	ARMED
b)	ONE	ARMED
c)	NONE	BLOCKED
d)	ONE	BLOCKED

Proposed Answer: B

Explanation (Optional): Question is considered SRO level since it requires the applicant to consider which of four Tech Spec LCOs related to RCS loops applies in MODE 4, along with the COPPS LCO. Also, it requires the applicant to assess the plant and apply detailed knowledge of the Plant Heatup procedure in lower MODEs. Per OP 3201, the first RCP is started prior to exceeding 160°F. Since the RCS is between 200°F and 350°F, the plant is in MODE 4. With the plant in MODE 4, LCO 3.4.1.3 requires at least one RCP to be in operation ("A" and "C" wrong). And per LCO 3.4.1.3, the first RCP shall not be started when any RCS loop temperature is $\leq$ 226°F unless COPPS is in service. In MODE 4, LCO 3.4.4, RCS Relief Valves, is NOT applicable, and per OP 3201, COPPs is not blocked until RCS temperature is 230°F ("B" correct, "D" wrong). "A" and "C" are plausible, since with RCS pressure less than 240 psia, no RCPs are allowed to be running due to seal DP concerns. "D" is plausible, since in MODE 5, RHR Suction Relief Valves may be used to provide COPPS, COPPS will be blocked above 226°F, and LCO 3.4.4 will be applicable when MODE 3 is reached.

Technical Reference(s): AOP 3578 (Rev 03-0), steps 2.f and 3.c
Tech Spec LCOs 3.4.1.3 and 3.4.1.4.1 (Amend 230)
Tech Spec LCO 3.4.4 (Amend 229) and 3.4.9.3 (Amend 197)
OP 3201 (Rev 22-2), Steps 4.3.5.f, 4.3.6, 4.4.1 and 4.4.3, and Att 1
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03450 Given a plant condition requiring the use of the OP 3208 procedure, identify applicable Technical Specification Action requirements (As available)

Question Source: New

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43. 2 and 43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 86	Tier #		2
K/A Statement: Chemical and Volume Control:	Group #		1
Knowledge of specific bases for EOPs	K/A #	004.GEN.2.4.18	
Proposed Question:	Importance Rating		4.0

The following sequence of events occurs:

1. A Steam Generator Tube Rupture occurs on the "B" SG.
2. Offsite power is lost on the trip.
3. The crew enters E-3, *Steam Generator Tube Rupture*.
4. The crew is preparing to depressurize the RCS to minimize break flow and refill the Pressurizer.

By what method is the crew required to depressurize the RCS, and why?

a) The Auxiliary Spray Valve, to minimize the possibility of a void in the Vessel Head.

b) The Auxiliary Spray Valve, to minimize the loss of reactor coolant.

c) A Pressurizer PORV, to maximize the depressurization rate.

d) A Pressurizer PORV, to minimize thermal stresses on the Pressurizer Spray Nozzle.

Proposed Answer: D

Explanation (Optional): This question is considered SRO level, since it requires detailed knowledge of E-3 actions, and the status of the Chemical and Volume Control System at this point in E-3, which is beyond knowledge of the overall strategy of E-3, and beyond system knowledge. Also, the preferred method of depressurization is normal spray, which is not available with an LOP. The question is considered a KA match since it requires an understanding of the status of the CVCS system at this point in E-3, along with its effect on Charging water temperature, which needs to be coupled with applying E-3 basis knowledge to these steps. "A" and "B" are wrong, since the crew will not be directed to depressurize the plant using the Aux Spray Valve, due to thermal stresses that will occur on the Pzr Spray Nozzle with Letdown still isolated. "A" and "B" are plausible, since Aux Spray is preferred later in ES-3.1, since by that time, letdown has been restored, and using a PORV can lead to adverse Ctmt conditions, loses RCS inventory, and is less controllable than normal Pzr spray. "A" is plausible, since ES-0 series procedures use the head vent path to protect against void growth, and the crew is cautioned in the E-3 depressurization step that void growth is possible during the depressurization. Also, the head vent letdown path will be aligned later in E-3 to restore letdown if RPCCW is not available. "B" is plausible, since this is a basis for using Aux Spray rather than a PORV if Letdown is in service. "D" is correct, and "C" wrong, since at this point in E-3, letdown has not yet been restored to provide aux spray pre-heating, so thermal shock of the Aux Spray nozzle will occur if spray is initiated. "C" is plausible, since PORVs do depressurize the RCS at a significantly faster rate than the Aux Spray Valve.

Technical Reference(s): E-3 (Rev 24-1), steps 16, 17, and 25; WOG Bkgd Doc (Rev 2) for E-3, step 16 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04372 Discuss the basis of major procedure steps and/or sequence of steps in EOP 35 E-3. (As available)

Question Source: Bank #75598

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 87	Tier #		2
K/A Statement: Residual Heat Removal:	Group #		1
Predict impact and mitigate RHR valve malfunction	K/A #	005.A2.04	
Proposed Question:	Importance Rating		2.9

Initial Conditions:

- RCS temperature is 180ºF.
- RCS pressure is 360 psia.
- There is a bubble in the Pressurizer.
- The "B" RCP is in service.
- The "A" RHR pump is in service.
- The "B" RHR pump is tagged out for breaker repairs.
- All S/Gs are at 45% NR level.

The following sequence of events occurs:

1. The "A" RHR Discharge Cold Leg Injection Valve (3SIL*MV8809A) spuriously closes.
2. The RHR PUMP A FLOW LO annunciator is received on MB2.
3. 3SIL*MV8809A cannot be opened from the Control Room.
4. The crew enters EOP 3505, *Loss of Shutdown Cooling and/or RCS Inventory*.

What action is the US required to direct per EOP 3505 to restore Shutdown Cooling?

a) Open both PORVs and feed the RCS using one charging pump from the RWST

b) Open both PORVs and feed the RCS using gravity feed from the RWST

c) Stop the "B" RCP and establish Natural Circulation cooling

d) Establish Forced Circulation cooling using the "B" RCP

Proposed Answer: D

Explanation (Optional): Question is considered SRO since it requires the applicant to assess plant conditions, and select the appropriate Attachment in EOP 3505, and determine the action to be taken per that attachment. Per EOP 3505, Mode 5, non RIO conditions directs the operators to Att "A" of 3505. "D" is correct since steps 8 and 9 use the running RCP for cooling. "A" is wrong, but plausible since Feed & Bleed using CHS pump is attempted after Forced circ (steps 8 & 9) and Natural circ (steps 10 & 11) attempts are unsuccessful. "B" is wrong but plausible since Gravity feed is utilized in Modes 6 or Zero (Att. "B"). "C" is wrong, but plausible since step 8 will stop RCPs in excess of one, but will leave one running with RCS pressure between 310 and 375 psia. "C" is plausible, since if RCS pressure is less than 310 psia, operators would be required to stop the RCP and establish natural circulation cooling.

Technical Reference(s): EOP 3505 (Rev 13-1), Entry Conditions (Attach if not previously provided)
EOP 3505 (Rev 13-1), Step 1-7
EOP 3505 (Rev 13-1), Att. "A", steps 1-13

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07513 Given a set of plant conditions, determine the required actions to be taken per EOP 3505. (As available)

Question Source: Bank #78102

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 88	Tier #		2
K/A Statement: Emergency Core Cooling:	Group #		1
Ability to evaluate plant performance and	K/A #	006.GEN.2.1.7	
make operational judgments	Importance Rating		4.7

Proposed Question:

A large break LOCA occurs, and current conditions are as follows:

- No SIH pumps could be started.
- RWST Level is approaching the Lo-Lo level setpoint.

Which procedure will address the loss of SIH Pumps, and based on the loss of SIH Pumps, what action will be taken?

a) Per E-1, *Loss of Reactor or Secondary Coolant*, the crew will verify two Charging Pumps are running.

b) Per E-1, *Loss of Reactor or Secondary Coolant*, the crew will start the swing Charging Pump.

c) Per ES-1.3, *Transfer to Cold Leg Recirculation*, the crew will reopen one RHR Cold Leg Injection Valve.

d) Per ES-1.3, *Transfer to Cold Leg Recirculation*, the crew will restart one RHR Pump

Proposed Answer: C

Explanation (Optional): Question is considered SRO since it requires the applicant to assess plant conditions, determine which procedure addresses the specific failure, and then determine the action to be taken based on those conditions. The crew is currently progressing through E-1, waiting for the RWST Lo-Lo level signal, which will require transition to ES-1.3 to align for cold leg recirculation. E-1 will not address the loss of SIH Pumps ("A" and "B" wrong). Minimum flow required per accident analysis is one Charging and one SIH Pump. "A" is plausible, since a swing Charging Pump is available, and would increase injection flow. "B" is plausible, since two Charging Pumps would provide flow similar to one Charging and one SIH Pump. "C" is correct, since the RSS pumps utilize a portion of the RHR piping to supply the suctions of the Charging and SIH pumps during the recirculation phase, and ES-1.3 directs opening one RHR cold leg injection valve to provide the flowpath from RSS into the RCS ("D" wrong). "D" is plausible, since an RHR Pump provides a similar amount of flow to an RSS Pump.

Technical Reference(s): ES-1.3 (Rev 16-0), Entry Conditions (Attach if not previously provided)
ES-1.3 (Rev 16-0), step 3.o

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07429 Given a set of plant conditions, determine the required actions to be taken per ES-1.3 and ES-1.4 (As available)

Question Source: Modified Bank #75656
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.5
Comments:
Original Bank Question #75656 is on the following page. Considered modified since question stem was changed to before the RWST Lo-Lo level setpoint is reached in E-1 versus after entering ES-1.3, so now E-1 steps are also required to be considered. Also, distractor "A" was changed from original distractor D, which described injecting into the hot leg, to verifying a second Charging Pump in service.

Original Bank Question #75656

A large break LOCA has occurred and current conditions are as follows:

- No SIH pumps could be started.
- The crew is lining up for cold leg recirculation.

How is the crew required to increase core recirculation flow with no SIH pumps running?

a) The swing charging pump will be started, injecting additional RSS water into the RCS cold legs.

b) One RHR pump will be restarted, injecting additional RWST water into the RCS cold legs.

c) One RHR Cold Leg Injection Valve will be opened, injecting additional water from the RSS pump discharge through the RHS piping into the RCS cold legs.

d) The RHR Hot Leg Injection Valve will be opened, injecting additional water from the RSS pump discharge through the RHS piping into the RCS hot legs.

Answer: C

Examination Outline Cross-reference:	Level	RO	SRO
Question # 89	Tier #		2
K/A Statement: Pressurizer Relief/Quench Tank:	Group #		1
Predict impact and mitigate abnormal pressure	K/A #	007.A2.02	
in the PRT	Importance Rating		3.2

Proposed Question:

With the plant at 100% power, the following sequence of events occurs:

1. A relief valve sticks open, discharging to the PRT.
2. The PZR REL TK PRESSURE HI annunciator is received on MB4.
3. The crew successfully gets the relief valve to reseat.
4. The RO reports PRT pressure has increased to 45 psia.
5. The crew enters OP 3353.MB4A, 2-4, *Pzr Rel Tk Pressure Hi*.

Complete the following statement concerning the design pressure for the PRT Rupture Disks; and which portion(s) of OP 3301A, *Pressurizer Relief Tank and Reactor Vessel Flange Leakoff Operations* the crew is required to use to restore the PRT to normal operating conditions.

The PRT Rupture Disks ____(1)___exceeded the design pressure above which disk damage may have occurred; and the US will direct the RO to use OP 3301A, section(s)____(2)____.

	(1)	(2)
a)	HAVE NOT	4.7, "Restoring PRT Pressure to Normal" only
b)	HAVE NOT	4.2, 4.3, and 4.7 to restore PRT level, temperature, and pressure to normal
c)	HAVE	4.7, "Restoring PRT Pressure to Normal" only
d)	HAVE	4.2, 4.3, and 4.7 to restore PRT level, temperature, and pressure to normal

Proposed Answer: B

Explanation (Optional): Considered SRO level since knowledge of FSAR design information is required, as well as knowledge of what sections of the PRT operating procedure the ARP directs the crew to use to restore normal operating conditions. PRT pressure has reached 45 psia, which is below the design discharge pressure of 50 psig (64.7 psia), where Rupture Disk fatigue or distortion may occur ("C" and "D" wrong). "C" and "D" are plausible, since PRT pressure is well above the high pressure alarm setpoint of 23 psia. The ARP directs the crew to refer to sections 4.2, 4.3, and 4.7 to restore the PRT ("B" correct, "A" wrong), since the each section of the OP is focused on restoring the one parameter to normal, and all three of these are elevated after a discharge from a relief valve, since all of the relief valves that discharge to the PRT contain very hot water or steam. "A" is plausible, since the annunciator that is lit is the high pressure annunciator, and the ARP directs use of each of these sections depending on whether the high level is due to over-pressurizing with nitrogen, overfilling with Primary Grade Water, or due to a discharge into the PRT.

Technical Reference(s): FSAR (Rev 27-2) Section 5.4.11.2 (Attach if not previously provided)
OP 3353.MB4A (Rev 02-20), 2-4, step 2.1
OP 3301A (Rev 08-6), Table of Contents

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05349 Describe the Pressurizer Relief Tank System operation… under the following… Pzr Safety Valve or Power Operated Relief Valve discharge… (As available)

Question Source: New

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.43.1, 43.2, and 43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 90	Tier #		2
K/A Statement: Process Radiation Monitoring:	Group #		1
Predict impact and mitigate:	K/A #	073.A2.01	
erratic or failed power supply	Importance Rating		2.9

Proposed Question:

With the plant at 100% power and all Radioactive Liquid Waste System Radiation Monitoring Instrumentation operating normally, the following sequence of events occurs:

1. A discharge of the "A" Low Level Waste Drain Tank (LLWDT) is commenced.
2. Liquid Waste Effluent Radiation Monitor 3LWS-RE70 loses power.
3. The crew terminates the discharge.

The crew desires to recommence discharging the "A" Low Level Waste Drain Tank.

What additional actions are required in order to discharge the LLWDT with 3LWS-RE70 out of service?

a) Direct I&C to install a temporary monitor with an alarm setpoint below that of the 3LWS-RE70 setpoint.

b) Initiate efforts to repair the instrument. Perform at least two independent samples, independent release calculations, and independent discharge valve lineups.

c) Recirculate the LLWDT an additional 15 minutes, and perform two independent discharge valve lineups.

d) Reconfirm release calculations. Direct Chemistry to take samples every 15 minutes while the discharge is in progress to ensure effluent is within limits.

Proposed Answer: B

Explanation (Optional): Question is considered SRO level since it requires the applicant to apply REMODCM administrative requirements related to liquid radioactive release approvals. "B" is correct, and "A", "C", and "D" wrong, since REMODCM Table V.C-1 ACTION A requires best efforts to repair the instrument; and independent samples, release calculations, and discharge valve lineups prior to initiating a release. "A" and "D" are plausible, since numerous actions with inoperable rad monitors or other discharge monitors involve temporary monitors or manual samples. "C" is plausible, since recirculating the tank is required prior to its discharge.

Technical Reference(s):	REMODCM Section V.C.1 (Rev 27-01), page 132 REMODCM Table V.C.-1 (Rev 27-01), pages 133 and 134	(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective:	MC-04868 Given a plant condition or equipment malfunction… Evaluate Tech Spec applicability and determine required action.	(As available)

Question Source:	Bank #74490
Question History:	Millstone 3 2013 NRC Exam
Question Cognitive Level:	Memory or Fundamental Knowledge
10 CFR Part 55 Content:	55.43.2, 43.4, and 43.5
Comments:	

Examination Outline Cross-reference:	Level	RO	SRO
Question # 91	Tier #		2
K/A Statement: Control Rod Drive:	Group #		2
Predict impact and mitigate: rod misalignment alarm	K/A #	001.A2.17	
Proposed Question:	Importance Rating		3.8

The crew is initially increasing reactor power per OP 3204, *At Power Operations*, when the following sequence of events occurs:

1. The RO withdraws control rods.
2. The ROD POSITION DEVIATION annunciator is received on MB4.
3. The RO reports the following:
   - Control Bank "D" GRPI now indicates 205 steps.
   - Control Bank "D", Group 2 rod D-12 still indicates 192 steps on DRPI.
   - NO other annunciators are lit on MB-4.
4. The crew enters AOP 3552, *Malfunction of the Rod Drive System.*

Which Attachment(s) in AOP 3552 will be used by the crew to address the affected rod?

a) Use Attachment "A", "Misaligned Rod," attempt to align the rod. If successful, use Attachment "E", "Restoration of Pulse-To-Analog Converter," to restore the Pulse to Analog Converter.

b) Use Attachment "A", "Misaligned Rod," attempt to align the rod. If successful, the Pulse to Analog Converter does NOT need to be restored.

c) Use Attachment "C", "Position Indication Malfunction," determine the Rod Position Indication malfunction, and reduce thermal power to less than 50% within 8 hours.

d) Use Attachment "D", "Determination of Rod Trippability," determine if the rod is trippable, and if coil patterns DO NOT conform to their expected pattern, be in HOT STANDBY within 6 hours.

Proposed Answer: B

Explanation (Optional): Question is considered SRO since it requires the applicant to assess plant conditions and select the correct Attachment in AOP 3552 to mitigate the event. After stabilizing the plant, AOP 3552 directs the crew to the appropriate attachments based on annunciator status. The Rod Position Deviation annunciator directs the US to Attachment "A" to attempt to align the rod. If successful, Attachment "D" will direct the US to use Attachment "E" if the rod is a group 1 rod, but since this is a group 2 rod, Attachment "D" is not required ("B" correct, "A" wrong, but plausible). "C" is wrong, since this Attachment would be appropriate if DRPI annunciators were lit. "C" is plausible, since abnormal DRPI indications exist, a Rod Position Deviation annunciator is lit, and the crew has not yet confirmed the status of the rod based on primary plant parameters. Also, the downpower would be appropriate if a DRPI failure existed. "D" is wrong, since with coil patterns not normal, the problem is with Rod Control, so rod would not be considered stuck, and Tech Specs require Hot Standby in 6 hours only if the rod is stuck. "D" is plausible, since this Attachment would be used if the crew is not successful in realigning the rod, and a note prior to step 5 in AOP 3552 states that if at any time a rod is determined to be untrippable, perform a SHUTDOWN MARGIN within 1 hour and be in at least HOT SHUTDOWN within 6 hours.

Technical Reference(s): AOP 3552 (Rev12-0), steps 1-5 (Attach if not previously provided)
AOP 3552 (Rev 12-0), Att A, step 7
OP 3353.MB4C (Rev 07-4), 6-9

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07594 Given a set of plant conditions, determine the required actions to be taken per AOP 3552, Malfunction of the Rod Drive System (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.2 and 43.5
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 92	Tier #		2
K/A Statement: Non-nuclear Instrumentation:	Group #		2
Prioritize and interpret the significance of each	K/A #	016.GEN.2.4.45	
annunciator or alarm	Importance Rating		4.3

Proposed Question:

A refueling outage has just been completed, and a plant startup is in progress per OP 3203, *Plant Startup*, with initial conditions as follows:

- The plant is at 23% power.
- The crew is raising Main Generator load.
- The Condenser Steam Dump Valves have just gone closed.

Prior to any further operator action, the following sequence of events occurs:

1. A feed transient occurs.
2. The crew stabilizes the plant.
3. The RO and BOP walk down their boards and report the following four annunciators are lit:
   - LEFM Accuracy Trouble
   - Turb Bypass Valve Arm for Opening
   - Tave/Auct Tave Deviation
   - Tref/Auct Tave Deviation

Assuming no instrument failures have occurred, which one of these annunciators is the highest priority for the crew?

a) LEFM Accuracy Trouble, since the calorimetric has shifted to an NIS based calculation.

b) Turb Bypass Valve Arm for Opening, since this may have been the cause of the transient.

c) Tave/Auct Tave Deviation, since entry into a Tech Spec LCO is required.

d) Tref/Auct Tave Deviation, since performance of a surveillance is required.

Proposed Answer: D

Explanation (Optional): Question is considered SRO since it requires the applicant to assess four separate Annunciator Response Procedure actions, and prioritize them appropriately, and also requires knowledge of when surveillances are required. None of these annunciators require a Reactor Trip, an AOP entry, or a Tech Spec LCO entry ("C" wrong). "D" is correct, since a Tref/Auct Tave Deviation annunciator being lit while the reactor is critical requires SP 3601G.3, *Tavg Monitoring* to be performed per Tech Spec Surveillance Requirement 4.1.1.4, "Reactivity Control Systems, Minimum Temperature for Criticality." "A" is wrong, but plausible, since the Leading Edge Flow Transmitter provides input to the plant calorimetric program, and will cause calorimetric to swap to NIS based calculation, but on the initial startup after a refueling outage, the plant is selected to feed flow calorimetric. "B" is wrong, but plausible, since the steam dumps have just gone closed, so at this point in OP 3203, they are still armed, so this is an expected annunciator. This annunciator will clear after manually selecting Tave mode in the next few steps in OP 3203. "C" is wrong, since no action is required per the ARP. "C" is plausible, since RCS temperature is not on program, and Tech Spec LCOs exist based on RCS temperature (Minimum Temperature for Criticality, DNB, and Pzr Level versus Tave), and the other temperature based annunciator requires the surveillance to be performed. "A", "B", and "C" are plausible, since a feed transient has occurred, and each of these annunciators receive input from non-nuclear instruments that are related to either the feed system or could be affected by a feed system transient.

Technical Reference(s):	OP 3353.MB4C (Rev 07-4), 5-5	(Attach if not previously provided)
	OP 3353.MB4C (Rev 07-4), 6-5	
	OP 3353.MB4C (Rev 07-4), 6-12	
	OP 3203 (Rev 20-7), steps 4.3.55 and 4.3.62	
	SP3601G.3 (Rev 05-0), Section 1.2	
	OP 3360 (Rev 07-9), page 3	
	Functional Drawing 10 (Rev J)	
	ESK 10BM (Rev 11-0)	

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-03388 Discuss conditions which require transition to other procedures form OP 3203. (As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.2 and 43.5
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 93	Tier #		2
K/A Statement: Steam Generator:	Group #		2
Knowledge of the bases in Technical Specifications for LCOs and safety limits	K/A #	035.GEN.2.2.25	
	Importance Rating		4.2

Proposed Question:

Initial conditions:

- SG Code Safety Valve 3MSS*RV23A has been gagged shut due to excessive leakage.
- Reactor power has been reduced to 60.0%.

The following sequence of events occurs:

1. A short-term secondary pressure transient occurs due to grid instabilities.
2. SG Code Safety Valves 3MSS*RV22A and 3MSS*RV22D also begin to leak.
3. The plant remains on line.
4. The crew gags 3MSS*RV22A and 3MSS*RV22D shut.

Using the attached Tech Spec LCO 3.7.1.1 and Table 3.7-1, what ACTION is required to be taken as a result of the two newly gagged SG Code Safety Valves, and per Tech Spec Bases, why are the SG Code Safety Valves required to be OPERABLE?

a) Reduce Reactor Power to 42.8% within 4 hours. The Safety Valves provide protection against over-pressurizing the RCS pressure boundary on a turbine trip.

b) Reduce Reactor Power to 42.8% within 4 hours. The Safety Valves limit the effects of SG overfill on a SG Tube Rupture.

c) Reduce Reactor Power to 25.5% within 4 hours. The Safety Valves provide protection against over-pressurizing the RCS pressure boundary on a turbine trip.

d) Reduce Reactor Power to 25.5% within 4 hours. The Safety Valves limit the effects of SG overfill on a SG Tube Rupture.

Proposed Answer: A

Explanation (Optional): Question is considered SRO since it requires the applicant to apply Tech Spec LCO actions to a given situation, and also understand Tech Spec Bases information. One of the five Safety Valves being inoperable PER steam generator requires reducing power to 60.1%. Because one additional leaking safety is now gagged on one SG, a further reduction in power to 42.8% is required. "C" and "D" are wrong, but plausible, since this would be the action if the three SG safety valves were gagged on the same SG. The primary purpose of the Main Steam Code Safety Valves (MSSVs) is to provide overpressure protection for the secondary system. The MSSVs also provide protection against over-pressurizing the reactor coolant pressure boundary by providing a heat sink for the removal of energy from the Reactor Coolant System (RCS). The safety analysis demonstrates that the transient response for turbine trip occurring from full power without a direct reactor trip presents no hazard to the integrity of the RCS or the Main Steam System ("A" correct, "B" wrong). This analysis demonstrates that the maximum RCS pressure does not exceed 110% of the design pressure and limits the maximum steam pressure to less than 110% of the steam generator design pressure. If there are inoperable MSSV(s), it is necessary to limit the primary system power during steady-state operation to a value that does not result in exceeding the combined steam flow capacity of the turbine (if available) and the remaining OPERABLE MSSVs. "B" and "D" are plausible, since this is related to be bases for the atmospheric relief bypass valves.

Technical Reference(s):	Tech Spec (Amend 242) LCO 3.7.1.1	(Attach if not previously provided)
	Tech Spec (Amend 242) Table 3.7.1	
	Tech Spec (Amend 106) Table 3.7.3	
	Tech Spec Bases (LBDCR 07-MP3-037) for LCO 3.7.2	

Proposed references to be provided to applicants during examination: **Tech Spec LCO 3.7.1.1, and Table 3.7.1**

Learning Objective:	MC-05007 Given a plant condition or equipment malfunction, use provided reference material to… Evaluate technical specification applicability and determine required action requirements…	(As available)

Question Source: New
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.2
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 94	Tier #		3
K/A Statement: Generic:	Group #		1
Ability to identify and interpret diverse indications	K/A #	GEN.2.1.45	
to validate the response of another indication	Importance Rating		4.3

Proposed Question:

With the plant initially at 100% power, the following sequence of events occurs:

<u>Time</u>	<u>Event</u>
0250	The plant trips due to a loss of all Main Feedwater Pumps.
0253	The BOP reports NO AFW Pumps are running, and they can NOT be started from MB5.
0324	The crew enters FR-H.1, *Response to Loss of Secondary Heat Sink*.
0330	All SG WR levels indicate 50% and decreasing.
0337	RCS Tcold reaches 561°F and the SG Atmospheric Dump valves open.
0355	No AFW Pumps have been started, and current conditions are as follows:

- All SG WR levels indicate 32% and stable.
- RCS pressure is cycling on the PORVs.
- CETCs indicate 639°F and increasing.
- RCS Loop ΔT is decreasing.

What required action is the highest priority for the crew at this point?

a) Restore feed from AFW pumps.

b) Restore feed from the Main Feed pumps.

c) Initiate feed from the Main Condensate pumps.

d) Initiate bleed and feed cooling of the RCS.

Proposed Answer: D

Explanation (Optional): Question is considered SRO since is requires the applicant to assess plant conditions, and determine SG level indications are faulty based on diverse indications, then determine the bleed and feed section in the procedure is required. This event is related to Diablo Canyon OE: (NRC-IN 2002-10) Feb 9, 2002, where a FRV failed closed, but SG level appeared to stabilize at 7.5% NR, above the 7.2% trip & AFW actuation setpoint with actual level still decreasing. This was due to DP across the SG moisture separator mid-deck plate. With all WR levels stable above the bleed and feed setpoint of 21% WR, the 2nd B&F criterion is RCS pressure at 2350 psia due to a loss of heat sink. "D" is correct, and "A", "B", and "C" wrong, since RCS temperature is increasing with secondary reliefs open and subcooling is down to 20°F, showing heat sink is not adequate. Decreasing DT with temperature increasing shows heat removal from the SGs is inadequate. Time is of the essence, as the PORVs are rapidly losing their ability to depressurize the RCS and SI cooling flow at higher RCS pressures may not be adequate. "A", "B", and "C" are plausible since these are actions used in FR-H.1 to restore heat sink if immediate bleed and feed is not yet required, and SG levels are all above the 21% B&F actuation setpoint. Also, there are several ways to be at 2350 psia with CETCs increasing that are not due to loss of heat sink, such as if SI actuates due to a SG fault, with the RCS heating up after the SG blows dry.

Technical Reference(s):	FR-H.1 (Rev 24-1) Bleed and Feed Criteria WOG Bkgd Doc (Rev 2) for FR-H.1	(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective:	MC-07461 Given a set of plant conditions, determine the required actions to be taken per FR-H.1.	(As available)

Question Source: Bank #78739
Question History: Millstone 3 2011 NRC Exam
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.5
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 95	Tier #		3
K/A Statement: Generic: Knowledge of the process for managing maintenance activates during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator	Group #		2
	K/A #	GEN.2.2.17	
	Importance Rating		3.8

Proposed Question:

The plant is at 100% power.

In accordance with WM-AA-100, *Work Management*, which of the following situations does **NOT** require a PRA risk review?

a) Emergent work on Switchyard Breaker 13T-2 is completed satisfactorily earlier than originally scheduled.

b) A crane is driven inside the switchyard substation fenced area while preparing for emergent work in the switchyard, without actually beginning any work.

c) Scheduled maintenance on the "A" EDG is started early, so it is now going to be conducted in parallel with work on other maintenance rule-related equipment.

d) Scheduled maintenance continues on the "A" EDG beyond its allowed configuration time.

Proposed Answer: A

Explanation (Optional): Considered SRO since it involves knowledge of administrative procedures related specifically to the SRO job function of coordinating work in the plant, and controlling its effect on risk. This question is also tied to a learning objective that is specifically labeled as "SRO" only. The SM is responsible for reviewing scheduled work activities at start of each shift with the US, Work Control SRO, and STA, including the following at a minimum:

- Current risk color and any changes in risk color projected for the shift ("B", "C", and "D" plausible, since any color change requires SM discussion with US, WC SRO, and STA).
- Summary/listing of all scheduled activities causing any change in risk above the baseline.
- Any significant scheduling issues associated with risk significant activities for the shift (e.g., ensuring that any activities scheduled in series are NOT performed in parallel).
- Any emergent items impacting PRA model NOT accounted for in the current risk profile.

General guidance is that emergent work requires Risk Assessments if the work causes conditions to change such that previous analysis is invalidated. Conditions that may require a re-analysis include:

- Changes in weather or grid condition that significantly increase probability of a loss of off-site power (OR reactor trip risk) ("B" wrong).
- Maintenance on systems already analyzed not planned to be concurrent but will now be performed concurrently ("C" wrong).
- Equipment failures or degraded conditions.
- Any significant deviation from the assumptions of the analysis ("D" wrong).

Changes in activity duration that result in new overlaps with other activities also require reanalysis ("A" correct, since the color change does not create an overlap with other activities).

Technical Reference(s): WM-AA-100 (Rev 25-0), Sections 3.5.7 and 3.5.8 (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05570 (SRO) Discuss the Work Control SRO's authority and responsibility associated with On-Line Maintenance activities. (As available)

Question Source: Bank #77695

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 96	Tier #		3
K/A Statement: Generic: Knowledge of the process for managing troubleshooting activities	Group #		2
	K/A #	GEN.2.2.20	
	Importance Rating		3.8

Proposed Question:

A Troubleshooting Plan has been developed per MA-AA-103, *Conduct of Troubleshooting*.

The Troubleshooting Team Lead (TTL) is preparing to submit the plan for approval.

Per MA-AA-103, what is one item required to be considered by the TTL in determining the highest level of approval required for the Troubleshooting Plan?

a) The Rigor Category necessary for the troubleshooting to be conducted.

b) The Human Performance issues involved with the original failure.

c) Whether the action being taken is to correct a specific known problem or an unknown problem.

d) Whether the troubleshooting is on power block equipment or non-power block equipment.

Proposed Answer: A

Explanation (Optional): Considered SRO since it involves knowledge of administrative procedures related specifically to the SRO job function of coordinating work in the plant, and controlling its effect on risk. This question is also tied to a learning objective that is specifically labeled as "SRO" only. "A" is correct, and "B", "C", and "D" wrong, since the approval of the troubleshooting plan contains three requirements: the troubleshooting team is to ensure the PRA risk impact of the troubleshooting has been assessed, and the TTL determines the level of approval required based on the Risk Level of the troubleshooting, and on the Rigor Category of the troubleshooting. "B", "C", and "D" are plausible, since each of these items are considered in determining whether the troubleshooting falls within the scope of the troubleshooting procedure.

Technical Reference(s): MP-AA-103 (Rev 13-0), Section 3.9 (Attach if not previously provided)
MP-AA-103 (Rev 13-0), Section 2

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-05378 (SRO) Discuss the considerations involved in reviewing a Trouble Shooting Plan (As available)

Question Source: New
Question Cognitive Level: Memory or Fundamental Knowledge
10 CFR Part 55 Content: 55.43.5
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 97	Tier #		3
K/A Statement: Generic:	Group #		2
Knowledge of conditions and limits	K/A #	GEN.2.2.38	
in the facility license	Importance Rating		4.5

Proposed Question:

After a transient, the RO reports that the current calorimetric 4-minute average power indication is at 3750 MWth based on steam-flow calorimetric.

The crew is taking the following actions:

- The US directs the RO to ensure the 12-hour shiftly average power doesn't exceed 3650 MWth.
- The SM will submit a CR.

What other action(s) is/are required to be taken by the crew?

a) "Immediately" reduce power to less than or equal to 3650 MWth only.

b) "Promptly" reduce power to less than or equal to 3650 MWth only.

c) "Immediately" reduce power to less than or equal to 3650 MWth, and contact RE to determine reportability requirements.

d) "Promptly" reduce power to less than or equal to 3650 MWth, and contact RE to determine reportability requirements.

Proposed Answer: C

Explanation (Optional): Question is considered SRO since it requires the applicant to assess plant conditions that are potentially in violation of the facility license, and determine the actions required to restore compliance, including the potential for a reportable condition. The Millstone 3 License requires the licensee to maintain reactor power at or below its license limit of 100%. The process for carrying this out is found in OP 3204, with differing actions required based on how high power is, and for how long. IF the "4 minute average" THERMAL POWER (CVQRPA) exceeds 100.5% (3,668 MWth), PERFORM the following: Promptly REDUCE power to less than or equal to the licensed maximum power level ("B" and "D" plausible). NOTIFY Reactor Engineering, and SUBMIT a CR. "B" and "D" are wrong, since IF the "4 minute average" THERMAL POWER (CVQRPA) exceeds 102% (3,723 MWth), PERFORM the following: Immediately REDUCE power to less than or equal to the licensed maximum power level ("B" and "D" wrong). NOTIFY Reactor Engineering, and SUBMIT a CR. The NRC notification is only required if 4-minute average power exceeds 102% ("C" correct, "A" wrong, but plausible), or if the 12-hour average exceeds 3650 MWth.

Technical Reference(s): OP 3204 (Rev 19-2), Section 4.3.1; Millstone 3 License (Amendment 254), Section 2.C.(1) (Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07497 Given a set of plant conditions, determine the required actions to be taken per OP 3204. (As available)

Question Source: Modified Bank #69062

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 55.43.1 and 43.5

Comments: Original Bank Question 69062 is included on the next page.

Original Bank Question 69062. Considered "modified" since the amount of the power excursion has been increased to the point where one of the previous wrong answers is now the correct answer.

After a transient, the RO reports that the current calorimetric 4-minute average power indication is at 3705 MWth based on a steam flow calculation.

The crew is taking the following actions:

- The US directs the RO to ensure the 12-hour shiftly average power doesn’t exceed 3650 MWth.
- The work control SRO notifies Reactor Engineering.
- The SM submits a CR.

What other action(s) is/are required to be taken by the crew?

a) Immediately reduce power to less than or equal to 3650 MWth only.

b) Promptly reduce power to less than or equal to 3650 MWth only.

c) Immediately reduce power to less than or equal to 3650 MWth and notify the NRC within 24 hours.

d) Promptly reduce power to less than or equal to 3650 MWth and notify the NRC within 24 hours.

Correct answer: B

Examination Outline Cross-reference:	Level	RO	SRO
Question # 98	Tier #		3
K/A Statement: Generic: Knowledge of radiological safety procedures pertaining to licensed operator duties, such as rad monitor alarms, Ctmt entry requirements, fuel handling responsibilities, access to locked high rad areas, etc.	Group #		3
	K/A #	GEN.2.3.13	
	Importance Rating		3.8

Proposed Question:

With the plant at 100% power with the "B" SLCRS Fan running, the following sequence of events occurs:

1. A RADIATION ALERT annunciator comes in on MB2.
2. The RO reports that "SLCRS Filter Fan Discharge to Millstone Stack" radiation monitor 3HVR*RE19B has trended up to the ALERT setpoint.

What procedure is the US required to use to mitigate the event, and what action will that procedure direct to check for potential sources of the radioactive release?

a) OP 3353.MB2B, 2-8, *Radiation Alert*, which checks the Condenser Air Ejector Discharge Radiation Monitor 3ARC-RE21 trend.

b) OP 3353.MB2B, 2-8, *Radiation Alert*, which checks the CTMT Purge Exhaust Fans running.

c) AOP 3573, *Radiation Monitor Alarm Response*, which checks the Condenser Air Ejector Discharge Radiation Monitor 3ARC-RE21 trend.

d) AOP 3573, *Radiation Monitor Alarm Response*, which checks the CTMT Purge Exhaust Fans running.

Proposed Answer: C

Explanation (Optional): Question is considered SRO level since it requires the applicant to assess plant conditions and select the appropriate procedure, and interpret radiation readings to determine the required action to be taken per the AOP. "A" and "B" are wrong, since OP3353.MB2B, 2-8 will direct the crew to AOP 3573 prior to taking actions with ventilation. "A" and "B" are plausible, since OP 3353.MB2B, 2-8 is applicable in this event, and directs some actions. Also, some AOPs are written assuming actions have been taken per the ARP prior to entering the AOP. "C" is correct since one of the actions in AOP 3573 is to check the Condenser Air Ejector Rad Monitor Trend. "D" is wrong, since AOP 3573 does not direct the crew to check the Containment Purge System in service. "D" is plausible, since AOP 3573 directs the crew to check the CTMT Vacuum Pumps, and the CTMT Purge System also draws on CTMT.

Technical Reference(s): OP 3353.MB2 (Rev 00-2), 2-8 (Attach if not previously provided)
AOP 3573 (Rev 20-0), Att A, page 11

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-07567 Given a set of plant conditions, determine the required actions to be taken per AOP 3573. (As available)

Question Source: Bank #78805

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.43.4 and 43.5

Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 99	Tier #		3
K/A Statement: Generic:	Group #		4
Knowledge of EOP entry conditions	K/A #	GEN.2.4.1	
and immediate action steps	Importance Rating		4.8

Proposed Question:

Initial Conditions:

- A Steam Break has occurred.
- AFW has been throttled per ECA-2.1, *Uncontrolled Depressurization of All Steam Generators*, bringing in the expected RED path on the Heat Sink status tree.
- The crew is terminating SI per ECA-2.1.
- The STA has the INTEGRITY CSF status tree called up on SPDS.

The following sequence of events occurs:

1. The STA notices the INTEGRITY status tree turn ORANGE.
2. The STA immediately informs the US.
3. The US verifies that there are no other ORANGE or RED CSF Status Trees, and then immediately exits ECA-2.1 and enters FR-P.1 *Response to Imminent Pressurized Thermal Shock Condition*.

Did the STA/US deal with the ORANGE path correctly? If not, why not?

a) No. The US was required to transition to FR-P.1 as soon as the ORANGE path was observed, prior to checking for other RED or ORANGE paths.

b) No. The US was required to remain in ECA-2.1, which at this point takes precedence over the FRPs.

c) No. The US was required to transition to FR-P.2 *Response to Anticipated Pressurized Thermal Shock Condition*.

d) Yes. The STA/US handled the CSF status trees monitoring correctly and the US made the appropriate transition.

Proposed Answer: D

Explanation (Optional): Question is considered SRO since it requires knowledge of administrative procedures that specify hierarchy and implementation of EOPs. OP 3272, section 1.8 and Attachment 4 require that during status tree monitoring, the SM/US be immediately informed of any RED or ORANGE path condition. The EOP in effect is immediately stopped ("A" plausible) and the required FRP is performed "according to the rules of priority", which is based first on color and then by sequence priority. The remaining trees must be checked to conform with rules of priority ("D" correct, "A" wrong). "B" is wrong since ORANGE path FRs take priority over EOPs. "B" is plausible, since ECA-2.1 has an exception for FR-H.1 with throttled feed, and doesn't allow transition back to E2 with a good SG if SI termination steps are in progress. "C" is wrong, since ORANGE and RED paths both require entry into P.1. "C" is plausible, since other FR Procedure sets are designed to enter Procedure 1 for a Red path, and procedure 2 for an Orange or Yellow path.

Technical Reference(s): OP 3272 (Rev 08-13), Section 1.8 (Attach if not previously provided)
OP 3272 (Rev 08-13), Att 4

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04453 Given a specific plant condition, describe the use of the critical safety function (CSF) status tree rules of priority toward implementation of the functional response procedures including the person(s) responsible for monitoring the CSF status trees and priority of implementation. (As available)

Question Source: Bank #65030
Question Cognitive Level: Comprehension or Analysis
10 CFR Part 55 Content: 55.43.5
Comments:

Examination Outline Cross-reference:	Level	RO	SRO
Question # 100	Tier #		3
K/A Statement: Generic: Knowledge of	Group #		4
facility protection requirements, including fire	K/A #	GEN.2.4.26	
brigade and portable firefighting equipment usage	Importance Rating		3.6

Proposed Question:

The plant is at 100% power on the nightshift, with the on-shift crew staffed as follows:

- One SM
- One US
- One STA
- Two ROs
- Five PEOs

The following sequence of events occurs:

1. A Security Guard calls the Control Room and reports a fire in the Cable Spreading Room.
2. The crew enters EOP 3509, *Fire Emergency*.
3. The Fire Brigade is being dispatched to fight the fire using the Fire Fighting Strategy Book.

Complete the following statement concerning how many of the five Millstone 3 PEO's are allowed to be dispatched as fire brigade members, and which action in the Fire Fighting Strategy specifically requires Shift Manager permission to perform.

____(1)___Millstone 3 PEOs are allowed to be dispatched as fire brigade members, and Shift Manager permission is required to____(2)___in the Cable Spreading Area.

	(1)	(2)
a)	Three	pressurize the fire hoses
b)	Three	manually discharge the CO2 System
c)	Five	pressurize the fire hoses
d)	Five	manually discharge the CO2 System

Proposed Answer: B

Explanation (Optional): Question is considered SRO since it tests Tech Spec and TRM Section 6 admin requirements on shift staffing, including the fire brigade, and tests SM responsibility in the Fire Fighting Strategy Book, and Fire Brigade makeup per EOP 3509. Two PEOs are required to meet minimum crew composition. This leaves three of the four PEOs available for the fire brigade ("C" and "D" wrong). "C" and "D" are plausible, since five PEOs are required for the fire brigade, but this includes Millstone Unit 2 PEOs. "B" is correct, since EOP 3509 will lockout the CO2 System for personnel safety, and the Fire Fighting Strategy Book requires Shift Manager permission to discharge CO2 into the area. "A" is wrong, since Shift Manager permission is not required to pressurize the hoses. "A" is plausible, since the hose stations are kept dry and isolated in this area, due to concerns with all of the electrical cables in the area.

Technical Reference(s): Fire Fighting Strategies Book (Rev 00-0), Control Bldg, pg 32-35
Tech Spec (Amendment 212), Table 6.2-1
TRM (LBDCR 07-MP3-018) Requirement 6.2.2
EOP 3509 (Rev 26-0), step 2.g-i
(Attach if not previously provided)

Proposed references to be provided to applicants during examination: None

Learning Objective: MC-04584 Describe the major administrative or procedural precautions and limitations placed on the operation of the CO2 Fire Protection (FPL) system… (As available)

Question Source: New

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 55.43.2 and 43.5

Comments: